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Criterion 3: Research, Innovations and Extension

Key indicator 3.3: Research Publications and Awards

3.3.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

Index

S.No	Description	Website link
3.3.1.1	Number of research papers published per teacher in the Journals notified on UGC care list during the last five years	Click to View




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3.3.1.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

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AUTHENTICATION CERTIFICATE

3.3.1.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

Details	Academic Year				
	2022-2023	2021-2022	2020-2021	2019-2020	2018-2019
Number of Papers published	26	70	49	63	35
Total no of Papers Published	243				




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TITLE OF PAPER	NAME OF THE AUTHORS	DEPT OF THE AUTHOR	Name of Journal	Link to the recognition in UGC enlistment of the journal / Digital object				
				Year of Publication	ISSN number	Link to website of the journal	Is it listed in UGC Care list /Scopus/ Web of Science /other, mention	Link to article/ paper/ abstract of the article
Reduction of Voltage Stress in a Medium Frequency Transformer using IFBTL DC/DC Converter for PMSG Based Wind Turbine	A. sugunya	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	http://ijee.in/2021/4/3.pdf	No	http://ijee.in/2021/4/3.pdf
Life prediction and statistical analysis of e-glass fiber with alovera in composite specimen	A.Arulkumar	Mech	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://ijrmae.in/Volume7issue4/paper2.pdf	No	http://ijrmae.in/Volume7issue4/paper2.pdf



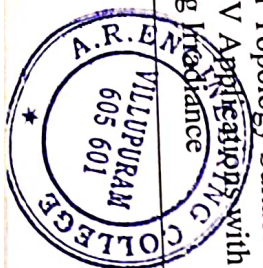
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An effective GDI (Gate Diffusion Input) Based 16-bit Shift Register Design for Power and Area Optimization	A.Chandrasekaran	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://ijice.in/2019/4/4.pdf	No	http://ijice.in/2019/4/4.pdf
Development of Smart Control System for Improved Energy Management in Building	A.Chandrasekaran	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://iriges.com/Volume4issue3/paper21.pdf	No	http://iriges.com/Volume4issue3/paper21.pdf
smart utilization of power using new bidirectional intelligent solid state transformer	A.Chandrasekaran	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2250-1118	http://ijice.in/2020/5/5.pdf	No	http://ijice.in/2020/5/5.pdf
Implementation of low power 17-transist or true single-phase clocking flip-flop designs with 45 nm cmos technology	A.Madhavan	CSE/ECE	International Journal of Electrical and Computer Engineering	2020-2021	2456-172X	http://iriges.com/Volume5issue4/paper4.pdf	No	http://iriges.com/Volume5issue4/paper4.pdf
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	A.Sugunaya	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2456-172X	http://iriges.com/Volume5issue4/paper7.pdf	No	http://iriges.com/Volume5issue4/paper7.pdf



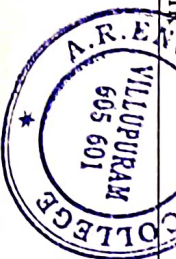
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kinetic study on the effect of water hyacinths in foodwaste biogas production	A. Vinoth	Civil	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	http://iirmmae.in/Volume7Issue3/paper7.pdf	No	http://iirmmae.in/Volume7Issue3/paper7.pdf
Design and analysis of single layer quantum dot-cellular automata based 1-bit comparators	Amutha.S	CSE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.in/Volume6Issue2/paper4.pdf	No	http://iirmmae.in/Volume6Issue2/paper4.pdf
Experimental behavior of fiber reinforced concrete using recycled aggregate with agro-waste replacement	B. Anandhakumar	Civil	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://irset.com/2023/March/paper5.pdf	No	http://irset.com/2023/March/paper5.pdf
Smart Drainage Management to Mitigate Summer Drought Damage in Nordic Agriculture within the Circular Economy Framework	B. Anandhakumar	Civil	International Journal of Rock Mechanics and Mining	2022-2023	2454-1435	http://iirmmae.in/Volume9Issue3/paper5.pdf	No	http://iirmmae.in/Volume9Issue3/paper5.pdf



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			Sciences					3.pdf
Effect of Mechanical, Thermal Properties and Drilling Parameters on Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite	Anbazhagan R	Mech	Internationa l Journal for Research in Applied Science and Engineering Technology	2021-2022	2347- 6729	http://irrsct.com/2022/November/paper4.pdf	No	http://irrsct.com/2022/November/paper4.pdf
Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites	Anbazhagan R	MECH	Internationa l Journal of Rock Mechanics and Mining Sciences	2021-2022	2347- 6729	http://www.iirmmae.in/Volum7Issue2/paper3.pdf	No	http://www.iirmmae.in/Volum7Issue2/paper3.pdf
Fabrication of mems pressure sensor on thin film membrane	Anbazhagan R	Mech	Internationa l Journal for Research in Applied Science and Engineering Technology	2021-2022	2348- 3105	http://irrsct.com/2021/Oct/paper2.pdf	No	http://irrsct.com/2021/Oct/paper2.pdf



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preparation, properties and machinability study of luffa fiber - groundnut shell reinforced epoxy composite	Anbazhagan R	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2347-6729	http://irset.com/2022/September/paper5.pdf	No	http://irset.com/2022/September/paper5.pdf
Hybrid Composite Materials: Machinability of Luffa with Groundnut shell Fiber Reinforced Epoxy Polymer	Anbazhagan R	Mech	International Journal of Rock Mechanics and Mining Sciences	2021-2022	23454-1435	http://www.ijrm-mae.in/Volume7/Issue1/paper4.pdf	No	http://www.ijrm-mae.in/Volume7/Issue1/paper4.pdf
smart utilization of power using new bidirectional intelligent solid state transformer	B.Keerthana	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2250-1118	http://ijee.in/2020/5/5.pdf	No	http://ijee.in/2020/5/5.pdf
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	B. Keerthana	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2456-172X	http://irjes.com/Volume4/Issue4/paper7.pdf	No	http://irjes.com/Volume4/Issue4/paper7.pdf



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Error control system in cellular network	B.Keerthana	EEE	International Journal of Electrical and Computer Engineering	2021-2022	2456-172X	http://iriges.com/Volume6Issue2/paper7.pdf	No	http://iriges.com/Volume6Issue2/paper7.pdf
Power Flow of MTDC Using Droop Control & Impact of DC Voltage Drops	B.Keerthana	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2456172 X	http://iriges.com/Volume7Issue2/paper1.pdf	No	http://iriges.com/Volume7Issue2/paper1.pdf
SBFET -Based Full Adder with Ultra-Low Leakage and High Speed	B.Lakshmi	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2231-2099	http://niice.in/2021/1/3.pdf	No	http://niice.in/2021/1/3.pdf
soil area network for landslide predict and avoidance system based on arm cortex m3, mems and gsm	Bharath	ECE	International Journal of Rock Mechanics and Mining Sciences	2019-2020	2454-1435	http://ijrmae.in/Volume5-Issue-1/paper8.pdf	No	http://ijrmae.in/Volume5-Issue-1/paper8.pdf
Growth, structural, optical, spectral and mechanical studies of single crystal	Bharathiraja.R	S&H PHYSICS	International Journal of Electrical and Computer	2019-2020	2250-1118	http://ijice.in/2019/4/5.pdf	No	http://ijice.in/2019/4/5.pdf



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			Engineering						
connectivity in a fuzzy graph	Chandrapraba.R	S&H MATHS	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://iirmmae.in/Volume7Issue4/paper3.pdf	No	http://iirmmae.in/Volume7Issue4/paper3.pdf	
Design and analysis of knuckle joint using fea software	D.Manikandan	Mech	International Journal of Rock Mechanics and Mining Sciences	2018-2019	2454-1435	http://iirmmae.in/Volume4-Issue-3/paper11.pdf	No	http://iirmmae.in/Volume4-Issue-3/paper11.pdf	
Investigation of properties and machinability of luffa with groundnut shell fiber reinforced epoxy polymer hybrid composites	D.Manikandan	Mech	International Journal of Rock Mechanics and Mining Sciences	2018-2019	2454-1435	http://iirmmae.in/Volume4-Issue-4/paper5.pdf	No	http://iirmmae.in/Volume4-Issue-4/paper5.pdf	
Analysis of surface preparation in en8 steel materials by using coating methods	D.Manikandan	Mech	International Journal of Electrical and Computer	2019-2020	2456-172X	http://iriges.com/Volume4Issue2/paper18.pdf	No	http://iriges.com/Volume4Issue2/paper18.pdf	



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Experimental investigation and buckling analysis of woven glass epoxy laminated composite plate	D.Manikandan	Mech	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://irset.com/2019/December/paper9.pdf	No	http://irset.com/2019/December/paper9.pdf
Assessment of open central hole on the stress concentration factor of glass fibre-coconut coir-human hair hybrid composite	D.Manikandan	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2348-3105	http://irset.com/2021/November/paper12.pdf	No	http://irset.com/2021/November/paper12.pdf
Life prediction and statistical analysis of e-glass fiber with alovera in composite specimen	D.Manikandan	Mech	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://ijrmme.in/Volume7Issue4/paper2.pdf	No	http://ijrmme.in/Volume7Issue4/paper2.pdf



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Non-verbal communication: focus on recruitment interview for freshers	D.Sampathkumar	English	International Journal of Electrical and Computer Engineering	2019-2020	2456- 172X	http://iriges.com/Volume4issue2/paper17.pdf	No	http://iriges.com/Volume4issue2/paper17.pdf
English language teaching and conversational	D.Sampathkumar	English	International Journal of Electrical and Computer Engineering	2019-2020	2456- 172X	http://iriges.com/Volume4issue4/paper6.pdf	No	http://iriges.com/Volume4issue4/paper6.pdf
smart utilization of power using new bidirectional intelligent solid state transformer	D.Sureshkumar	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2250- 1118	http://iriges.in/2020/5/5.pdf	No	http://iriges.in/2020/5/5.pdf
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	D.Sureshkumar	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2456- 172X	http://iriges.com/Volume4issue4/paper7.pdf	No	http://iriges.com/Volume4issue4/paper7.pdf
Growth, structural, optical, spectral and mechanical studies of a single crystal	Devika.D	S&H PHYSICS	International Journal of Electrical and Computer Engineering	2019-2020	2250- 1418	http://iriges.in/2019/4/5.pdf	No	http://iriges.in/2019/4/5.pdf

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optimal load control for economic energy equilibrium in smart grid using adaptive inertia weight teaching-learning-based optimization	Dhanalakshmi V	CSE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.in/Volume6issue2/paper5.pdf	No	http://iirmmae.in/Volume6issue2/paper5.pdf
Implementation of low power 17-transistor or true single-phase clocking flip-flop designs with 45 nm cmos technology	Dhanalakshmi V	CSE/ECE	International Journal of Electrical and Computer Engineering	2020-2021	2456-172X	http://iriges.com/Volume5issue4/paper4.pdf	No	http://iriges.com/Volume5issue4/paper4.pdf
Bounded sum and bounded product of fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2018-2019	406-414	https://www.researchgate.net/publication/330818431843_Bounded_Sum_and_Bounded_Product_of_Fuzzy_Matrices	No	https://www.researchgate.net/publication/330818431843_Bounded_Sum_and_Bounded_Product_of_Fuzzy_Matrices



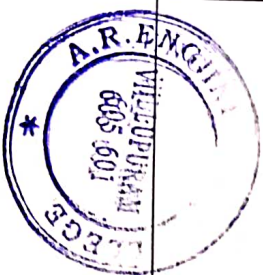
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Hamacher sum and Hamacher product of fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2018-2019	116-131	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf	No	https://www.researchgate.net/profile/I-Silambarasan/publication/338833812_ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES/links/5e2ed59c458515e2e8755b2e/ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES.pdf
Algebraic Operations on Pythagorean Fuzzy Matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2018-2019	81-90	https://www.researchgate.net/profile/I-Silambarasan/publication/338833812_ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES/links/5e2ed59c458515e2e8755b2e/ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES.pdf	No	https://www.researchgate.net/profile/I-Silambarasan/publication/338833812_ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES/links/5e2ed59c458515e2e8755b2e/ALGEBRAIC_OPERATIONS_ON_FUZZY_MATRICES.pdf



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								N-FUZZY- MATRICES.pdf
Hamacher Operations of Intuitionistic Fuzzy Matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2018-2019	81-91	https://www.researchgate.net/publication/323385451_Hamacher_Operations_of_Intuitionistic_Fuzzy_Matrices	No	https://www.researchgate.net/publication/323385451_Hamacher_Operations_of_Intuitionistic_Fuzzy_Matrices
Commutative monoid of Pythagorean fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2019-2020	191-198	https://www.ijcesonline.org/pub/paper/107-IJCSE-06602.pdf	No	https://www.ijcesonline.org/pub/paper/107-IJCSE-06602.pdf
Implication Operator On Pythagorean Fuzzy Set	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2019-2020	69-78	http://www.ijstr.org/final-print/aug2019/Implication-Operator-On-Pythagorean-Pythagorean	No	http://www.ijstr.org/final-print/aug2019/Implication-Operator-On-Pythagorean-Pythagorean



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						Fuzzy-Set.pdf	No	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf
Hamacher operations on Pythagorean fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2019-2020	1505-1509	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf	No	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf
New operations for Pythagorean Fuzzy Matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2019-2020	1	https://indist.org/articles/new-operations-for-pythagorean-fuzzy-matrices	No	https://indist.org/articles/new-operations-for-pythagorean-fuzzy-matrices
An Interval-Valued Intuitionistic Fuzzy Matrices Based on Hamacher Operations	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer	2020-2021	637-643	https://www.iscser.org/wp-content/uploads/2020-Volume%201-	No	https://www.iscser.org/wp-content/uploads/2020-Volume%201-



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			Engineering			Issue%205/JSCER03122020.pdf	Issue%205/JSCER03122020.pdf
						No	No
Fernatean Fuzzy Matrices	Dr. I. Silambarasan	S&H	Internationa l Journal of Electrical and Computer Engineering	2020-2021	541-551	https://iaem.isikun.edu.tr/web/index.php/archive/116_e/116-vol12no3/887-fermatean-fuzzy-matrices	https://iaem.isikun.edu.tr/web/index.php/archive/116_e/116-vol12no3/887-fermatean-fuzzy-matrices
Some Operations over Pythagorean Fuzzy Matrices Based on Hamacher Operations	Dr. I. Silambarasan	S&H	Internationa l Journal of Electrical and Computer Engineering	2020-2021	541-552	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf	https://pdfs.semanticscholar.org/35cc/bbe9310e40b8384afb9619162138771737e2.pdf



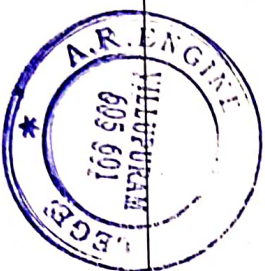
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New operators for Fermatean fuzzy sets	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2020-2021	429-442	https://www.researchgate.net/publication/344218108 New operators for Fermatean fuzzy sets	No	https://www.researchgate.net/publication/344218108 New operators for Fermatean fuzzy sets
New Operations Defined Over The Q-Rung Orthopair Fuzzy Sets	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	429-443	http://www.imvibl.org/journal/102022/journalimvi1020202341359.pdf	No	http://www.imvibl.org/journal/102022/journalimvi1020202341359.pdf
Some new operations and their properties on q-rung orthopair fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	44-64	https://www.researchgate.net/publication/351268862 Some new operations and their properties on q-rung orthopair fuzzy matrices	No	https://www.researchgate.net/publication/351268862 Some new operations and their properties on q-rung orthopair fuzzy matrices



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								https://pist.org/psrpress/ll/oms/2021/1/generalized-orthopair-fuzzy-matrices.pdf
Generalized orthopair fuzzy matrices	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	513-523	https://pist.org/psrpress/ll/oms/2021/1/generalized-orthopair-fuzzy-matrices.pdf	No	https://pist.org/psrpress/ll/oms/2021/1/generalized-orthopair-fuzzy-matrices.pdf
Generalized orthopair fuzzy sets based on Hamacher T-norm and T-conorm	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	148-161	https://pist.org/psrpress/ll/oms/2021/1/generalized-orthopair-fuzzy-sets-based-on-hamacher-t-norm-and-t-conorm.pdf	No	https://pist.org/psrpress/ll/oms/2021/1/generalized-orthopair-fuzzy-sets-based-on-hamacher-t-norm-and-t-conorm.pdf



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Some algebraic properties of Picture fuzzy sets	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	30-41	http://www.imvibl.org/bulletin/imvi_11_3_2021/bulletin_imvi_11_3_2021_429_442.pdf	No	http://www.imvibl.org/bulletin/imvi_11_3_2021/bulletin_imvi_11_3_2021_429_442.pdf
Fermatean Fuzzy Subgroups	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	288-299	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Jt5lhQAAAAA:8k81kl-MbHgC	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Jt5lhQAAAAA:8k81kl-MbHgC
Some Operations Over Intuitionistic Fuzzy Matrices Based On Hamacher T-Norm And T-Conorm	Dr. I. Silambarasan	S&H	International Journal of Electrical and Computer Engineering	2021-2022	119-133	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Jt5lhQAAAAA:8k81kl-MbHgC	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Jt5lhQAAAAA:8k81kl-MbHgC



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Some Algebraic structures of Neutrosophic fuzzy sets	Dr. I. Silambarasan	S&H	Internationa l Journal of Electrical and Computer Engineering	2022-2023	341-359	https://scholar.g oogle.com/citati ons?view_op=vie w_citation&hl=e n&user=Jt5lhQA AAAAJ&citation_ for_view=Jt5lhQ AAAAJ:M3ejUd6 NZC8C	No https://schola r.google.com/ citations?vie w_op=view_c itation&hl=en &user=Jt5lh QAAAAJ&cita tion_for_view =Jt5lhQAAAA J:M3ejUd6NZ C8C
Parameter optimization of friction stir welding of cryorolled AA2219 alloy using artificial neural network modeling with genetic algorithm	Dr. K KAMAL BABU AP/MECH	AP/MECH	Internationa l Journal of Electrical and Computer Engineering	2018-2019	417-429	https://scholar.g oogle.co.in/citati ons?view_op=vie w_citation&hl=e n&user=A6j7O3g AAAAJ&citation_ for_view=A6j7O	No https://schola r.google.co.in /citations?vie w_op=view_c itation&hl=en &user=A6j7O 3gAAAAJ&cita

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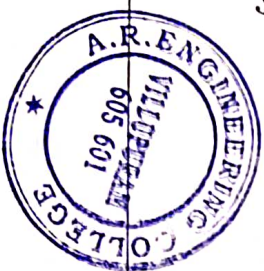
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Influences of metastable θ ", θ' and stable θ intermetallics formed during cryorolling and friction stir welding process on AA2219	Dr. K KAMAL BABU AP/MECH	AP/MECH	Internationa l Journal of Electrical and Computer Engineering	2018-2019	2149 - 2165	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=A6j7O3gAAAAU:jICSPb-OGe4C	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=A6j7O3gAAAAU:jICSPb-OGe4C
Microstructure Evaluation on Friction Stir Welding of Cryorolled 2219 Aluminum Alloy	Dr. K KAMAL BABU AP/MECH	AP/MECH	Internationa l Journal of Electrical and Computer Engineering	2019-2020		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=A6j7O3gAAAAU:Y0pcki3gAAAAU:UeHWp8XOCEIC	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=A6j7O3gAAAAU:Y0pcki3gAAAAU:UeHWp8XOCEIC



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Synthesis, spectroscopic, computational and molecular docking studies of 1-(pyridin-2-yl amino) methyl naphthalene-2-ol	Dr. P.RAJAMANI	S&H	Internationa l Journal of Electrical and Computer Engineering	2019-2020		https://www.sciencedirect.com/science/article/abs/pii/S0022286019308804	No	https://www.sciencedirect.com/science/article/abs/pii/S0022286019308804
Synthesis, spectroscopic characterisation and Molecular dynamics simulations and molecular docking study of 3-(4-bromophenyl)-1-(thiophen-2-yl) prop-2-en-1 one	Dr. P.RAJAMANI	S&H	Internationa l Journal of Electrical and Computer Engineering	2019-2020	67-75	https://www.researchgate.net/publication/337738455_DFT_SYNTHESIS_COPI_C_CHARACTERISATION_FT-IR_FT-RAMAN_NMR_A_ND_UV-VISIBLE_AND_MOLECULAR_DOCUMENTATION_OF_3-4-	No	https://www.researchgate.net/publication/337738455_DFT_SYNTHESIS_COPI_C_CHARACTERISATION_FT-IR_FT-RAMAN_NMR_A_ND_UV-VISIBLE_AND_MOLECULAR_DOCUMENTATION_OF_3-4-



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Synthesis, Characterization, Spectroscopic, DFT and Molecular Docking Studies of 3-(3, 4-Dihydroxyphenyl)-1-Phenyl-3-(Phenylamino) Propan-1-One	Dr. P.RAJAMANI	S&H	International Journal of Electrical and Computer Engineering	2020-2021	103-108	https://www.sciencedirect.com/org/science/article/abs/pii/S1040663822005802	No	https://www.sciencedirect.com/org/science/article/abs/pii/S1040663822005802
FT-IR, FT-Raman, UV-Visible, NMR, DFT and molecular docking investigation of 1-(phenyl(piperidin-1-yl) methyl) naphthalene-2-ol	Dr. P.RAJAMANI	S&H	International Journal of Electrical and Computer Engineering	2021-2022	65-71	https://www.sciencedirect.com/science/article/pii/S2211715621000011	No	https://www.sciencedirect.com/science/article/pii/S2211715621000011
Preparation and optical characterization of ZnO thin film for optoelectronic applications	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	497-499	https://ieeexplore.ieee.org/document/5441056	No	https://ieeexplore.ieee.org/document/5441056



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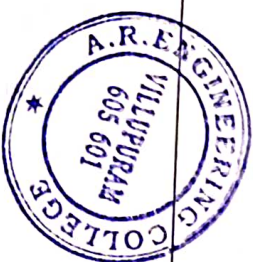
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Structural, optical and magnetic characterization of Cu-doped ZnO nanoparticles synthesized using solid state reaction method	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	1168-1173	https://link.springer.com/article/10.1007/s10854-009-0041-y	No	https://link.springer.com/article/10.1007/s10854-009-0041-y
Effect of annealing on structural and optical properties of zinc oxide films	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	378-384	https://www.google.com/search?q=Effect+of+annealing+on+structural+and+optical+properties+of+zinc+oxide+films%0D%0A&sca_esv=b31090248295323e&sca_upv=1&xsrf=ADLWIK2uT2VC9l9CCPg-qgmw37wr2wcQ%3A1716616959	No	https://www.google.com/search?q=Effect+of+annealing+on+structural+and+optical+properties+of+zinc+oxide+films%0D%0A&sca_esv=b31090248295323e&sca_upv=1&xsrf=ADLWIK2uT2VC9l9CCPg-qgmw37wr2wcQ%3A1716616959



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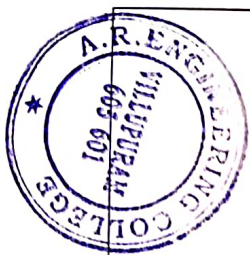
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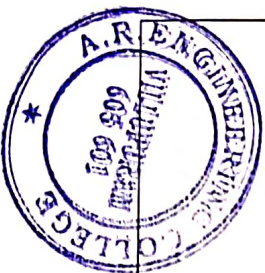
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Dr. R. PANNERDHAS, M.E., Ph.D.,
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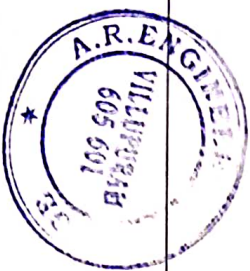
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Synthesis and optical properties of Ni-doped zinc oxide nanoparticles for optoelectronic applications	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	378-385	https://link.springer.com/article/10.1007/s11801-010-9236-y	No	https://link.springer.com/article/10.1007/s11801-010-9236-y
Structural and optical characterization of Cds nanoparticles synthesized using a simple chemical reaction route	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	309-312	https://www.researchgate.net/publication/268365456_Structural_and_optical_characterization_of_Cds_nanoparticles_synthesized_using_a_simple_chemical_reaction_route	No	https://www.researchgate.net/publication/268365456_Structural_and_optical_characterization_of_Cds_nanoparticles_synthesized_using_a_simple_chemical_reaction_route



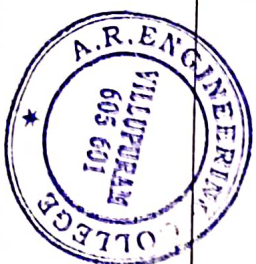
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https://pubs.acs.org/doi/10.1021/acso.1021/acso.1021/acs.3c01727	No	https://pubs.acs.org/doi/10.1021/acso.1021/acso.1021/acs.3c01727	450-455	2018-2019	International Journal of Electrical and Computer Engineering	S&H	Dr. R. ELLARASSI	Structural, optical and magnetic properties of nanoparticles of ZnO:Ni-DMS prepared by sol-gel method
https://www.researchgate.net/publication/251196070_Diluted_magnetic_semiconductor_properties_in_Zn_xCu_xO_nano particles_synthesized_by_sol_gel_route	No	https://www.researchgate.net/publication/251196070_Diluted_magnetic_semiconductor_properties_in_Zn_xCu_xO_nano particles_synthesized_by_sol_gel_route	101-108	2018-2019	International Journal of Electrical and Computer Engineering	S&H	Dr. R. ELLARASSI	Diluted magnetic semiconductor properties in Zn1-xCuxO nanoparticles synthesized by sol gel route



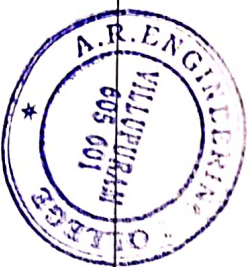
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Microstructural and photoluminescence properties of Co-doped ZnO films fabricated using a simple solution growth method	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	179-183	https://www.google.com/search?q=Microstructural+and+photoluminescence+properties+of+Co-doped+ZnO+films+fabricated+using+a+simple+solution+growth+method&q=Microstructural+and+photoluminescence+properties+of+Co-doped+ZnO+films+fabricated+using+a+simple+solution+growth+method&aq=chrome..69157.3347j015&sourceid=chrome&ie=UTF-8	https://www.google.com/search?q=Microstructural+and+photoluminescence+properties+of+Co-doped+ZnO+films+fabricated+using+a+simple+solution+growth+method&q=Microstructural+and+photoluminescence+properties+of+Co-doped+ZnO+films+fabricated+using+a+simple+solution+growth+method&aq=chrome..69157.3347j015&sourceid=chrome&ie=UTF-8
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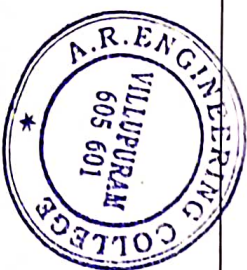
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Synthesis, structural and optical characterization of Ni-doped ZnO nanoparticles	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	751-756	https://link.springer.com/article/10.1007/s10854-010-0206-8
Synthesis, Structural and Magnetic Characterization of Ni-doped ZnO Diluted Magnetic Semiconductor	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	46-50	http://article.sapub.org/10.5923.j.materials.20120201.09.html#:~:text=In%20summary%2C%20nanocrystalline%20Ni%2Ddoped,has%20occurred%20in%20the%20samples.



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Synthesis and characterization of ball milled Fe-doped ZnO diluted magnetic semiconductor	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	109-112	https://link.springer.com/article/10.1007/s11801-012-1157-5	No	https://link.springer.com/article/10.1007/s11801-012-1157-5
Optical absorption and emission properties of ZnO:Co nanoparticles synthesized using a novel auto-combustion method	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	96-105	https://pubs.acs.org/doi/10.1021/acsomega.3c01727	No	https://pubs.acs.org/doi/10.1021/acsomega.3c01727
Optical and Electron Paramagnetic resonance studies on Cu-doped nanoparticles synthesized using a novel autocombustion method	Dr. R. ELLARASSI	S&H	International Journal of Electrical and Computer Engineering	2018-2019	196-201	https://www.academia.edu/35055112/Structural_optical_and_electron_paramagnetic_resonance_studies_on_Cu_doped_ZnO_nanoparticles_synthesized_using_a_novel_auto_combustion_method	No	https://www.academia.edu/35055112/Structural_optical_and_electron_paramagnetic_resonance_studies_on_Cu_doped_ZnO_nanoparticles_synthesized_using_a_novel_auto_combustion_m



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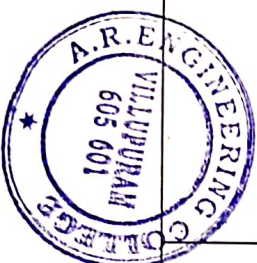
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Optical, electrical and ferromagnetic studies of ZnO:Fe diluted magnetic semiconductor nanoparticles for spintronic applications	Dr. R. ELLARASSI	S&H	Internationa l Journal of Electrical and Computer Engineering	2018-2019	120-131	https://pubmed.ncbi.nlm.nih.gov/28641142/	No	https://pubmed.ncbi.nlm.nih.gov/28641142/
Influence of nickel doping on the structural, optical and magnetic properties of TiO2 diluted magnetic semiconductor nanoparticles prepared by high energy ball-milling technique	Dr. R. ELLARASSI	S&H	Internationa l Journal of Electrical and Computer Engineering	2018-2019	14536-14542	https://link.springer.com/article/10.1007/s10854-017-7317-4	No	https://link.springer.com/article/10.1007/s10854-017-7317-4
Impact of Annealing Temperature on Spin Coated V2O5 Thin Films as Interfacial Layer in Cu/V2O5/n-Si Structured Schottky Barrier Diodes	Dr. S. Rajesh	S & H PHY	Internationa l Journal of Electrical and Computer Engineering	2019-2020		https://link.springer.com/article/10.1007/s10904-019-01117-z	No	https://link.springer.com/article/10.1007/s10904-019-01117-z



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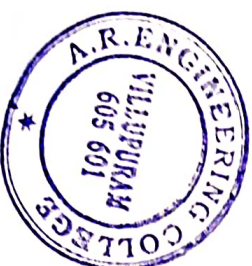
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Highly crystalline V2O5 and V6O13 thin films by PLD and a study on morphology transition of V2O5 by post annealing	Dr. S. Rajesh	S & H PHY	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	https://www.sciencedirect.com/science/article/pii/S0042207X21000531	No	https://www.sciencedirect.com/science/article/pii/S0042207X21000531
Visible light sensitive hexagonal boron nitride (hBN) decorated Fe2O3 photocatalyst for the degradation of methylene blue	Dr. S. Rajesh	S & H PHY	International Journal of Electrical and Computer Engineering	2021-2022		https://link.springer.com/article/10.1007/s10854-020-05215-4	No	https://link.springer.com/article/10.1007/s10854-020-05215-4
COVID-19: Invasion, pathogenesis and possible cure-A review	Dr. S. Rajesh	S & H PHY	International Journal of Electrical and Computer Engineering	2022-2023		https://pubmed.ncbi.nlm.nih.gov/34919978/	No	https://pubmed.ncbi.nlm.nih.gov/34919978/



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A Survey of Student preception and feedback during the COVID -19 lockdown	Dr. Senthilkumar D	S&H	Internationa l Journal of Electrical and Computer Engineering	2020-2021	https://journals.iww.com/jmsc/fulltext/2021/23020/perception of faculty and students about.11.aspx	No	https://journals.iww.com/jmsc/fulltext/2021/23020/perception of faculty and students about ut.11.aspx
Repetitive Deferred Variable Sampling plan Involving Minimum Sum of Risks	Dr. Senthilkumar D	S&H maths	Internationa l Journal of Electrical and Computer Engineering	2021-2022	https://scholar.google.co.in/citations?user=f1e5UzIAAAAJ&hl=en	No	https://scholar.google.co.in/citations?use r=f1e5UzIAAA AJ&hl=en
Selection and Development of Double Inspection Single Sampling Plan	Dr. Senthilkumar D	S&H maths	Internationa l Journal of Electrical and Computer Engineering	2021-2022	https://scholar.google.co.in/citations?user=f1e5UzIAAAAJ&hl=en	No	https://scholar.google.co.in/citations?use r=f1e5UzIAAA AJ&hl=en
Design of Double Inspection Quick Switching System [DIQSS (0,1)]	Dr. Senthilkumar D	S&H maths	Internationa l Journal of Electrical and Computer Engineering	2022-2023	https://scholar.google.co.in/citations?user=f1e5UzIAAAAJ&hl=en	No	https://scholar.google.co.in/citations?use r=f1e5UzIAAA AJ&hl=en



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Construction and Selection of Double Inspection Single Sampling Plan for an Independent Process Using Bivariate Poisson Distribution	Dr. SENTHILKUMAR D	S&H maths	International Journal of Electrical and Computer Engineering	2022-2023		https://scholar.google.co.in/citations?user=f1e5UzIAAAAJ&hl=en	No	https://www.researchgate.net/publication/308000158
Investigation of properties and machinability of luffa with groundnut shell fiber reinforced epoxy polymer hybrid composites	Dr. R. Panneerchass	Principal	International Journal of Rock Mechanics and Mining Sciences	2019-2020	2454-1435	https://www.researchgate.net/publication/308000158 Preparation Properties and Machinability Study of Luffa Fiber - Groundnut Shell Reinforced Epoxy Composite	No	https://www.researchgate.net/publication/308000158
Properties of Luffa Fiber Reinforced PHBV Biodegradable Composites	Dr. R. Panneerchass	Principal	International Journal of Electrical and Computer Engineering	2019-2020		https://www.researchgate.net/publication/336849175 Properties of Luffa Fiber - Groundnut Shell Reinforced Epoxy Composite	No	https://www.researchgate.net/publication/336849175



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Optimization approach for design of spur gear based genetic algorithm"	Dr.R. Panneerchass	Principal	International Journal of Electrical and Computer Engineering	2019-2020	https://journals.innovareacademics.in/index.php/ijet/article/view/15076/19633	Reinforced_PHBV_Biodegradable_Composites	No	https://journals.innovareacademics.in/index.php/ijet/article/view/15076/19633
Study of mechanical behavior of luffa / coir fiber reinforced composite using experimental and fem techniques	Dr.R. Panneerchass	Principal	International Journal of Electrical and Computer Engineering	2019-2020	https://www.iitfe.org/wp-content/uploads/papers/v10i1/A59340510121.pdf	https://www.iitfe.org/wp-content/uploads/papers/v10i1/A59340510121.pdf	No	https://www.iitfe.org/wp-content/uploads/papers/v10i1/A59340510121.pdf
Compressive and impact properties of luffa fiber reinforced composite materials	Dr.R. Panneerchass	Principal	International Journal of Electrical and Computer Engineering	2019-2020	https://www.sciencedirect.com/science/article/pii/S187705814035176	https://www.sciencedirect.com/science/article/pii/S187705814035176	No	https://www.sciencedirect.com/science/article/pii/S187705814035176



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preparation, properties and machinability study of groundnut shell-broom fibre-reinforced epoxy composite	Dr.R. Panneerdhaas	Principal	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	https://www.researchgate.net/publication/344159525 Preparation Properties and Machinability Study of Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite	No	https://www.researchgate.net/publication/344159525 Preparation Properties and Machinability Study of Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite
Effect of mechanical, thermal properties and drilling parameters on groundnut shell-broom fibre-reinforced epoxy composite"	Dr.R. Panneerdhaas	Principal	International Journal of Electrical and Computer Engineering	2019-2020	2347-6729	https://www.ripublication.com/Volune/jiaerv10n2spl.htm	No	https://www.ripublication.com/Volune/jiaerv10n2spl.htm
Analysis of surface preparation in end steel materials by using coating methods	R.Panneerdhaas	Mech	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	https://www.researchgate.net/publication/334282740 Analysis and Experimental	No	https://www.researchgate.net/publication/334282740 Analysis and



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						Investigation of Surface Modification in EN8 Steel by Using Thermal Spray Technique		Experimental Investigation of Surface Modification in EN8 Steel by Using Thermal Spray Technique
							No	https://www.researchgate.net/publication/37394586
Analysis of woven glass epoxy laminated with composite plate	Dr.R. Panneerdhass	Principal	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://www.researchgate.net/publication/37394586 586 Buckling Analysis of Woven Glass Epoxy Laminated Composite Plate		https://www.researchgate.net/publication/37394586 Buckling Analysis of Woven Glass Epoxy Laminated Composite Plate
characterization analysis on algae methyl ester (ame) biodiesel injected in automotive engine	Dr.R. Panneerdhass	Principal	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://www.researchgate.net/publication/367002852 2852 An Impact of Methyl Ester Biodiesel in Automotive Engine	No	https://www.researchgate.net/publication/367002852 An Impact of Methyl Ester Biodiesel in Automotive Engine



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Elaboration and Characterization of a Hybrid Composite Material with Two Particles of the Same Size: Coco Shells and Palm Shells	Dr.R. Panneerdhass	Principal	International Journal of Electrical and Computer Engineering	2020-2021		https://www.scirp.org/journal/paperinformation?paperid=102056	No	https://www.scirp.org/journal/paperinformation?paperid=102056
Assessment of open central hole on the stress concentration factor of glass fibre-coconut coir-human hair hybrid composite	Dr.R. Panneerdhass	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2348-3105	https://www.researchgate.net/publication/274639850 Effect of Open Central Hole Stress Concentration on Mechanical Properties of Luffa fiber Reinforced Epoxy Composite	No	https://www.researchgate.net/publication/274639850 Effect of Open Central Hole Stress Concentration on Mechanical Properties of Luffa fiber Reinforced Epoxy Composite



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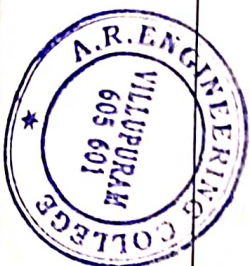
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Mechanical and Water Absorption Characterization of Mango Seed Shell/Epoxy Composite for Low Load Carrying Structures	Dr.R. Panneerchass	Principal	International Journal of Electrical and Computer Engineering	2022-2023	https://www.hindawi.com/journals/jips/2023/9976409/	No	https://www.hindawi.com/journals/jips/2023/9976409/
Ionic conductivity and battery characteristic studies on PEO+NaClO ₃ polymer electrolyte	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpfTKAAAAJ&citation_for_view=m2jpfTKAAAAJ:u-x608ySG0SC	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpfTKAAAAJ&citation_for_view=m2jpfTKAAAAJ:u-x608ySG0SC
Conductivity studies on PEO:NaClO ₃ electrolyte system with different plasticizers	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpfTKAAAAJ&citation_for_view=m2jpfTKAAAAJ:qjMakF	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpfTKAAAAJ&citation_for_view=m2jpfTKAAAAJ:qjMakF



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Heterojunction solar cell with 2% efficiency based on a Cu ₂ O substrate	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAJ&citation_for_view=m2jpFTKAAAJ:ufvOPGSRksc	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAJ&citation_for_view=m2jpFTKAAAJ:ufvOPGSRksc
Olivine-type nanoparticle for hybrid supercapacitors	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAJ&citation_for_view=m2jpFTKAAAJ:ufvOPGSRksc	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAJ&citation_for_view=m2jpFTKAAAJ:ufvOPGSRksc



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Photophysical studies of a food hydrocolloid, Gum Arabic with resorcinol based acridinedione dyes in water	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:LKGwnXOMwfc	No		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:UebzRTKAAAAJ_a9y70C
Photophysical and Electrochemical studies of 4-dicyanomethylene 2, 6-dimethyl-4H-pyran (DDP) dye with amides in water	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:UebzRTKAAAAJ_a9y70C	No		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:UebzRTKAAAAJ_a9y70C



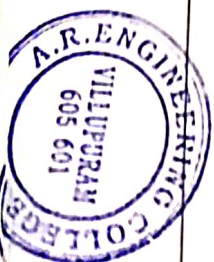
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Electrostatic Investigation of 4-Dicyanomethylene-2,6-dimethyl-4H-pyran (DDP) Dye with amide Derivatives in Water	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2019-2020		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ&citation_for_view=m2jpFTKAAAAJ:Se3iqnhouftwC	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ&citation_for_view=m2jpFTKAAAAJ:Se3iqnhouftwC
Spectroelectrochemical Investigation of 4-Dicyanomethylene 2, 6-Dimethyl-4H-Pyran (DDP) Dye with Guanidine Hydrochloride (GuHCl) in Water	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2019-2020		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ&citation_for_view=m2jpFTKAAAAJ:Se3iqnhouftwC	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ&citation_for_view=m2jpFTKAAAAJ:Se3iqnhouftwC



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Interaction Of Acridine Dye With A Globular Protein In The Presence Of Site Selective And Site Specific Binding Drugs: Photophysical Techniques Assisted By Molecular ...	Dr.R. Vasanthi	S&H	International Journal of Computer and Electrical Engineering	2021-2022	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ:kNdYx-mwKoc	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ:kNdYx-mwKoc
Structural characterization, spectral investigation and antimicrobial studies Of ZnWO ₄ and ZnO. 9CuO. IWO ₄ nanoparticles synthesized by microwave and sucrose mediated solgel method	Dr.R. Vasanthi	S&H	International Journal of Computer and Electrical Engineering	2022-2023	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ:Zph67rFs4hoc	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTKAAAAJ:Zph67rFs4hoc



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Synthesis and characterization of (Co1-x Nix) 3 (BTC) 2.12 H2O (0 ≤ x ≤ 0.5) MOF based Janus chemical micromotors	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2022-2023		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:4TOpqG69KYC	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:4TOpqG69KYC
Ionic liquid supported on mesoporous Pd/SBA-15 during the manufacture of 1, 3-butadiene using ethanol at lower temperature reaction	Dr.R. Vasanthi	S&H	International Journal of Electrical and Computer Engineering	2022-2023		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:Yowf2qJgPHMC	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=m2jpFTkAAAAJ&citation_for_view=m2jpFTkAAAAJ:Yowf2qJgPHMC



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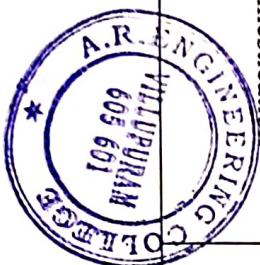
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Interconnect stack using self-aligned quad and double patterning for 10nm high volume manufacturing	Dr.S.S. Raj Solay Anand	AP/MECH	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=Hu7MWKAAAJ&citation_for_view=Hu7MWKAAAJ:ULOm3_A8WrAC	No	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=Hu7MWKAAAJ&citation_for_view=Hu7MWKAAAJ:ULOm3_A8WrAC
Long-read bitter gourd (Momorda charantia) genome and the genomic architecture of nonclassic domestication	Dr.S.S. Raj Solay Anand	AP/MECH	International Journal of Electrical and Computer Engineering	2020-2021		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=Hu7MWKAAAJ&citation_for_view=Hu7MWKAAAJ:ULOm3_A8WrAC	No	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=Hu7MWKAAAJ&citation_for_view=Hu7MWKAAAJ:ULOm3_A8WrAC



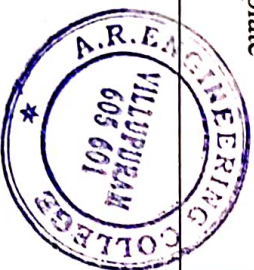
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						Hu7MwKAAAAl: mB3voienLucc		or_view=- Hu7MwKAAA Al:mB3voien Lucc
Growth, structural, optical, spectral and mechanical studies of adp single crystal	Elilarasi.R	S&H PHYSICS	Internationa l Journal of Electrical and Computer Engineering	2019-2020	2250- 1118	https://www.researchgate.net/publication/256115708 Growth structural spectral and optical studies on 24-dinitrophenol or ganic single crystal	No	https://www.researchgate.net/publication/256115708 Growth structural spectral and optical studies on 24-dinitrophenol organic single crystal
Experimental investigation and buckling analysis of woven glass epoxy laminated composite plate	G.Ganapathy	Mech	Internationa l Journal for Research in Applied Science and Engineering Technology	2019-2020	2347- 6729	https://www.ijirset.com/upload/2015/multicon/mech/21_ME024.pdf	No	https://www.ijirset.com/upload/2015/multicon/mech/21_ME024.pdf



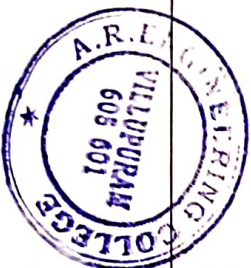
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Design and analysis of single layer quantum dot-cellular automata based 1 - bit comparators	Geetha.T	CSE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454- 1435	https://www.researchgate.net/publication/358214538 4538. Design and analysis of single layer quantum dot-cellular automata based 1-bit comparators /download	No	https://www.researchgate.net/publication/358214538 Design and analysis of single layer quantum dot-cellular automata based 1-bit comparators/download
An effective GDI (Gate Diffusion Input) Based 16- bit Shift Register Design for Power and Area Optimization	Indhumathi	EEE	Internationa l Journal of Electrical and Computer Engineering	2019-2020	2250- 1118	https://www.iiraset.com/research-paper/anh-effective-gdi-based-16-bit-shift-register-design-for-power-and-area-optimization	No	https://www.iiraset.com/research-paper/anh-effective-gdi-based-16-bit-shift-register-design-for-power-and-area-optimization



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Development of Smart Control System for Improved Energy Management in Building	Indhumathi	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	https://www.ijournals.com/for_matedpaper/1703180.pdf	No	https://www.ijournals.com/for_matedpaper/1703180.pdf
challenges and solutions on current-only directional overcurrent protection for distribution automation	Indhumathi	EEE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://ieeexplore.ieee.org/abstract/document/6279482/	No	https://ieeexplore.ieee.org/abstract/document/6279482/
Power Flow of MTDC Using Droop Control & Impact of DC Voltage Drops	Indhumathi	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2456172 X	https://ieeexplore.ieee.org/iel5/59/4374138/06169971.pdf	No	https://ieeexplore.ieee.org/iel5/59/4374138/06169971.pdf
Error control system in cellular network	Indhumathi	EEE	International Journal of Electrical and Computer Engineering	2021-2022	2456-172X	https://doi.org/10.1023/A:1013676531988#:~:text=ARO%20is%20control,parity%20bit%20control,parity%20bits%20	No	https://doi.org/10.1023/A:1013676531988#:~:text=ARO%20is%20control,parity%20bit%20control,parity%20bits%20

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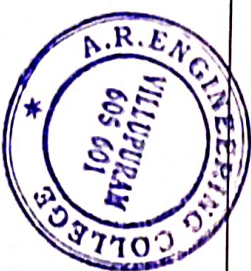




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						een%20added.	No	20have%20be en%20added.
kinetic study on the effect of water hyacinths in foodwaste biogas production	J.Jayakodi	Civil	Internationa l Journal of Rock Mechanics and Mining Sciences	2021-2022	2454- 1435	https://first.com/admin/upload/1501741586_K_K_Dinesh_Kumar_CS_14.pdf	No	https://first.com/admin/upload/1501741586_K_K_Dinesh_Kumar_CS_14.pdf
Smart Drainage Management to Mitigate Summer Drought Damage in Nordic Agriculture within the Circular Economy Framework	J. Jayakodi	Civil	Internationa l Journal of Rock Mechanics and Mining Sciences	2022-2023	2454- 1435	https://research.wur.nl/en/publications/smart-drainage-management-to-limit-summer-drought-damage-in-nordi	No	https://research.wur.nl/en/publications/smart-drainage-management-to-limit-summer-drought-damage-in-nordi



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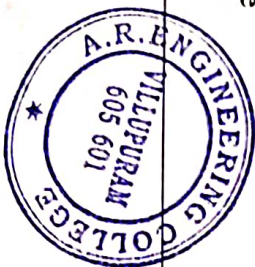
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Analysis of woven glass epoxy laminated with composite plate	Jayakumar R	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://core.ac.uk/download/pdf/151646269.pdf	No	https://core.ac.uk/download/pdf/151646269.pdf
Investigation of properties and machinability of luffa with groundnut shell fiber reinforced epoxy polymer hybrid composites	Jayakumar R	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://iopscience.iop.org/article/10.1088/1757-899X/1116/1/012032	No	https://iopscience.iop.org/article/10.1088/1757-899X/1116/1/012032
Design and analysis of knuckle joint using fea software	K.saktivel	Mech	International Journal of Rock Mechanics and Mining Sciences	2018-2019	2454-1435	https://www.rivierpublishers.com/pdf/ebook/chapter/RP_9788770227896C56.pdf	No	https://www.rivierpublishers.com/pdf/ebook/chapter/RP_9788770227896C56.pdf
characterization analysis on algae methyl ester (ame) bio-diesel injected in automotive engine	K.shakthivel	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://www.researchgate.net/publication/367002852_An_Impact_of_Methyl_Ester_of_Algae_bio_diesel_Used_as	No	https://www.researchgate.net/publication/367002852_An_Impact_of_Methyl_Ester_of_Algae_bio_diesel_Used_as



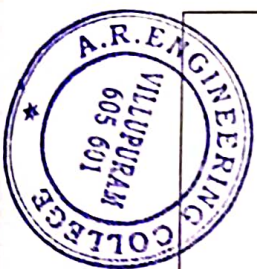
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						<u>Fuel in Diesel Engine</u>	No	<u>biodiesel Used as Fuel in Diesel Engine</u>
kinetic study on the effect of water hyacinths in foodwaste biogas production	K.Saranya	Civil	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	https://first.com/admin/upload/1501741586_K_K_Dinesh_Kumar_C5_14.pdf	No	https://first.com/admin/upload/1501741586_K_K_Dinesh_Kumar_C5_14.pdf
Design and analysis of knuckle joint using fea software	K.Sivasubramaniam	Mech	International Journal of Rock Mechanics and Mining Sciences	2018-2019	2454-1435	https://www.rivrepublishers.com/pdf/ebook/chapter/RP_9788770227896C56.pdf	No	https://www.rivrepublishers.com/pdf/ebook/chapter/RP_9788770227896C56.pdf
Analysis of surface preparation in en8 steel materials by using coating methods	K.Sivasubramaniam	Mech	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	https://www.researchgate.net/publication/334282740_Analysis_and_Investigation_of_Surface_Modification_in_EN8_Steel	No	https://www.researchgate.net/publication/334282740_Analysis_and_Investigation_of_Surface_Modification_in_EN8_Steel



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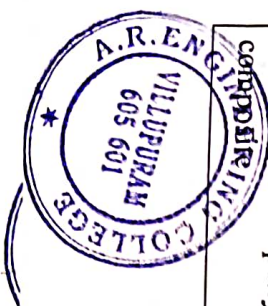
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						Steel by Using Thermal Spray Technique	e Modification in EN8 Steel by Using Thermal Spray Technique
Life prediction and statistical analysis of e-glass fiber with alovera in composite specimen	K.Sivasubramanian	Mech	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2456-172X	https://www.researchgate.net/publication/332911149 Evaluation of mechanical properties of e-glass and alovera fiber reinforced with polyester and epoxy resin matrices	https://www.researchgate.net/publication/332911149 Evaluation of mechanical properties of e-glass and alovera fiber reinforced with polyester and epoxy resin matrices
preparation, properties and machinability study of groundnut shell-broom fiber reinforced epoxy composite	Kamalbabu K	S & H	International Journal for Research in Applied Science and Engineering	2019-2020	2347-6729	https://www.researchgate.net/publication/344159525 Preparation	https://www.researchgate.net/publication/344159525 Preparation



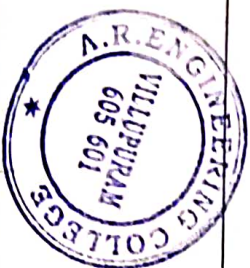
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Technology							
Effect of Mechanical, Thermal Properties and Drilling Parameters on Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite	Kamalbabu K	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2347-6729	https://www.researchgate.net/publication/344159525 Preparation Properties and Machinability Study of Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite	https://www.researchgate.net/publication/344159525 Preparation Properties and Machinability Study of Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite



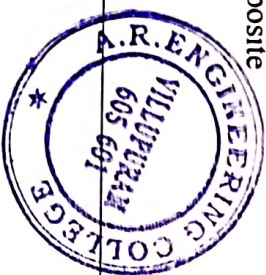
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Hybrid Composite Materials: Machinability of Luffa with Groundnut shell Fiber Reinforced Epoxy Polymer	Kamalbabu K	Mech	Internationa l Journal of Rock Mechanics and Mining Sciences	2021-2022	23454- 1435	https://www.researchgate.net/publication/308000158_Preparation_of_Machinability_of_Luffa_Fiber_-_Groundnut_Shell_Reinforced_Epoxy_Composite	No	https://www.researchgate.net/publication/308000158_Preparation_of_Machinability_of_Luffa_Fiber_-_Groundnut_Shell_Reinforced_Epoxy_Composite
Assessment of open central hole on the stress concentration factor of glass fibre-coconut coir-human hair hybrid composite	Kamalbabu K	Mech	Internationa l Journal for Research in Applied Science and Engineering Technology	2021-2022	2348- 3105	https://www.researchgate.net/publication/274639850_Effect_of_Open_Central_Hole_Stress_Concentration_on_Mechanical_Properties_of_Luffa_fiber_Reinforced_Epoxy_Composite	No	https://www.researchgate.net/publication/274639850_Effect_of_Open_Central_Hole_Stress_Concentration_on_Mechanical_Properties_of_Luffa_fiber_Reinforced_Epoxy_Composite



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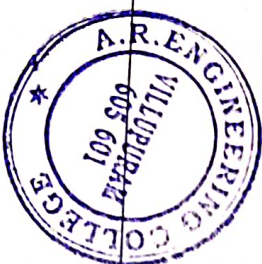
						e		iber Reinforced Epoxy Composite
Fabrication of mems pressure sensor on thin film membrane	Kamalbabu K	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2348-3105	https://www.mdpi.com/1424-8220/9/8/6200	No	https://www.mdpi.com/1424-8220/9/8/6200
Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites	Kamalbabu K	MECH	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2347-6729	https://www.researchgate.net/publication/340047684 Investigation of mechanical properties of sisal fibre and human hair reinforced with epoxy resin hybrid polymer composite	No	https://www.researchgate.net/publication/340047684 Investigation of mechanical properties of sisal fibre and human hair reinforced with epoxy resin hybrid polymer composite



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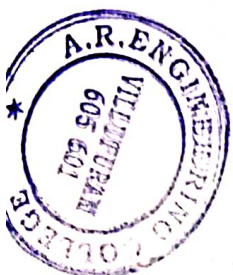
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connectivity in a fuzzy graph	Kathiravan. V	S&H MATHS	Internationa l Journal of Rock Mechanics and Mining Sciences	2022-2023	2454- 1435	https://www.ijmra.us/project%20doc/2017/IJESM JUNE2017/IJMR A-11528.pdf	No	https://www.ijmra.us/project%20doc/2017/IJESM JUNE2017/IJMR A-11528.pdf
Implementation of low power 17-transist or true single-phase clocking flip-flop designs with 45 nm cmos technology	Kuppulakshmi	CSE/ECE	Internationa l Journal of Electrical and Computer Engineering	2020-2021	2456- 172X	https://www.ijmets.com/uploads/files/paper/issue_1_january_2022/18246/final/fin_irmets16417_94171.pdf	No	https://www.ijmets.com/uploads/files/paper/issue_1_january 2022/18246/final/fin_irmets16417_94171.pdf
optimal load control for economic energy equilibrium in smart grid using adaptive inertia weight teaching-learning-based optimization	Kuppulakshmi	CSE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454- 1435	https://inass.org/wp-content/uploads/2021/11/2022043022-43022-3.pdf	No	https://inass.org/wp-content/uplo ads/2021/11/2022043022-3.pdf



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Analysis of woven glass epoxy laminated with composite plate	Manikandan D	Mech	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454- 1435	https://www.researchgate.net/publication/37394586 586 Buckling Analysis of Woven Glass Epoxy Laminated Composite Plate	No	https://www.researchgate.net/publication/37394586 Buckling Analysis of Woven Glass Epoxy Laminated Composite Plate
An effective GDI (Gate Diffusion Input) Based 16-bit Shift Register Design for Power and Area Optimization	Manimegalai	EEE	Internationa l Journal of Electrical and Computer Engineering	2019-2020	2250- 1118	https://www.iiraset.com/research-paper/another-effective-gdi-based-16-bit-shift-register-design-for-power-and-area-optimization	No	https://www.iiraset.com/research-paper/another-effective-gdi-based-16-bit-shift-register-design-for-power-and-area-optimization



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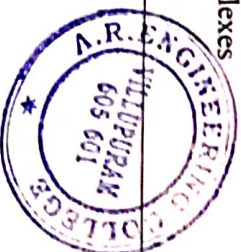
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challenges and solutions on current-only directional overcurrent protection for distribution automation	Manimegalai	EEE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://ieeexplore.ieee.org/abstract/document/6279482	No	https://ieeexplore.ieee.org/abstract/document/6279482
Mixed ligand complexes of nickel (II), copper (II) and zinc (II) with nicotinamide and thiocyanate	Maria kulanidai Raja balan	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=2E5F7A AAAAJ&citation_for_view=2E5F7A AAAAJ:KIATU1dFn6UC	No	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=2E5F7A AAAAJ&citation_for_view=2E5F7A AAAAJ:KIATU1dFn6UC
Synthesis, characterization, crystal structure and biological studies on nicotinamide based nickel (II), copper (II) and zinc (II) complexes	Maria kulanidai Raja balan	S&H	International Journal of Electrical and Computer Engineering	2018-2019		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=2E5F7A AAAAJ&citation_for_view=2E5F7A AAAAJ:KIATU1dFn6UC	No	https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=2E5F7A AAAAJ&citation_for_view=2E5F7A AAAAJ:KIATU1dFn6UC



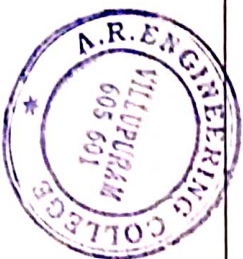
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							No		https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=2E5F7AAAAAJ&citation_for_view=2E5F7AAAAAJ:mVmsd5A6BfQC
An Efficient Eco-friendly Modified Palladium, Immobilized on Imidazolium Supported Bi-functionalized Ionic Liquid for Selective Oxidation of Alcohols	Maria kulanidai Raja balan	S&H	International Journal of Electrical and Computer Engineering	2019-2020		https://www.ijitee.org/wp-content/uploads/papers/v8i11/8927078919.pdf	No		https://www.ijitee.org/wp-content/uploads/papers/v8i11/8927078919.pdf
Road Accident Data Analytics Using Map – Reduce Concept	Mr.N. Muthukumaran	CSE	International Journal of Electrical and Computer Engineering	2019-2020		https://www.ijitee.org/wp-content/uploads/papers/v8i11/8927078919.pdf	No		https://www.ijitee.org/wp-content/uploads/papers/v8i11/8927078919.pdf



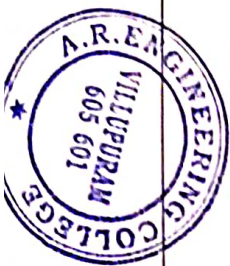
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Soil Area Network for Landslide predict and avoidance System based on ARM Cortex M3, MEMS and GSM	Mr.N. Muthukumaran	CSE	Internationa l Journal of Rock Mechanics and Mining Sciences	2019-2020	2454-1435	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3735839	No	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3735839
Design and Fabrication of Micro Strip Patch Antenna for Cognitive Radio Applications	Mr.N. Muthukumaran	CSE	Internationa l Journal of Electrical and Computer Engineering	2019-2020		https://www.ijresm.com/Vol.3_2020/Vol3_Iss5_May20/IJRESM_V3_I5_57.pdf	No	https://www.ijresm.com/Vol.3_2020/Vol3_Iss5_May20/IJRESM_V3_I5_57.pdf
Performance Analysis of Hookworm Detection using Deep Convolutional Neural Network	Mr.N. Muthukumaran	CSE	Internationa l Journal of Electrical and Computer Engineering	2019-2020		https://ieeexplore.ieee.org/document/8748645	No	https://ieeexplore.ieee.org/document/8748645
smart system for controlling and monitoring water and turbidity levels in dam reservoir using micro-controller technology	Muthukumaran.N	ECE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://iasre.net/index.php/iasre/article/download/1444/1892/2692#:~:text=In%20the%20unit%20micro	No	https://iasre.net/index.php/iasre/article/download/1444/1892/2692#:~:text=In%20the%20unit%20micro



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						https://www.irjmet.com/uploads/defiles/paper/issue_1_january_2022/18246/final/irjmet1641794171.pdf	No	https://www.irjmet.com/uploads/defiles/paper/issue_1_january_2022/18246/final/irjmet1641794171.pdf
Implementation of low power 17-transist or true single-phase clocking flip-flop designs with 45 nm cmos technology	N.Muthukumaran	CSE/ECE	Internationa l Journal of Electrical and Computer Engineering	2020-2021	2456-172X	https://inass.org/wp-content/uploads/2021/11/2022043022-3.pdf	No	https://inass.org/wp-content/uploads/2021/11/2022043022-3.pdf
optimal load control for economic energy equilibrium in smart grid using adaptive inertia weight teaching-learning-based optimization	Mr.N. Muthukumaran	CSE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	https://inass.org/wp-content/uploads/2021/11/2022043022-3.pdf	No	https://inass.org/wp-content/uploads/2021/11/2022043022-3.pdf



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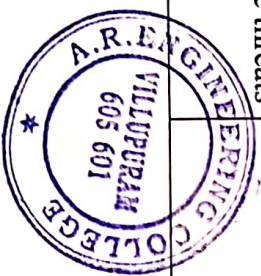
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Antenna Design: Micro Strip Patch for Spectrum Utilization in Cognitive Radio Networks	Mr.N. Muthukumar	CSE	International Journal of Electrical and Computer Engineering	2021-2022		https://dl.acm.org/doi/10.1007/s11277-021-08232-6	No	https://dl.acm.org/doi/10.1007/s11277-021-08232-6
Deep Learning-Based Hookworm Detection in Wireless Capsule Endoscopic Image Using AdaBoost Classifier	Mr.N. Muthukumar	CSE	International Journal of Electrical and Computer Engineering	2021-2022		https://www.techscience.com/cmc/v67n3/41581/html	No	https://www.techscience.com/cmc/v67n3/41581/html
Two wheeler design and fabrication to prevent tribleriders and accidents	Muthukumar.N	ECE	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	https://www.researchgate.net/publication/332679028_Design_of_Smart_Helmet_for_Accident_Avoidance	No	https://www.researchgate.net/publication/332679028_Design_of_Smart_Helmet_for_Accident_Avoidance
security of vehicles using protocol-level radiowire threats	N. muthu kumar	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	https://hexhive.epfl.ch/publications/files/22WOOT.pdf	No	https://hexhive.epfl.ch/publications/files/22WOOT.pdf



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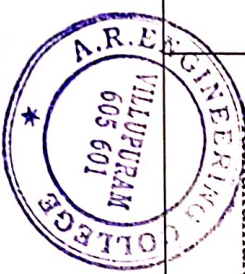
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SBFET -Based Full Adder with Ultra-Low Leakage and High Speed	Muthukumar	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2231-2099	https://www.researchgate.net/publication/332679028_Design_of_Smart_Helmet_for_Accident_Avoidance	No	https://www.researchgate.net/publication/332679028_Design_of_Smart_Helmet_for_Accident_Avoidance
A Neuromorphic Model for Image Recognition using	Mr.N. Muthukumar	CSE	International Journal of Electrical and Computer Engineering	2021-2022		https://www.researchgate.net/publication/374700839_A_Neuromorphic_Model_for_Image_Recognition_using_SNN	No	https://www.researchgate.net/publication/374700839_A_Neuromorphic_Model_for_Image_Recognition_using_SNN
Intelligent Drowsiness and Illness Detection Assist System for Drivers.	Mr.N. Muthukumar	CSE	International Journal of Electrical and Computer Engineering	2022-2023		https://ieeexplore.ieee.org/document/9743075	No	https://ieeexplore.ieee.org/document/9743075



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Secure GEDARouting Protocol for Underwater Data Collection Using WSN.	Mr.N. Muthukumar	CSE	Internationa l Journal of Electrical and Computer Engineering	2022-2023		https://www.researchgate.net/publication/367156989	No	https://www.researchgate.net/publication/367156989
lot based fish monitoring system for aquaculture	Muthuhasan.R	ECE	Internationa l Journal of Electrical and Computer Engineering	2021-2022	2250-1118	https://ieeexplore.ieee.org/document/8745543	No	https://ieeexplore.ieee.org/document/8745543
Intrusion Detection Systems to Secure IoT Networks	Muthuhasan.R	ECE	Internationa l Journal of Electrical and Computer Engineering	2022-2023	2250-1118	https://journalofcloudcomputing.springeropen.com/articles/10.1186/s13677-018-0123-6	No	https://journalofcloudcomputing.springeropen.com/articles/10.1186/s13677-018-0123-6



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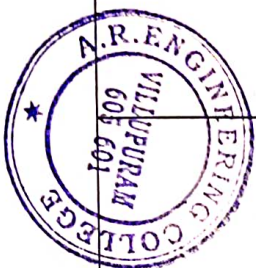
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Reduction of Voltage Stress in a Medium Frequency Transformer using IFBTL DC/DC Converter for PMSG Based Wind Turbine	Muthukumaran, A.	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	https://www.researchgate.net/figure/Block-diagram-of-the-control-for-the-VSWT-based-on-a-PMSG-and-an-IFBTL-dc-dc-converter figs 2 605099909	No	https://www.researchgate.net/figure/Block-diagram-of-the-control-for-the-VSWT-based-on-a-PMSG-and-an-IFBTL-dc-dc-converter fig 5 260509909
Pedarn-enhancement of pedestrian safety using mobile application	N.MALATHY	S&H	International Journal of Electrical and Computer Engineering	2020-2021		https://scholar.google.com/citations?view_op=view_citation&hl=en&user=mTVkwnwAAAAJ&citation_for_view=mTVkwnwAAAAJ:kindy1x-mwKoc	No	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=mTVkwnwAAAAJ&citation_for_view=mTVkwnwAAAAJ:kindy1x-mwKoc



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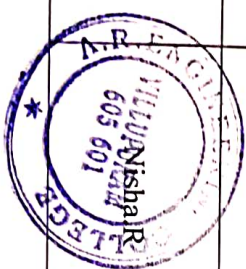
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soil area network for landslide predict and avoidance system based on arm cortex m3, mems and gsm	N.Saveetha	ECE	International Journal of Rock Mechanics and Mining Sciences	2019-2020	2454-1435	http://iirmmae.i/jn/Volume5-Issue-1/paper8.pdf	No	http://iirmmae.i/jn/Volume5-Issue-1/paper8.pdf
smart system for controlling and monitoring water and turbidity levels in dam reservoir using micro-controller technology	N.Savitha	ECE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.i/jn/Volume6Issue4/paper5.pdf	No	http://iirmmae.i/jn/Volume6Issue4/paper5.pdf
Two wheeler design and fabrication to prevent tribleriders and accidents	N.Savitha	ECE	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	http://iirmmae.i/jn/Volume7Issue4/paper1.pdf	No	http://iirmmae.i/jn/Volume7Issue4/paper1.pdf
smart system for controlling and monitoring water and turbidity levels in dam reservoir using micro-controller technology	Nisha.R	ECE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.i/jn/Volume6Issue4/paper5.pdf	No	http://iirmmae.i/jn/Volume6Issue4/paper5.pdf
Two wheeler design and fabrication to prevent tribleriders and accidents	Nisha.R	ECE	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	http://iirmmae.i/jn/Volume7Issue4/paper1.pdf	No	http://iirmmae.i/jn/Volume7Issue4/paper1.pdf



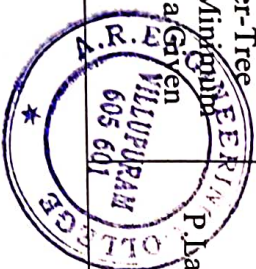
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			Sciences					1.pdf
IoT based fish monitoring system for aquaculture	Nisha.R	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	http://ijice.in/2022/2/2.pdf	No	http://ijice.in/2022/2/2.pdf
Intrusion Detection Systems to Secure IoT Networks	Nisha.R	ECE	International Journal of Electrical and Computer Engineering	2022-2023	2250-1118	http://ijice.in/2022/2/4.pdf	No	http://ijice.in/2022/2/4.pdf
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	P.Karthik	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2456-172X	http://iriges.com/Volume4/issue4/paper7.pdf	No	http://iriges.com/Volume4/issue4/paper7.pdf
GPU-friendly Steiner-Tree Heuristic to Find a Minimum Cost Tree Spanning a Given Subset	P.Jakshnidevi,	ECE	International Journal of Electrical and Computer Engineering	2020-2021	2250-1118	http://ijice.in/2020/5/4.pdf	No	http://ijice.in/2020/5/4.pdf



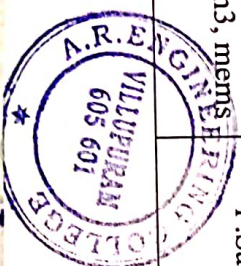
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GPU-friendly Steiner-Tree Heuristic to Find a Minimum Cost Tree Spanning a Given Subset	N.MUTHUKUMARAN	ECE	International Journal of Electrical and Computer Engineering	2020-2021	2250-1118	http://ijce.in/2020/5/4.pdf	No	http://ijce.in/2020/5/4.pdf
challenges and solutions on current-only directional overcurrent protection for distribution automation	P.M.Kumarasan	EEE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://ijrmmae.in/Volume6Issue2/paper6.pdf	No	http://ijrmmae.in/Volume6Issue2/paper6.pdf
Power Flow of MTDC Using Droop Control & Impact of DC Voltage Drops	P.M.Kumarasan	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2456172 X	http://iriges.com/Volume7Issue2/paper1.pdf	No	http://iriges.com/Volume7Issue2/paper1.pdf
Error control system in cellular network	P.M.Kumarasan	EEE	International Journal of Electrical and Computer Engineering	2021-2022	2456-172X	http://iriges.com/Volume6Issue2/paper7.pdf	No	http://iriges.com/Volume6Issue2/paper7.pdf
soil area network for landslide predict and avoidance system based on arm cortex m3, mps and gsm	P.Saravanan	ECE	International Journal of Rock Mechanics and Mining	2019-2020	2454-1435	http://ijrmmae.in/Volume5-Issue-	No	http://ijrmmae.in/Volume5-Issue-



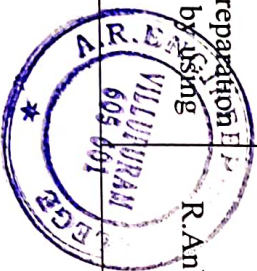
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			Sciences			1/paper8.pdf		1/paper8.pdf
connectivity in a fuzzy graph	Parvatha Varthini	S&H MATHS	Internationa l Journal of Rock Mechanics and Mining Sciences	2022-2023	2454- 1435	http://iirmmae.i n/Volume7issue 4/paper3.pdf	No	http://iirmma e.in/Volume7 issue4/paper 3.pdf
Experimental behavior of fiber reinforced concrete using recycled aggregate with agro- waste replacement	Pavithra	Civil	Internationa l Journal for Research in Applied Science and Engineering Technology	2019-2020	2347- 6729	http://irset.com /2023/March/pa per5.pdf	No	http://irset.c om/2023/Ma rch/paper5.p df
Design and analysis of single layer quantum dot-cellular automata based 1-bit comparators	Pushparaj.E	CSE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454- 1435	http://iirmmae.i n/Volume6issue 2/paper4.pdf	No	http://iirmma e.in/Volume6 issue2/paper 4.pdf
Analysis of surface preparation of in en8 steel materials by using coating methods	R.Anbuzhagan	Mech	Internationa l Journal of Electrical and Computer	2019-2020	2456- 172X	http://iriges.com /Volume4issue2/ paper18.pdf	No	http://iriges.c om/Volume4 issue2/paper1



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			Engineering					8.pdf
Life prediction and statistical analysis of e-glass fiber with aloevera in composite specimen	R. Anbuzhagan	Mech	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://iirmmae.in/Volume7Issue4/paper2.pdf	No	http://iirmmae.in/Volume7Issue4/paper2.pdf
Distributed Detection of Minimum Cuts in Wireless Multi-Hop Networks	R. Bharathi	CSE	International Journal of Computer Engineering	2019-2020	2250-1118	http://iijce.in/2019/4/3.pdf	No	http://iijce.in/2019/4/3.pdf
Relative Time Synchronization of Distributed System Clock of Applications for Software-in-the-loop Sil Simulation	R. Bharathi	CSE	International Journal of Computer Engineering	2021-2022	2231-2099	http://iijce.in/2021/1/4.pdf	No	http://iijce.in/2021/1/4.pdf
characterization analysis on algae methyl ester (ame) biodiesel injected in automobile engine	R. Manivanan	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.in/Volume6Issue1/paper10.pdf	No	http://iirmmae.in/Volume6Issue1/paper10.pdf



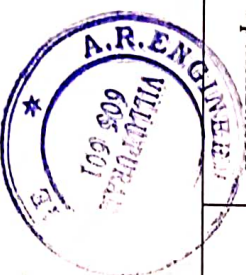
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Assessment of open central hole on the stress concentration factor of glass fibre-coconut coir-human hair hybrid composite	R.Manivaran	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2348-3105	http://iirset.com/2021/Nov/paper2.pdf	No	http://iirset.com/2021/Nov/paper2.pdf
Relative Time Synchronization of Distributed System Clock of Applications for Software-in-the-loop SIL Simulation	R.Nanthini	CSE	International Journal of Electrical and Computer Engineering	2021-2022	2231-2099	http://njice.in/2021/1/4.pdf	No	http://njice.in/2021/1/4.pdf
Experimental behavior of fiber reinforced concrete using recycled aggregate with agro-waste replacement	R.Saranraj	Civil	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://iirset.com/2023/March/paper5.pdf	No	http://iirset.com/2023/March/paper5.pdf
An effective GDI (Gate Diffusion Input) Based 16-bit Shift Register Design for Power and Area Optimization	R.Udhayakumar	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://ijice.in/2019/4/4.pdf	No	http://ijice.in/2019/4/4.pdf



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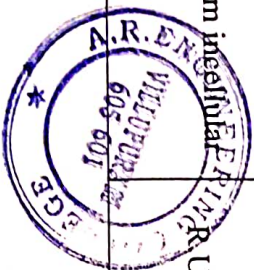
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Development of Smart Control System for Improved Energy Management in Building	R.Udhayakumar	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://iriges.com/Volume4Issue3/paper21.pdf	No	http://iriges.com/Volume4Issue3/paper21.pdf
challenges and solutions on current-only directional overcurrent protection for distribution automation	R.Udayakumar	EEE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmae.in/Volume6Issue2/paper6.pdf	No	http://iirmae.in/Volume6Issue2/paper6.pdf
smart utilization of power using new bidirectional intelligent solid state transformer	R.Udhayakumar	EEE	International Journal of Electrical and Computer Engineering	2020-2021	2250-1118	http://ijice.in/2020/5/5.pdf	No	http://ijice.in/2020/5/5.pdf
Power Flow of MTDC Using Droop Control & Impact of DC Voltage Drops	R.Udhayakumar	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2456172 X	http://iriges.com/Volume7Issue2/paper1.pdf	No	http://iriges.com/Volume7Issue2/paper1.pdf
Error control system in IEEE 802.11 network	R.Udhayakumar	EEE	International Journal of Electrical and Computer Engineering	2021-2022	2456-172X	http://iriges.com/Volume6Issue2/paper7.pdf	No	http://iriges.com/Volume6Issue2/paper7.pdf



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			Engineering						.pdf
Enhanced Photocatalytic Degradation of Textile Dye Using W, N Co-Doped ZnO Powder: Synthesis, Characterization, and Solar Activity	Ramya K	S & H	International Journal of Electrical and Computer Engineering	2019-2020	2347-6729	http://irrsct.com/2019/December/paper10.pdf	No	http://irrsct.com/2019/December/paper10.pdf	
Enhanced Photocatalytic Degradation of Textile Dye Using W, N Co-Doped ZnO Powder: Synthesis, Characterization, and Solar Activity	Revathi A	S & H	International Journal of Electrical and Computer Engineering	2019-2020	2347-6729	http://irrsct.com/2019/December/paper10.pdf	No	http://irrsct.com/2019/December/paper10.pdf	
Growth, structural, optical, spectral and mechanical studies of adp single crystal	Revathi.A	S&H PHYSICS	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://iijce.in/2019/4/5.pdf	No	http://iijce.in/2019/4/5.pdf	
Non-verbal communication: focus on recruitment interview for freshers	Revathy	English	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://irjges.com/Volume4/Issue2/paper17.pdf	No	http://irjges.com/Volume4/Issue2/paper17.pdf	



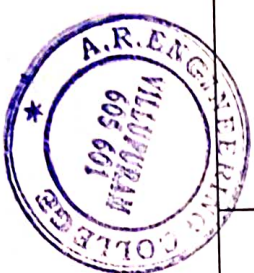
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Reduction of Voltage Stress in a Medium Frequency Transformer using IFBTL DC/DC Converter for PMSG Based Wind Turbine	s. saranya	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	http://iijce.in/2021/4/3.pdf	No	http://iijce.in/2021/4/3.pdf
Distributed Detection of Minimum Cuts in Wireless Multi-Hop Networks	S. Deevika	CSE	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://iijce.in/2019/4/3.pdf	No	http://iijce.in/2019/4/3.pdf
Relative Time Synchronization of Distributed System Clock of Applications for Software-in-the-loop Sil Simulation	S. Deevika	CSE	International Journal of Electrical and Computer Engineering	2021-2022	2231-2099	http://iijce.in/2021/1/4.pdf	No	http://iijce.in/2021/1/4.pdf
Design and analysis of knuckle joint using fea software	s. Ramamoorthy	Mech	International Journal of Rock Mechanics and Mining Sciences	2018-2019	2454-1435	http://iirmae.in/Volume4-Issue-3/paper11.pdf	No	http://iirmae.in/Volume4-Issue-3/paper11.pdf



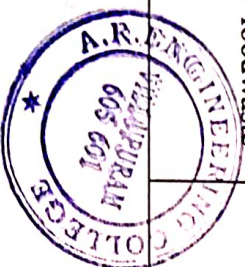
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Experimental investigation and buckling analysis of woven glass epoxy laminated composite plate	s.Ramamoorthy	Mech	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://jirset.com/2019/December/paper9.pdf	No	http://jirset.com/2019/December/paper9.pdf
Experimental investigation and buckling analysis of woven glass epoxy laminated composite plate	S.Sendilkumaran	Mech	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://jirset.com/2019/December/paper9.pdf	No	http://jirset.com/2019/December/paper9.pdf
Experimental behavior of fiber reinforced concrete using recycled aggregate with agro-waste replacement	S.Sugunya	Civil	International Journal for Research in Applied Science and Engineering Technology	2019-2020	2347-6729	http://jirset.com/2023/March/paper5.pdf	No	http://jirset.com/2023/March/paper5.pdf
kinetic study on the effect of water hyacinths in foodwaste biogas production	S.suganya	Civil	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2454-1435	http://ijrmmae.in/Volume7Issue3/paper7.pdf	No	http://ijrmmae.in/Volume7Issue3/paper7.pdf



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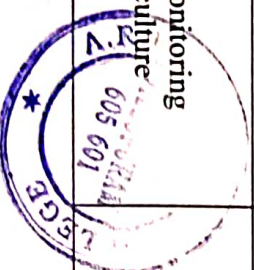
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lot based fish monitoring system for aquaculture	Saranaya.R	ECE	Internationa l Journal of Electrical and Computer Engineering	2021-2022	2250- 1118	http://jiice.in/2022/2.2.pdf	No	http://jiice.in/2022/2.2.pdf
Smart Drainage Management to Mitigate Summer Drought Damage in Nordic Agriculture within the Circular Economy Framework	Saranya, B.	Civil	Internationa l Journal of Rock Mechanics and Mining Sciences	2022-2023	2454- 1435	<a href="http://ijrmmae.i
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smart system for controlling and monitoring water and turbidity levels in dam reservoir using micro-controller technology	Saravanan.P	ECE	Internationa l Journal of Rock Mechanics and Mining Sciences	2020-2021	2454- 1435	<a href="http://ijrmmae.i
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5.pdf">http://ijrmm ae.in/Volume6 Issue4/paper 5.pdf
Two wheeler design and fabrication to prevent tribleriders and accidents	Saravanan.P	ECE	Internationa l Journal of Rock Mechanics and Mining Sciences	2021-2022	2454- 1435	<a href="http://ijrmmae.i
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lot based fish monitoring system for aquaculture	Saravanan.P	ECE	Internationa l Journal of Electrical and Computer Engineering	2021-2022	2250- 1118	http://jiice.in/2022/2.2.pdf	No	http://jiice.in/2022/2.2.pdf



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			Engineering					
Intrusion Detection Systems to Secure IoT Networks	Saravanan.P	ECE	International Journal of Electrical and Computer Engineering	2022-2023	2250-1118	http://jiice.in/2022/2/4.pdf	No	http://jiice.in/2022/2/4.pdf
Intrusion Detection Systems to Secure IoT Networks	Savitha.N	ECE	International Journal of Electrical and Computer Engineering	2022-2023	2250-1118	http://jiice.in/2022/2/4.pdf	No	http://jiice.in/2022/2/4.pdf
IoT based fish monitoring system for aquaculture	Savitha	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	http://jiice.in/2022/2/2.pdf	No	http://jiice.in/2022/2/2.pdf
connectivity in a fuzzy graph	Silambarasan.I	S&H MATHS	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://iirmmae.in/Volume7issue4/paper3.pdf	No	http://iirmmae.in/Volume7issue4/paper3.pdf



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Investigation of properties and machinability of luffa with groundnut shell fiber reinforced epoxy polymer hybrid composites	Sivasubramanian K	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.i.n/Volume4-Issue-4/paper5.pdf	No	http://iirmmae.i.n/Volume4-Issue-4/paper5.pdf
Analysis of woven glass epoxy laminated with composite plate	Sivasubramanian	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.i.n/Volume6Issue4/paper6.pdf	No	http://iirmmae.i.n/Volume6Issue4/paper6.pdf
Design and analysis of single layer quantum dot-cellular automata based 1-bit comparators	Sugunya.P	CSE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.i.n/Volume6Issue2/paper4.pdf	No	http://iirmmae.i.n/Volume6Issue2/paper4.pdf
Enhanced Photocatalytic Degradation of Textile Dye Using W, N Co-Doped ZnO Powder: Synthesis, Characterization, and Solar Activity	Thamizhselvi D	S & H	International Journal of Electrical and Computer Engineering	2019-2020	2347-6729	http://iirset.com/2019/December/paper10.pdf	No	http://iirset.com/2019/December/paper10.pdf
Non-verbal communication focus on recruitment interview for freshers	V. Girija	English	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://iirges.com/Volume4Issue2/paper17.pdf	No	http://iirges.com/Volume4Issue2/paper17.pdf



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				Engineering					7.pdf
English language teaching and conversational	V. Girija	English	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://iriges.com/Volume4/issue4/paper6.pdf	No	http://iriges.com/Volume4/issue4/paper6.pdf	
Distributed Detection of Minimum Cuts in Wireless Multi-Hop Networks	V. Maha	CSE	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://iijce.in/2019/4/3.pdf	No	http://iijce.in/2019/4/3.pdf	
Relative Time Synchronization of Distributed System Clock of Applications for Software-in-the-loop Sil Simulation	V. Maha	CSE	International Journal of Electrical and Computer Engineering	2021-2022	2231-2099	http://iijce.in/2021/1/4.pdf	No	http://iijce.in/2021/1/4.pdf	
Enhanced Photocatalytic Degradation of Textile Dye Using W, N Co-Doped ZnO Powder: Synthesis, Characterization, and Self-Activity	Vasanthi M	S & H	International Journal of Electrical and Computer Engineering	2019-2020	2347-6729	http://iriset.com/2019/December/paper10.pdf	No	http://iriset.com/2019/December/paper10.pdf	

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Smart Drainage Management to Mitigate Summer Drought Damage in Nordic Agriculture within the Circular Economy Framework	Vinoth, K	Civil	International Journal of Rock Mechanics and Mining Sciences	2022-2023	2454-1435	http://iirmmae.in/Volume9Issue1/paper3.pdf	No	http://iirmmae.in/Volume9Issue1/paper3.pdf
Effect of Mechanical, Thermal Properties and Drilling Parameters on Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite	R.PANNEERDHAS S	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2347-6729	http://irrsset.com/2022/November/paper4.pdf	No	http://irrsset.com/2022/November/paper4.pdf
preparation, properties and machinability study of luffa fiber - groundnut shell reinforced epoxy composite	Anbzhagan R	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2347-6729	http://irrsset.com/2022/September/paper5.pdf	No	http://irrsset.com/2022/September/paper5.pdf
preparation, properties and machinability study of luffa fiber - groundnut shell reinforced epoxy composite	R.PANNEERDHAS S	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2347-6729	http://irrsset.com/2022/September/paper5.pdf	No	http://irrsset.com/2022/September/paper5.pdf



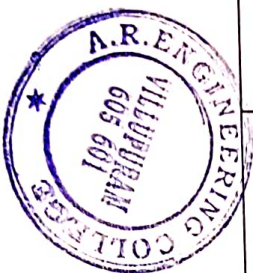
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Fabrication of mems pressure sensor on thin film membrane	R.PANNEERDHAS S	Mech	International Journal for Research in Applied Science and Engineering Technology	2021-2022	2348-3105	http://irset.com/2021/Oct/paper2.pdf	No	http://irset.com/2021/Oct/paper2.pdf
Hybrid Composite Materials: Machinability of Luffa with Groundnut shell Fiber Reinforced Epoxy Polymer	R.PANNEERDHAS S	Mech	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2345-1435	http://www.iirmmae.in/Volume7Issue1/paper4.pdf	No	http://www.iirmmae.in/Volume7Issue1/paper4.pdf
optimal load control for economic energy equilibrium in smart grid using adaptive inertia weight teaching-learning-based optimization	A.MADHAVAN	CSE	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://iirmmae.in/Volume6Issue2/paper5.pdf	No	http://iirmmae.in/Volume6Issue2/paper5.pdf
Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites	RAMAMOORTHY	MECH	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2347-6729	http://www.iirmmae.in/Volume7Issue2/paper3.pdf	No	http://www.iirmmae.in/Volume7Issue2/paper3.pdf



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Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites	PANNEERDHASS	MECH	International Journal of Rock Mechanics and Mining Sciences	2021-2022	2347-6729	http://www.ijrmmae.in/Vol7Issue2/paper3.pdf	No	http://www.ijrmmae.in/Vol7Issue2/paper3.pdf
characterization analysis on algae methyl ester (ame) biodiesel injected in automotive engine	RAMAMOORTHY	Mech	International Journal of Rock Mechanics and Mining Sciences	2020-2021	2454-1435	http://ijrmmae.in/Vol6Issue1/paper10.pdf	No	http://ijrmmae.in/Vol6Issue1/paper10.pdf
Development of Smart Control System for Improved Energy Management in Building	Manimegalai	EEE	International Journal of Electrical and Computer Engineering	2019-2020	2456-172X	http://irjges.com/Vol4Issue3/paper21.pdf	No	http://irjges.com/Vol4Issue3/paper21.pdf
Distributed Detection of Minimum Cuts in Wireless Multi-Hop Networks	MADHAVAN	CSE	International Journal of Electrical and Computer Engineering	2019-2020	2250-1118	http://ijice.in/2019/4/3.pdf	No	http://ijice.in/2019/4/3.pdf
security of vehicles using protocol-level radiowire threats	R. MAHALAKSHMI	ECE	International Journal of Electrical and Computer Engineering	2021-2022	2250-1118	http://ijice.in/2021/4/4.pdf	No	http://ijice.in/2021/4/4.pdf



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			Engineering					
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	P.M.Kumarasan	EEE	International Journal of Electrical and Computer Engineering	2021-2022	2456-172X	http://iriges.com/Volume4Issue4/paper7.pdf	No	http://iriges.com/Volume4Issue4/paper7.pdf
Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance	R.Udhayakumar	EEE	International Journal of Electrical and Computer Engineering		2456-172X	http://iriges.com/Volume4Issue4/paper7.pdf	No	http://iriges.com/Volume4Issue4/paper7.pdf

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CHALLENGES AND SOLUTIONS ON CURRENT-ONLY DIRECTIONAL OVERCURRENT PROTECTION FOR DISTRIBUTION AUTOMATION

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Abstract—Overcurrent relays are widely utilized for power system protection. While directional relays are prevalent on the transmission side, distribution systems often employ nondirectional types. These relays discern fault direction, which can be forward (between relay and grid) or reverse (between relay and source), considering the typical power flow from source to grid. Traditional directional overcurrent relays necessitate both current and voltage measurements, making them more costly than nondirectional ones. This paper introduces a novel current-only directional detection method, addressing its theoretical underpinnings, test signal analysis, challenges, and solutions. Additionally, potential applications of current-only directional relays in distribution-side protection, crucial for smart grid implementation, are outlined.

Index Terms—Distance protection, fault direction, fault isolation, fault location, medium voltage, MV, phase angle, radial network, relay, ring-main unit, smart grid, subtransmission, voltage-less direction.

I. INTRODUCTION

Numerical feeder protection relays commonly employ nondirectional time overcurrent techniques, where overcurrent monitoring occurs over a set time to trigger protection mechanisms [1], [2]. This monitoring, typically lasting 40–100 ms, distinguishes between faults and load changes and is governed by standards like IEC 60255 [3], specifying various overcurrent magnitude and duration thresholds for nondirectional relays. Time relaying introduces delays to allow closer relays and breakers to clear remote faults effectively, necessitating complex coordination settings for distance protection [2]. On the other hand, directional overcurrent relays [4] utilize a reference voltage phasor, also known as "voltage polarization," to discern fault direction.

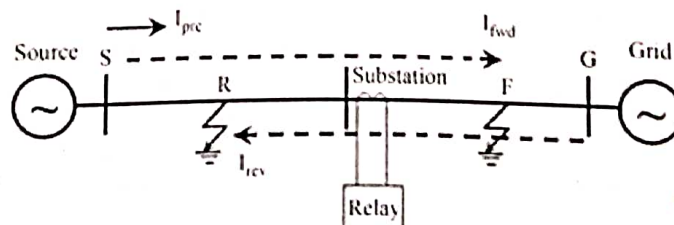


Fig. 1. Overcurrent relay: Forward (F) and reverse (R) fault



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PREPARATION, PROPERTIES AND MACHINABILITY STUDY OF LUFFA FIBER - GROUNDNUT SHELL REINFORCED EPOXY COMPOSITE

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2. K. Kamalbabu, Associate Professor, Department of Mechanical Engineering, SSN College of Engineering, Chennai, Tamilnadu-603110, India
3. *R. Anbazhagan, Professor, Department of Mechanical Engineering, A.R. Engineering College, Villupuram, Tamilnadu – 605601, India

Abstract

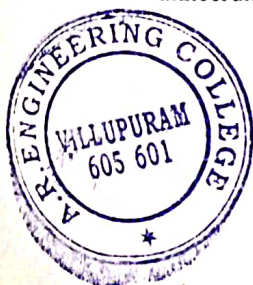
The need for eco-friendly materials and non-polluting processing techniques has made natural fibre reinforced polymer composites as potential candidates to replace GFRPs and CFRPs in semi structural applications. Ground nut shell and luffa fibre are easily available in the market at low cost. Polymer composites consisting of 30%, and 40% volume fractions of a hybrid reinforcement containing groundnut shell and luffa fibre in epoxy resin were fabricated by hand lay-up technique with varying process parameters. The variation in the mechanical properties such as Tensile, Compressive, Flexure and Impact strength are studied. The optimum mechanical properties were obtained in 40% of fiber volume fraction of treated fiber composites. The machinability study was performed by drilling experiments using a drilling machine with drill tool dynamometer. Two input parameters, cutting speed and feed rate and the one output parameter, thrust force, were used for the drilling process. TiAlN coated solid carbide and HSS drills were employed in the drilling experiments and a comparative study was made based on the output parameters. Solid carbide resulted in lower thrust force values and feed rate proved to be the most influential parameter on thrust force.

Keywords: Natural fibre, hand layup, mechanical properties, thrust force, feed rate, open hole, solid carbide tool, drilling.

INTRODUCTION

Environmental awareness programmers induced researchers to design materials which are more compatible to the environment. The natural fibers such as sisal, coir, jute, ramie, pineapple leaf, and kenaf are as enough potential to replace the glass or other traditional reinforcement materials. These fibers are abundant, cheap and renewable. Thiruchitrambalam et al., investigated effect of alkali and sodium Lauryl Sulfate treatment on natural fiber composite consisted of Banana and Kenaf hybrid composites. Fibers were treated with 10% of sodium hydroxide (NaOH) and 10% Sodium Lauryl Sulfate (SLS) for 30 minutes. The fiber content in the composite is kept constant at 40 %. The variables in the mechanical properties and morphological changes were studied. Raju et al., investigated mechanical properties fabricated polymer composite reinforced with various percentage of groundnut

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Effect of Mechanical, Thermal Properties and Drilling Parameters on Groundnut Shell-Broom Fibre-Reinforced Epoxy Composite

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Abstract.

In this preliminary study, the potential of ground nut shell and broom fiber as a reinforcement material for polymer bonded composites was investigated. Ground nut shell and broom fiber (fiber strands extracted from broom grass) are easily available in the market at low cost. Ground nut and broom fiber reinforced epoxy resin matrix composites have been developed by hand lay-up technique with different volume fraction of fibers as in 1:1 ratio (30%, 40% and 50%). The mechanical characterization of these composites was carried out by standard tensile, compressive and flexural tests on a Universal Testing Machine with appropriate setups. Thermo gravimetric analysis was performed to compare the thermal characteristics of conventionally cured and microwave cured composites. Microwave cured samples exhibited higher thermal stability indicating a better extent of cure. Drilling parameters were performed by experiments using a CNC drilling machine with drill tool dynamometer. Two input parameters, cutting speed and feed rate and the one output parameter, thrust force, were used for the drilling process. Solid carbide and HSS drills were employed in the drilling experiments and a comparative study was made based on the output parameters. Solid carbide resulted in lower thrust force values and feed rate proved to be the most influential parameter on thrust force. SEM analysis on the composite materials was performed. The fracture surface of the composite shows that pull out and de bonding of fiber is occurred.

Keywords: Natural fibre, Hand layup method, Mechanical and Thermal properties, Solid carbide tool, Drilling, SEM.

1 Introduction

Recently, the research attempts in natural fibre reinforced polymer composites have greatly increased. Natural fibre reinforced polymer composites involve simple processing techniques, easily procurable raw materials and high biodegradability levels among all the engineering materials. Apart from researchers, manufacturers have also shown increased interest in natural fibre composites from the past decade. To substantiate this claim, the increased in the use of the natural fibres in German cars from around 10000 tonnes in the year of 2000 to 19000 tonnes in 2005 could be mentioned [1]. Hemp, sisal, kenaf, and bamboo are the natural fillers which have undergone many evaluation procedures and declared fit for a good number of applications. The mechanical properties of natural fibers and the composites developed by incorporating them in different polymer matrices and various processing techniques for fabricating them have been studied by many researchers [2-4]. In a majority of the research attempts on natural fibre reinforced polymer composites, the filler phases used were in the form of fibres. Natural filler phases in other forms like shell (eggshell), powder (sawdust) were very rarely experimented. This research work is an exploratory attempt on composite containing shell

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INVESTIGATION INTO THE IMPACT OF AN OPEN CENTRAL HOLE ON THE STRESS CONCENTRATION FACTOR OF GLASS FIBER-COCONUT COIR-HUMAN HAIR HYBRID COMPOSITE

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Abstract

The recent research attempts in polymer composites are indicative of a shift of choice to synthetic fillers from natural fillers as the low eco-compatibility of the former is posing serious environmental hazards. Anyhow, the comparatively lower mechanical properties of the natural fibre reinforced polymer composites have restricted their entry into many sectors. A complementary measure by presenting a combination of natural and synthetic fibres in the polymer matrix can achieve a good balance between the degradability and performance of the material. In the recent past, a few research attempts were made on the feasibility of hybridization using selected natural and synthetic fillers. Most of the assembling operations of fibre reinforced plastic sheets involve a number of riveted joints which require the presence of holes which naturally give rise to zones of stress concentration. This factor has made the analysis of open hole behaviour of these laminate composites, a crucial step in defining their suitability for applications. The open hole mechanical properties of human hair-coconut coir-glass fibre-human hair hybrid composite (HCGHRP) are studied in this paper. The composite samples were prepared by hand lay-up. Eight sets of tensile and impact specimens with each set comprising of specimens with centrally drilled holes of a particular diameter were prepared and the experimental tensile and impact values were recorded. Additionally, Whitney Nusimer point stress model was validated for these values. The stress distribution in the open hole specimens were studied by Finite Element Method. In all these Increase in hole diameter was found to cause an increase in hole sensitivity. The finite element analysis of the loaded specimens indicated a much higher concentration of load in the regions surrounding the hole.

Keywords: Stress concentration factor, open central hole, glass fibre, human hair

INTRODUCTION

Green environment campaign has forced the researcher to change their approach in polymer composites reinforcement material from synthetic fillers to natural fillers to enhance polymer composites properties. The key is a low eco-compatibility of the synthetic fillers is posing serious environmental hazards. Since comparatively lower mechanical properties of the natural fibre reinforced polymer composites as restricted their entry into many sectors. A complementary measure has been taken by presenting a combination of natural and synthetic fibres in the polymer matrix can achieve a good balance between the degradability and performance of



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Hybrid Composite Materials: Machinability of Luffa with Groundnut shell Fiber Reinforced Epoxy Polymer

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Abstract:

This paper presents the study of the tensile, compressive, flexural, impact energy and water absorption characteristics of the luffa fiber and luffa with ground nut fiber reinforced epoxy polymer composites. Luffa fiber and luffa with ground nut fiber reinforced epoxy resin matrix composites have been developed by hand lay-up technique with varying process parameters such as fiber condition (treated, untreated), chopped randomly oriented and different volume fraction (30%, 40% and 50%). Tensile strength varies from 18 Mpa to 23.5 Mpa, compressive strength varies from 41.5 MPa to 56.2 MPa, flexural strength varies from 61.22 MPa to 73.6 MPa and impact energy varies from 1.1 Joules to 1.6 Joules, as a function of fiber volume fraction. Thermo gravimetric analysis was performed to compare the thermal characteristics and of conventionally cured and microwave cured composites. Effects of central open hole on the tensile and impact strengths of the composites were studied by five sets of tensile specimens containing central open holes of five different diameters. The machinability study was performed by drilling experiments using a CNC drilling machine with drill tool dynamometer. Two input parameters, cutting speed and feed rate and the one output parameter, thrust force, were used for the drilling process. Solid carbide and HSS drills were employed in the drilling experiments and a comparative study was made based on the output parameters. Solid carbide resulted in lower thrust force values and feed rate proved to be the most influential parameter on thrust force. The optimum mechanical properties were obtained in 40% of fiber volume fraction of the treated fiber composite. The fracture surface of the composite shows that pull out and de bonding of fiber is occurred.

Keywords: luffa / ground nut fiber hybrid, mechanical and thermal properties, open hole, machinability, SEM.

Introduction:

Synthetic fiber reinforced composites are being widely used in polymer composites because of their high stiffness and strength properties. The natural fibers such as jute, ramie, sisal, coir, pineapple leaf, and kenaf have the potential to be used as a replacement for glass or other traditional reinforcement materials in composites. These fibers are abundant, cheap and renewable. Martinez-Lopez et al., aims to study the Polymer Concrete were reinforced with Loofah fibers in order to improve the compressive and flexural strength. Polymer concrete specimens were prepared with, 30% of polyester resin, 70% of silicious sand and various fiber concentrations (0.3, 0.6 and 0.9 vol%). The results show decrease in the values of mechanical properties including compressive strength, flexural strength and compression modulus of elasticity [1]. Valcineide et al., studied the chemical treatments used on sponge gourd (*Luffa cylindrica*) fibers of Brazil to prepare their composites with polyester resin. Production of short fiber-polymer composite as well as mat-polyester composites is presented



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Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites

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ABSTRACT

This paper presents the study of the mechanical and water absorption characteristics of the Glass fiber / Human hair / Coir fiber reinforced epoxy polymer composites. G-H-C-G, C-H-G-C, and H-C-G-H reinforced epoxy resin matrix composites have been developed by hand lay-up technique with varying process parameters such as fiber condition. Tensile strength varies from 42 Mpa to 56 Mpa, Tensile modulus varies from 48 GPa to 52 GPa, flexural strength varies from 46 MPa to 52 MPa, flexural modulus varies from 42 Gpa to 50 Gpa, shear study and fracture study was carried out. Effects of central open hole on the tensile strengths of the composites were studied by five sets of tensile specimens containing central open holes of five different diameters. Dynamic mechanical analyzer (DMA) was used to examine the dynamic mechanical properties of composite laminates with increasing temperature. The optimum mechanical properties were obtained in the treated fiber composite. Results showed that the composite sample, which has human fabric at the outer layers, has the highest storage and loss modulus. Besides, it was observed that glass transition temperature (Tg) of samples are close to each other and at about 75 °C. The fracture surface of the composite shows that pull out and de bonding of fiber is occurred.

Keywords: Glass fiber / Human hair / Coir fiber fiber hybrid, mechanical, open hole, DMA, SEM.

INTRODUCTION:

Natural fibers are derived from plants, animals and mineral sources. In modern days, the natural fibers from plants like sisal, banana and jute mixed with the glass fiber are used to get high strength (HS) hybrid composite materials which are widely used in many applications. High strength composite materials are replacing the metallic materials when used in the aerospace, structural and automobile industries.

Hybrid laminates exhibited superior dynamic mechanical performance, even compared to the pure glass laminate. Lower tan delta peak height (related to better fiber-matrix interaction) values and higher Tg were reported for the [C/G/ G⁻]_s and [G/C/ C⁻]_s samples which, together with the [G/C/ G⁻]_s sample, exhibited the best results for reinforcement effectiveness and loss modulus peak height [1]. Polyester based hybrid composites are prepared by Hand lay-up technique followed by static compression having constant 25 wt.% of fibre content with various stacking sequences. A significant improvement in flexural properties of sisal fibre reinforced polyester composite is observed by incorporation of glass fibre [2]. Studied an effect of various curaua (C) /glass (G) interlaminar hybrid



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ERROR CONTROL SYSTEM IN CELLULAR NETWORK

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ABSTRACT

In cellular communication networks, the geographical area is divided into smaller regions, called cells. In each cell, there is one Mobile Service Station (MSS) as well as a number of Mobile Hosts (MH). The communication between MSSs is, in general, through wired links, while the links between an MH and MSS is wireless. A Mobile Host can communicate with other Mobile Hosts in the system only through the Mobile Service Station in its cell. This kind of architecture is shown in Fig. 1. There are two kinds of channels available to an MH: communication channel and control channel. The former is used to support communication between an MH and the MSS in its cell, while the latter is set aside to be used exclusively to send control messages that are generated by the channel allocation algorithm.

1. INTRODUCTION

In this paper, henceforth, unless specified otherwise, the term channel or wireless channel refers to a communication channel.



Fig1.1

another MH, it sends a request message to the MSS in its own cell. The request can be granted only if a wireless channel can be allocated for communication between MSS and MH. Since channels are limited, they should be reused as much as possible. But, a channel cannot be used at the same time by two cells if they are within a threshold distance called the minimum channel reuse distance (D_{min}), because it will cause interference. Such an interference is called co channel interference. A cell, say C_i , is said to be an interference neighbor of another cell, say C_j , if the distance between them is less than D_{min} . So, if a channel r is used by a cell C_i , then none of the interference neighbors of C_i can use r concurrently. If using a channel in a cell causes no interference, then we say that this channel is available for the cell. When an MH needs a channel to support a call, it sends a request message to the MSS in its cell through a control channel. When the MSS receives such a message, it tries to assign a channel using a channel allocation algorithm.

Mobile Station (MS) : This is basically the mobile phone

Base Station (BS) : The covered area of a cellular network is divided into smaller areas called cells. Each cell has a base station which communicates simultaneously with all mobiles within the cell, and passes traffic to the Mobile Switching Centre. The base station is connected to the mobile phone via a radio interface.

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**Soil Area Network for Landslide Predict, And Avoidance System
Based On ARM Cortex M3, MEMS And GSM**

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I.ABSTRACT

Around the world, avalanches and mudslides are not kidding topographical dangers influencing individuals, and bringing on critical harms each year. Around 15% of aggregate zone of India is powerless to avalanches. These zones are stamped as Landslide Hazard Zones. Avalanches happen for the most part because of overwhelming precipitation experienced by these zones amid the rainstorm season and infrequently as a repercussions of a tremor. The current routines utilizes satellite picture detecting innovation or a camera based picture detecting. In any case, these strategies are not the least expensive one too.

II. INTRODUCTION

The arrangement this venture gives is based upon the idea of ease remote sensor systems (WSN). WSN system utilizes a sensor system comprising of sensor sections. Sensor sections are conveyed on slopes to locate the early flags going before a mudslide or avalanche. This sensor system comprises of a gathering of sensor segments set inside the vertical openings penetrated amid the system sending stage and they are introduced in a dispersed way over the checked range. Every sensor segment has two segments: the detecting segment that is covered underground and contains every one of the instruments, and the figuring part that keeps afloat and contains the processor and radio module. The sensor hub comprises of a MEMS speeding up sensor and a dirt dampness sensor, a low power information preparing unit (microcontroller) and remote correspondence unit in light of IEEE 802.15.4 RF handset. Measure of soil dampness (wetness) builds the likelihood of area and mudslides. MEMS speeding up sensor is utilized to survey the slant security. The slant steadiness is a measure of tilt/slant of the area. Any suggestive development of area changes the introduction (tilt) estimation of the MEMS sensor. Sensor hubs transport this data to host framework through the remote system. Recognition is performed by the host hub in the wake of accepting information from all the sensor hubs. In the event that it recognizes a drawing nearer avalanche or a happening one, the host framework instantly transmits a crisis SMS to the administering power at long separation by method for GSM unit interfaced with it. The venture gives a less expensive technique for avalanche forecast and counteractive action taking into account WSN with the assistance of ease sensors. WSN can be reached out to caution the general population in their home through hubs with sirens. By associating it with notice activity lights out and about the vehicles in the locale can be cautioned before an avalanche. The microcontroller picked depends on ARM Cortex M3 structural planning. ARM Cortex M3 is the cutting edge superior 32-bit ARM center

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DESIGN AND ANALYSIS OF SINGLE LAYER QUANTUM DOT-CELLULAR AUTOMATA BASED 1- BIT COMPARATORS

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Abstract

Quantum dot-cellular automata (QCA) technology has emerged as a promising avenue for designing nanometer-scale computational circuits. In digital logic circuits, comparators serve as fundamental components for comparing binary values. This paper introduces and implements two 1-bit QCA-based comparator designs. These proposed QCA implementations are compact, utilizing only a single layer and exhibiting reduced complexity compared to previously reported designs. Functional validation of the proposed QCA structures has been conducted using the QCA Designer tool. Simulation results of the proposed comparators demonstrate significant improvements over existing counterparts in terms of the number of QCA cells, area requirements, cost, and complexity efficiency. Moreover, the proposed structures exhibit extremely low energy consumption. Therefore, these QCA-based comparators present viable options for low-power digital applications.

Keywords: 1-bit comparator, Low power, QCA technology, Single QCA layer

1. Introduction

The relentless pursuit of higher performance and increased integration in microelectronics, driven by Complementary Metal Oxide Semiconductor (CMOS) scaling, has been a cornerstone of technological advancement for decades [1]. However, the continued densification of transistors on a chip has led to escalating power dissipation within digital systems. Moreover, the constraints imposed by physical limitations on parameters such as effective channel length and gate oxide thickness have prompted a quest for alternative materials and device structures to sustain scaling efforts [1]-[4].

Quantum Dot-Cellular Automata (QCA) technology has emerged as a promising candidate to circumvent the challenges facing traditional CMOS technology. Offering advantages like rapid switching speeds, enhanced packing densities, and reduced energy consumption, QCA presents an enticing avenue for future device scaling [3], [5]. In QCA, logical states are encoded based on the position of electrons within quantum dots, with data transmission facilitated by electrostatic interactions among adjacent cells, in contrast to conventional CMOS where current flow conveys information [4].

Building logical circuits on the nanoscale with QCA entails employing various strategies for data transmission and computation [4], [7]. However, due to the reliance on electrostatic repulsions for data propagation, ensuring reliable information flow necessitates the incorporation of clocking mechanisms



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**OPTIMAL LOAD CONTROL FOR ECONOMIC ENERGY
EQUILIBRIUM IN SMART GRID USING ADAPTIVE INERTIA
WEIGHT TEACHING-LEARNING-BASED OPTIMIZATION**

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Abstract: Optimal load management for energy balance in the smart grid (SG) is crucial due to various operational constraints and economic considerations. This research introduces a novel multi-objective optimization technique to achieve energy balance in SG, aiming to avoid penalties from excessive upstream network power extraction beyond contractual demands. A common challenge in optimal load control (OLC) is the inability to consistently achieve the global optimum in each run. To address this, we employ the Adaptive Teaching-Learning Based Optimization (ATLBO), an advanced variant of Teaching Learning Based Optimization (TLBO), which incorporates modifications during both the exploitation and exploration phases. Implemented on a modified IEEE 33-bus system, ATLBO produces outstanding results, improving energy balance, enhancing voltage profiles, and reducing distribution losses. Comparative analyses with Particle Swarm Optimization (PSO), basic TLBO, Backtracking Search Algorithm (BSA), and Cuckoo Search Algorithms demonstrate ATLBO's superiority.

Keywords: Smart grid, Optimal load control, Adaptive teaching-learning-based optimization, Multi-objective optimization.

1. Introduction:

Electricity is in high demand in today's power grids, leading to an imbalance between supply and demand. While traditional methods have been adjusted to meet these needs, they often result in time and financial inefficiencies. Challenges persist in distribution network performance and transmission system support. Achieving effective control over transmission line power flows through Flexible AC Transmission System (FACTS) devices, renewable energy (RE) sources, and other efficient power management devices has been a target for modern power systems. Load shedding (LS) is used as an emergency corrective measure to provide appropriate stability margins and prevent voltage collapse or blackouts, thus helping to restore the electrical system to normal operation. Energy balancing solutions in microgrids (MGs) include undervoltage load shedding (UVLS) and frequency load shedding (FLS) (UFLS); however, these solutions often overlook customer engagement and satisfaction.

Microgrids are capable of operating in either an islanding/stand-alone mode or a grid-integrated mode, depending on the scenario. Islanding involves assessing the MG's capacity and reallocating power to various loads once it is disconnected from the main grid. Utility operations predominantly manage these duties. Since the global power industry restructuring in 1988, and more globally since 1998, there has

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SMART SYSTEM FOR CONTROLLING AND MONITORING WATER AND TURBIDITY LEVELS IN DAM RESERVOIR USING MICRO- CONTROLLER TECHNOLOGY

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ABSTRACT

A micro-controller-based technology has been developed for monitoring and controlling the water quality and quantity in dam reservoirs by using various sensors. This system is able to automatically detect and measure the changes in water and turbidity levels of incoming water for hydropower production. In this project, an Arduino UNO micro-controller and GSM Technology control the operations of the system through sending messages and regulating automatic water valves according to the instant status of the dam water. The developed prototype has four units: sensing unit, processing unit, displaying unit, and alerting unit. In the sensing unit, the ultrasonic sensor continuously monitors the change in water levels and the turbidity sensor takes turbidity measurements of incoming water. In the processing unit, the detected data are collected and fed to the microcontroller for further processing. This technology is expected to reduce the time and cost incurred during the hydropower plant operations by using a small amount of manpower and will facilitate fast information collection.

Keywords: Automation, Arduino Uno, Micro-controller, Sensors, Serial monitor.

1. INTRODUCTION

Dam is a man-made structure designed to hold backwater for generating electricity, water supply, flood management or river flow diversion [1]. Dam and water reservoir are both built to regulate the flowing water and to store this latter for various purposes such as flood reduction, hydroelectric production, recreation, fisheries and irrigation. The most common problems encountered by the water reservoir and dams are mainly based on failure to fulfill the intended purpose which is to store

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ANALYSIS OF WOVEN GLASS EPOXY LAMINATED WITH COMPOSITE PLATE

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ABSTRACT

. In this project the Buckling behavior of laminated composite plates subjected to in-plane loads is an important consideration in the preliminary design of aircraft components. The sizing of many structural subcomponents of the aircraft structures is often determined by stability constraints. The objective of the current study is to understand the influence of the length-to-thickness ratio, the aspect ratio, the fiber orientation and the cut-out shapes on the buckling load for the woven glass epoxy laminated composite plate in clamped-free-clamped-free configuration by finite element analysis using ANSYS software. Initially, buckling analysis was carried out on woven glass epoxy laminated composite plate, both; experimentally and numerically; for the two different geometric configurations to predict the critical buckling load and the test results were compared with the FEA predictions, to check the validity of the analysis methodology. The same methodology was further followed for analyzing the buckling behavior of the composite plates. The results shows the effect of orientation of fiber, aspect ratio, cut-out shape and length-to-thickness ratio on the buckling of the glass epoxy laminated composite plate.

Keywords: - Plate buckling, woven glass epoxy laminate, length-to-thickness ratio, aspect ratio, fiber orientation, cut-out shapes.

1. INTRODUCTION

1.1 INTRODUCTION TO COMPOSITE MATERIALS

There are many types of failures in engineering structures. Some of them include creep, fatigue, alternate stresses, bending, buckling etc. Buckling takes place in columns, plates,

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LIFE PREDICTION AND STATISTICAL ANALYSIS OF E-GLASS FABER WITH ALOEVERA IN COMPOSITE SPECIMEN

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ABSTRACT

Composite materials having major Applications in Aerospace industries and automobile industries. They have variability in their mechanical properties and also strength properties due to their internal structure. This leads to perform their safe utilization in design and manufacturing. In this study, the life prediction of the composite specimen is obtained by experimentally; the Experiments are carried according to standard ASTM D3039 in flexural and barcol Machine. The results are compared with the other specimen experimental results of the composite specimen.

Keywords: Life prediction, ASTM D3039

1. INTRODUCTION

In recent years conventional materials are replaced by composite materials due to their mechanical properties such as high specific strength, Elastic modulus, light weight and corrosion resistance. Aircraft and automobiles are examples of vehicles in which the application of fiber reinforced composite materials has been increasing. However, there are problems with fabrication of these composites, which require highly précised volume fraction methods like Resin transfer molding process (RTM), Vacuum Bag molding, compression molding. Whatever the method used for fabrication of composites, they are not isotropic and therefore have different mechanical properties in different directions. In addition to this, they present varying strengths due to their internal structure and to brittleness of the fibers and matrices, which means that there is no specific strength value to represent their mechanical behavior. This leads to the necessity of employing analyses for their safe utilization in design and manufacturing.

The Weibull distribution, which has recently been used for the determination of static and dynamic mechanical properties of ceramics and metal-matrix, ceramic- matrix, and polymer- matrix composites statistically. Weibull distribution is a practical method in the determination of 90% and 95% reliability values used in composite material mechanics. In this study, the life prediction of the carbon/epoxy and glass/polyester composite specimens was determined by both

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CONNECTIVITY IN A FUZZY GRAPH

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ABSTRACT

The concept of connectivity play an important role in fuzzy graph theory. In this paper we discuss about cycle connectivity, arc connectivity, node connectivity and complement connectivity cyclic cut vertices, cyclic bridges and cyclically balanced fuzzy graphs. Connectivity of a complement fuzzy graph is analyzed. Also we discussed about connected domination in fuzzy graph using strong arcs.

Key words: cycle connectivity, arc connectivity, node connectivity and complement connectivity cyclic cut vertices, cyclic bridges and cyclically balanced fuzzy graphs.

1. INTRODUCTION TO FUZZYGRAPH

Graph theory is proved to be tremendously useful in modeling the essential features of systems with finite components. Graphical models are used to represent telephone network, railway network, communication problems, traffic network etc. Graph theoretic models can sometimes provide a useful structure upon which analytic techniques can be used. A graph is also used to model a relationship between a given set of objects. Each object is represented by a vertex and the relationship between them is represented by an edge if the relationship is unordered and by means of a directed edge if the objects have an ordered relation between them. Relationship among the objects need not always be precisely defined criteria; when we think of an imprecise concept, the fuzziness arises.

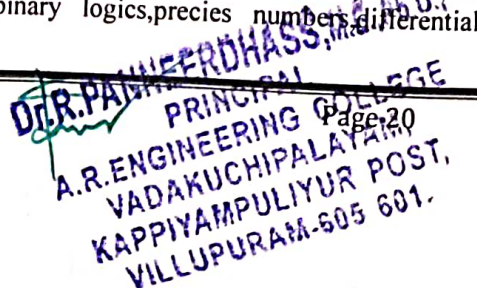
The notion of fuzzy graph was introduced by Rosenfeld in year 1975[2]. Fuzzy analogues of many structures in crisp graph theory, like bridges, cut nodes, connectedness, trees and cycles etc were developed after that. Fuzzy trees were characterized by Sunitha and Vijayakumar [3]. The author have characterized fuzzy trees using its unique maximum spanning tree. A sufficient condition for a node to be a fuzzy cut node is also established. Center problems in fuzzy graph, blocks in fuzzy graphs and properties of self complementary fuzzy graphs were also studied by the same authors. They have obtained a characterization for blocks in fuzzy graphs using the concepts of strongest paths [8]. The authors have need the concepts of strong arcs and strong paths. As far as the applications are concerned (information networks, electric circuits, etc.), the reduction of flow between pairs of nodes is more relevant and many frequently occur than the total disruption of the theorem or the disconnection of the entire networks. In this paper we put forward the conditions under which a fuzzy graph and its complement will be connected.

In 1965, L.A. Zadeh introduced a mathematical frame work to explain the concept to fun certainty in real life through the publication of a seminar paper. A fuzzy set is defined mathematically by assigning to each possible individual in the universe of discourse a value, representing its grade of membership, which corresponds to the degree, to which that individual is similar or compatible with the concept represented by the fuzzy set. The fuzzy graph introduced by A. Rosenfeld using fuzzy relation, represents the relationship between the objects by precisely indicating the level of the relationship between the objects of the given set. Also he coined many fuzzy analogous graph theoretic concepts like bridge, cut vertex and tree. Fuzzy graphs have many more applications in modeling real time systems where the level of information inherent in the system varies with different levels of precision.

The notion of fuzzy set stems from the observation made by [18] L.A. Zadeh (1965) that more often than not, the classes of objects encountered in real physical world do not have precisely defined criterial of membership". This observation emphasis the gap existing between mental representation of reality and usual mathematical representation therefore, which are based on binary logics, precise numbers, differential



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CONNECTIVITY IN A FUZZY GRAPH

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ABSTRACT

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ANALYSIS OF SURFACE PREPARATION IN EN8 STEEL MATERIALS BY USING COATING METHODS

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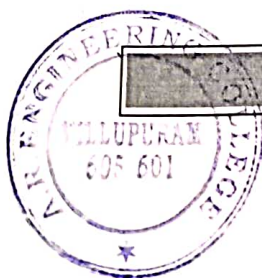
Abstract

In this present paper thermal spray surface modification technique has been used to enhance the corrosion resistances of EN8 steel substrate. After an exhaustive literature survey alloy powder Al_2O_3 , TiO_2 have been selected to deposit on the substrate steel specimen with help of thermal spray techniques. The corrosion resistance of the coated and uncoated specimens was investigated according to ASTM standard AISI1040. An aim of the present study is to analyze of various coating powder like aluminium oxide, Titanium oxide and zirconium are used to compare the better coating thickness range by using ANSYS software. It can be designed using CATIA software and imported the model to ANSYS work bench software. From the result it can be choosing the better coating powder on the EN8 steel to be investigated in this project. It has been concluded that the alloy powder deposited with the help of thermal spray coating process have been found very useful to minimize the corrosion problem of carbon steels.

Keywords: Thermal spray coating, plasma spray, hardness and corrosion resistances.

1. INTRODUCTION

It is an unalloyed medium carbon steel. EN8 is a medium strength steel, good tensile strength, its suitable for automobile components likes shaft, stressed pin, studs, keys etc. EN8 is a very popular grade of through hardening medium carbon steel, which is readily machinable in any condition. Wear, friction and corrosion resistances are responsible for many problem and large costs in a modern civilization and engineers and designers always must take these factors into account when constructing different equipments [1]. It can be further surface- hardened typically to 50-55 HRC by induction processes components with enhanced corrosion resistances. For such application the



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IMPLEMENTATION OF LOW POWER 17-TRANSISTOR TRUE SINGLE-PHASE CLOCKING FLIP-FLOP DESIGNS WITH 45 NM CMOS TECHNOLOGY

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Abstract:

Flip-Flops (FFs) serve as fundamental storage components extensively employed in digital system designs, particularly in structures involving pipelining and modules constructed by FFs. However, FFs contribute significantly to both the power consumption and chip area of digital systems. Consequently, there arises a demand for FF designs that prioritize low power consumption and reduced area. In this paper, a low-power 17-True Single-Phase Clock (TSPC) flip-flop method is proposed, which has gained widespread usage in advanced design.

The proposed flip-flop operates in 45 nm CMOS and features a logic structure of the TSPCFF of master-slave type. The master stage comprises static CMOS logic, while the slave stage utilizes a mixed combination of static CMOS logic and complementary pass transistor logic. This design ensures that the TSPC FF circuit remains fully static during operation, thus preventing leakage power dissipation.

The proposed TSPC FF design optimizes a 17-transistor logic structure reduction flip-flop (LRFF) concerning area and power consumption without compromising functionality. To validate the design, three FFs—Transmission Gate based Flip-Flop (TGFF), LRFF, and the proposed TSPC FF—are implemented and simulated using gpd 45 nm technology library with a supply voltage (V_{dd}) of 1V and clock frequency of 500MHz in DSCH and MICROWIND tool.

Keywords: TSPC, VLSI, Flip-Flop, RAM, ROM, SRAM.

1. Introduction:

Two essential characteristics of CMOS devices are high noise immunity and low static power consumption. The CMOS arrangement draws significant power only momentarily during transitions between on and off states due to one transistor of the pair always being off. Consequently, CMOS devices generate less waste heat compared to other logic types, such as transistor-transistor logic (TTL) or N-type metal-oxide-semiconductor logic (NMOS). CMOS also enables high logic density on a chip, making it the most widely used technology in very-large-scale integration (VLSI) chips.

The term "CMOS" refers to both a specific style of digital design and the array of techniques used to implement that electronics on integrated circuits (chips). CMOS circuits dissipate less power than logic families with resistive load. As this advantage has become increasingly important, CMOS processes and variations have come to dominate, with the majority of modern integrated circuit manufacturing utilizing CMOS processes. CMOS circuits employ a combination of p-type and n-type metal-oxide-semiconductor field-effect transistors (MOSFETs) to implement logic gates and other digital circuits. While CMOS logic can be demonstrated with discrete devices, commercial CMOS products are integrated circuits composed of billions of transistors of both types on a rectangular silicon chip ranging from 10 to 400 mm². CMOS always uses enhancement mode MOSFETs.

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Power Flow of MTDC Using Droop Control & Impact of DC Voltage Drops

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Abstract—This paper investigates the ramifications of DC transmission voltage drops on the distribution of DC grid balancing power under the application of DC voltage droop control. In a multiterminal VSC-HVDC (MTDC) system, variations in DC line voltage due to drops lead to nonuniform adjustments in DC bus voltages, thereby impacting the allocation of instantaneous balancing power. The influence of DC voltage droop constants determines the extent to which these voltage drops affect the sharing of balancing power across the DC grid. An analytical expression is formulated to estimate the distribution of balancing power, accounting for DC line voltage drops. A five-terminal MTDC system is simulated using PSCAD to demonstrate the effects of DC line voltage drops and validate the proposed analytical expression.

Index Terms: DC grid, droop control, multiterminal VSC-HVDC (MTDC), voltage source converter high-voltage DC transmission (VSC-HVDC).

NOMENCLATURE

- VSC: Voltage source converter
- HVDC: High-voltage DC transmission
- MTDC: Multiterminal VSC-HVDC

INTRODUCTION

In recent years, significant research efforts have been directed towards the development of VSC-based multiterminal HVDC systems, particularly driven by the expansion of offshore wind farms, such as those in the North Sea region. Multiterminal VSC-HVDC (MTDC) systems, also referred to as DC grids, offer advantages including reduced transmission losses, enhanced control flexibility, synchronization of asynchronous grids, and ease of integrating new VSC-HVDC terminals into existing MTDC setups.

Control strategies proposed in the literature for MTDC systems can be broadly classified into two groups: constant DC voltage control schemes (often termed master-slave control schemes) and DC voltage droop control schemes. The operational principle of constant DC voltage control, also known as the master-slave scheme, has been extensively discussed in prior works. However, one drawback of this approach is its dependency on the normal operation of the DC voltage regulating terminal (i.e., the master terminal). In contrast, DC voltage droop control involves two or more terminals participating in DC voltage regulation, thereby sharing the responsibility of instantaneous power balancing among them. This approach is considered more reliable as it ensures continued operation of the MTDC system even if one terminal is disconnected.

While the basic working principle of DC voltage droop control in MTDC systems has been explored, the impact of DC line voltage drops on primary DC grid power balancing has not been thoroughly analyzed. This paper aims to address this gap by investigating how DC line voltage drops influence the distribution of balancing power in droop-controlled MTDC systems. The paper also sheds light on the subtle yet



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significant influence of DC line voltage drops on balancing power distribution, which is crucial for optimizing the operation of MTDC systems.

DC bus voltage variations are dependent on the topology and line conductances of the DC grid, resulting in different responses from converter terminals to changes in power flow across various locations of the grid. Additionally, the chosen DC voltage droop constants also influence the severity of the impact of DC bus voltage variations on the distribution of balancing power.

This paper compares two mathematical models for DC grid power balancing to understand the influence of DC line voltage drops on power flow. The first approach neglects DC line voltage drops, while the second one, which is the main contribution of this paper, considers these drops to describe the system interaction more accurately. A five-terminal VSC-HVDC system is simulated in PSCAD, and the results are compared with the estimations from the two mathematical models. It is demonstrated that the proposed model (the second approach) accurately describes the droop interactions in the DC grid and serves as a useful tool to understand the influence of DC line voltage drops on the power flow of DC grids.

This paper is outlined as follows:

- In Section II, the different types of VSC-HVDC control are discussed.
- Section III discusses the distribution of DC grid balancing power in an ideal lossless DC grid in the presence of DC voltage droop control.
- In Section IV, the impact of DC line voltage drops is discussed.
- Section V discusses the proposed analytical expression for estimating the distribution of balancing power in DC voltage droop controlled DC grid systems.
- Section VI presents simulation studies to demonstrate the impacts of DC voltage line drops and to validate the proposed analytical estimation method.
- Conclusions are drawn in Section VII.

II. VSC-HVDC TERMINAL CONTROL !



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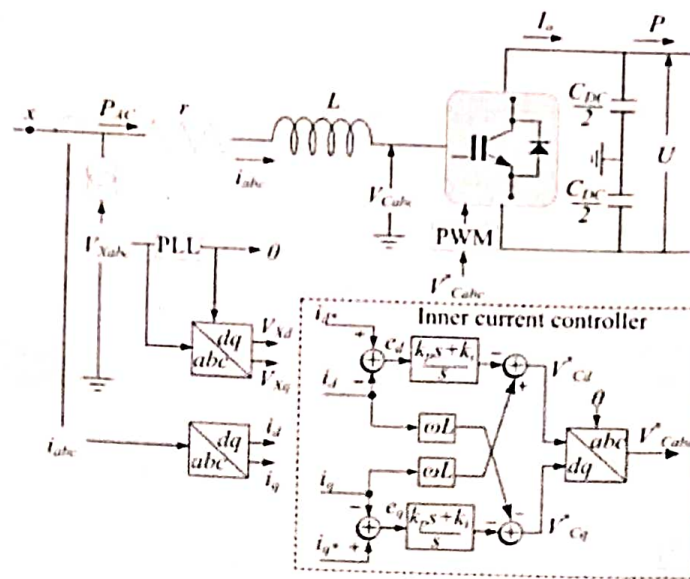


Fig.1. Schematic diagram of the VSC controller.

TABLE I
 LIST OF SYMBOLS IN FIG. 1

P	DC bus power measurement of the converter;
P_{AC}	AC side converter power measured at PCC;
PLL	Phase locked loop;
PWM	Pulse width modulator;
i_{abc}	3-phase AC current measured at PCC;
V_{xabc}	3-phase AC voltage measured at PCC;
V_{cabc}	3-phase AC voltage output of VSC;
V^*_{cabc}	3-phase AC voltage reference for VSC;
V_{xd}, V_{xq}	AC voltage at PCC in dq reference frame
V^*_{cd}, V^*_{cq}	AC voltage of VSC in dq reference frame
V^*_{cd}, V^*_{cq}	AC voltage reference for VSC in dq reference frame
I_o	DC current of VSC behind DC capacitor;
U	DC voltage measurement (pole to pole);
ω	Synchronous frequency in rad/s;
L, r	Series filter inductance and resistance;
C_{DC}	DC bus capacitance;
k_p, k_i	Proportional and integral gains of inner controller
abc/dq	abc to dq transformation
dq/abc	dq to abc transformation
e_d, e_q	Error signals of PI controllers of the inner current loop

TABLE I LIST OF SYMBOLS IN FIG. 1

A. Basic VSC Controller The most commonly used control approach for VSC is the decoupled (d-q axes) oriented control, where the d-axis of the synchronously rotating reference frame is aligned to the voltage phasor of phase-A measured at the point of common coupling (PCC) (Fig. 1). This



alignment also implies that the quadrature axis (q-axis) component of the voltage measurement becomes zero. The sign convention used here for the power and current measurements of the converter ensures that power/current measured at a converter terminal is positive if it flows from the AC grid to the DC grid via the converter station, with positive corresponding to rectifier mode of operation and negative corresponding to inverter mode of operation.

The voltage-current relation in Fig. 1 is given by:
 After the abc/dq transformations, (1) takes the form of (2) After the abc/dq transformations, (1) takes the form of (2)

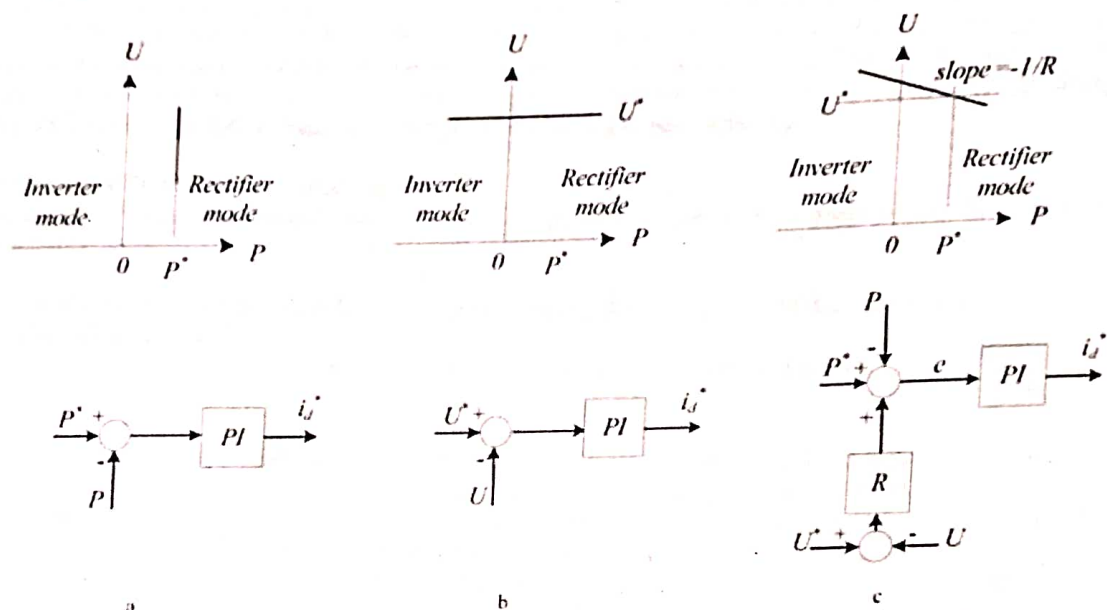


Fig. 2 DC terminal control configurations and the corresponding DC voltage versus power characteristics. (a) DC bus power controller (b) DC voltage regulator (c) DC voltage droop controller (Insert URL of Fig. 2)

The apparent power and real power measured at PCC are expressed as:

$$SPCC = PPCC + jQPCC \quad SPCC = PPCC + jQPCC$$

where $PPCC$ and $QPCC$ refer to apparent power and real power of the converter. V_d and I_d refer to direct-axis (d-axis) voltage and direct-axis current of the converter measured at PCC. where $PPCC$ and $QPCC$ refer to apparent power and real power of the converter. V_d and I_d refer to direct-axis (d-axis) voltage and direct-axis current of the converter measured at PCC.

Reactive power/AC voltage control is not the focus of this paper and will not be discussed here. Depending on the mode of operation, the active current reference I_{ref}/ref is used to control active power or DC bus voltage of the VSC.

B. DC Voltage and Power Control Modes

A VSC-HVDC terminal, hereafter simply referred to as a DC terminal, may have one of three control modes: constant power mode, constant voltage mode, or droop mode of control. The DC voltage versus power characteristic curve of the constant power mode DC terminal is shown in the top of Fig. 2(a), where P_d/P_d is the power axis and V_d/V_d is the DC bus voltage.

Constant DC voltage control is represented by Fig. 2(b) (bottom), where V_{ref}/V_{ref} and V_d/V_d refer to DC voltage reference and actual DC bus voltage, respectively. A DC terminal which regulates DC voltage will have a DC voltage versus power characteristic curve shown in Fig. 2(b) (top). DC voltage droop control can be seen as a combination of the first two types of VSC-HVDC control. It tries to control power to its reference level while at the same time contributing some balancing power. Since these two actions are somewhat contradicting (i.e., power control and DC voltage control), one action happens at the cost of steady-state deviations for the other. DC voltage droop control is shown in Fig. 2(c) (bottom), and the corresponding P_d/P_d versus V_d/V_d characteristic is shown in Fig. 2(c) (top). In Fig. 2(c) (bottom), the symbol $k_{P/P}$ refers to the DC voltage response (analogous to the frequency response of synchronous generators in AC grids) and has the unit of MW/kV. The slope is often given in terms of the DC droop constant $k_{d/d}$, which is the ratio of change in DC bus voltage to the corresponding change in converter power both in per-units. It could also be defined as the change in DC voltage in per-unit that results in a 100% change in converter power flow. The DC voltage droop constant $k_{d/d}$ and the DC voltage response $k_{P/P}$ are related to each other by:

$$k_P = k_d \times P_{rated} / V_{rated} \quad k_P = k_d \times V_{rated} / P_{rated}$$

Where P_{rated} and V_{rated} refer to rated power and rated DC voltage of the DC terminal, respectively.

From the DC voltage droop controller in Fig. 2(c) (bottom), the error signal $\Delta V_d/V_d$ is given by:

$$\Delta V_d/V_d = V_{ref}/V_{ref} - V_d/V_d$$

At steady state, the relation between DC voltage and converter power then becomes:

$$\Delta P_d = k_d \times \Delta V_d / V_d \quad \Delta P_d = k_d \times \Delta V_d$$

It could be noted that the steady-state characteristics in constant power control mode and constant DC voltage control mode could be represented by DC voltage droop controllers with $k_d = 0$ (i.e., $k_{P/P} = 0$) and $k_d = \infty$ (i.e., $k_{P/P} = \infty$), respectively. For analytical purposes, a large (but finite) value of $k_{d/d}$ could sufficiently represent steady-state behavior in constant DC voltage control mode.

In the absence of DC voltage error signal, the converter power will be the same as the power reference without any steady-state deviations. Hence, for precise control of power, the DC voltage reference in Fig. 2(c) (bottom) should be assigned according to results from load flow analysis conducted for the entire DC grid. For further details about DC grid load flow analysis, the reader is referred to [9].

Now let us consider an initial steady-state operating point of the controller in Fig. 2(c) (bottom) with input and output variables represented by the superscript "1," i.e., P_{d1}/P_{d1} , V_{ref1}/V_{ref1} , V_{d1}/V_{d1} , and P_{PCC1}/P_{PCC1} . The input/output variables at another steady-state point could be expressed in terms of the initial steady-state conditions expressed by $\Delta P_d/\Delta P_d$, $\Delta V_{ref}/\Delta V_{ref}$, $\Delta V_d/\Delta V_d$, and $\Delta P_{PCC}/\Delta P_{PCC}$. Substituting $\Delta V_{d1}/\Delta V_{d1}$ into $\Delta P_{d1}/\Delta P_{d1}$ yields the relation:

$$\Delta P_{d1} = k_d \times \Delta V_{d1} / V_{d1} \quad \Delta P_{d1} = k_d \times \Delta V_{d1}$$

Furthermore, we assume that during initial steady-state conditions, all error signals are zero, as in $\Delta V_{ref1} = \Delta P_{PCC1} = 0$. Substituting $\Delta V_{d1}/\Delta V_{d1}$ into $\Delta P_{d1}/\Delta P_{d1}$, we obtain:

$$\Delta P_{d1} = k_d \times \Delta V_{d1} / V_{d1} \quad \Delta P_{d1} = k_d \times \Delta V_{d1}$$

From this, the change in output of the droop controller due to changes in inputs becomes:

$$\Delta P_{d1} = k_d \times \Delta V_{d1} / V_{d1} \quad \Delta P_{d1} = k_d \times \Delta V_{d1}$$

In matrix form, this could be rewritten as:

$$\Delta P_d = k_d \times \Delta V_d / V_d \quad \Delta P_d = k_d \times \Delta V_d$$

Other vectors such as P_{in}/P_{in} , P_{out}/P_{out} , and V_d/V_d are also defined in a similar manner. The vector, which refers to power flow into the DC grid via the DC terminals, is given by:

$$P_{in} = Y \cdot V_d \quad P_{in} = Y \cdot V_d$$

where Y refers to the admittance matrix of the HVDC grid, and the symbol $\odot$ is the entry-wise (point-to-point) matrix multiplication operator, also called Hadamard product operator. Differentiation of the



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power flow equations of individual terminals with respect to the nodal voltage vector results in the Jacobian matrix J of the DC grid. This is mathematically given by:

$$J = \partial P / \partial V_d = \partial V_d / \partial P$$

If the HVDC grid has an initial state given by V_{d1} , the linearization of power flow equation around the initial steady-state point is given by:

$$\Delta P = J \times \Delta V_d \Delta P = J \times \Delta V_d$$

Hence, the relationship between the vectors representing small DC voltage variations ΔV_d and small nodal power variations ΔP is given by:

$$\Delta P = J \times \Delta V_d \Delta P = J \times \Delta V_d$$

If the vector ΔP is known, the voltage vector ΔV_d could be found by:

$$\Delta V_d = J^{-1} \times \Delta P \Delta V_d = J^{-1} \times \Delta P$$

Care should be taken while computing J^{-1} to avoid the singularity condition during the inverse matrix calculation. The inverse matrix gets closer to singularity if computed close to a flat DC voltage profile (i.e., when all DC bus voltages are very close to each other and DC grid power flow approaches zero). Once computed at a suitable operating point, the Jacobian matrix could be applied for a wider range of operations with negligible errors.

Equation (11) is rewritten in vector form as:

$$\Delta P = k_d \times \Delta V_d \Delta P = k_d \times \Delta V_d$$

indicating the relationship between changes in power references of the DC terminals with the resulting steady-state changes in injected powers at each of the terminals. From (24) and (27), the DC voltage change becomes as:

$$\Delta V_d = \Delta V_{d1} + \Delta V_{d2} \Delta V_d = \Delta V_{d1} + \Delta V_{d2}$$

Comparing (18) and (27), the differences in the two equations result from the differences between the constant matrices J and J^{-1} . As discussed in Section III, the matrix J is independent of DC grid topology since a lossless grid was assumed to establish the mathematical relation. In contrast, in the proposed analytical method, the constant matrix J^{-1} is dependent upon DC line resistances and hence upon DC grid topology. This is reflected by the presence of the DC Jacobian matrix J in (27). Due to the line voltage drop considerations, the proposed method gives an accurate mathematical model of the interaction between power control reference changes and the resulting observed power flow pattern in the DC grid.

V. EFFECT OF INCREASING/DECREASING DC VOLTAGE DROOP CONSTANT

From (5), it could be seen that the DC droop constant in physical units (i.e., k_d , the DC voltage response in MW/kV of a single terminal) could be changed by changing either the rated power P_{rated} , rated DC voltage V_{rated} , or the DC droop constant (i.e., k_d). Since P_{rated} and V_{rated} are fixed parameters for an already existing DC grid, k_d is the only means for changing the value of k_d . By following the same practice as in frequency droop control of synchronous generators, it may be reasonable to assign all DC terminals participating in DC voltage control the same value of k_d .

Now, consider an initial value of the DC voltage response vector kP , such that a new DC voltage response vector $kPkP$ is given by:

$$kP = \alpha \cdot kP \quad kPkP = \alpha \cdot kP$$

where α refers to a scaling factor by which we want to vary the droop constants of the entire DC grid. Then the initial total DC voltage response will be given by $\sum kP$. Substituting $kPkP$ into the definition of $KPKP$ in (15), we obtain:

$$KP = \text{diag}(kP) \quad KP = \text{diag}(kP)$$

where diag refers to a mathematical operator which transforms a vector into a diagonal matrix. Substituting (30) into the definition of YY , we obtain:

$$Y = G \times \text{diag}(kP) \times GTY = G \times \text{diag}(kP) \times GT$$



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Equation (26) could further be simplified as:

$$Pin = Y \cdot VdPin = Y \cdot Vd$$

$$Pin = (G \cdot \text{diag}(kP) \times GT) \cdot VdPin = (G \cdot \text{diag}(kP) \times GT) \cdot Vd$$

$$Pin = (G \cdot Vd) \times \text{diag}(kP) \times (G \cdot Vd)T Pin = (G \cdot Vd) \times \text{diag}(kP) \times (G \cdot Vd)T$$

$$Pin = J \cdot VdPin = J \cdot Vd$$

where I refers to the identity matrix and the matrix J , termed here as the steady-state sensitivity matrix, is a dimensionless quantity. Matrix J describes the quantitative relation between DC voltage variations and corresponding power flow variations.

Hence, in the ideal lossless model, increasing/decreasing the size of the DC droop constant in all HVDC terminals by a scalar constant will not have any impact on the steady-state power flow of the HVDC grid.

By following a similar procedure for the matrix $J-I$, we get the relationships given by:

$$\Delta Vd = J - I \times \Delta Pin \Delta Vd = J - I \times \Delta Pin$$

This indicates that, with increasing values of the scalar multiplier α , the power flow pattern is affected more strongly by the DC grid line resistances (and hence by its topology). As a result, with larger values of α , the balancing power distribution shows a larger deviation from the one predicted by the lossless analytical model. Since α and $kdkd$ are inversely proportional, larger values of α correspond to smaller values of $kdkd$ and vice versa.

Hence, we can conclude that, for smaller DC droop constants $kdkd$ applied to the HVDC terminals, the DC line voltage drops cause larger deviations of DC grid balancing power distribution from the estimation approach which ignores DC line resistance effects.

VI. Simulation Studies

A five-terminal VSC-HVDC network (shown in Fig. 3) was simulated using a PSCAD simulation software package. The simulation results are needed for checking the validity of the proposed analytical model, which estimates distribution of balancing power among different terminals, and for demonstrating the impact of DC line voltage drops in comparison to the ideal lossless analytical model. Since much of the focus in this paper is on the MTDC aspect, the AC grids are represented only by aggregated models. Symbols used in Fig. 3 are listed here.

| Parameters of HVDC Terminals Used in the Simulation |

Symbol	Description
$Vrated$	Rated pole-to-pole DC grid voltage (in kV).
$kdkd$	DC voltage droop constant of the i th DC terminal (in per-unit).
$Pmax$	Maximum (rated) power capacity of i th DC terminal (in MW).
Lij	DC transmission distance between terminals i and j .

The parameters of the converter terminals used in the simulation are shown in Table II.

The set of values given in Table III was chosen arbitrarily to represent an initial steady-state condition for the MTDC system. In practice, this data should come from the power dispatcher (scheduler).

In order to get the desired power flow pattern, the unknown power at terminal 2 should be computed and used as the power reference for terminal 2.

Similarly, unknown DC bus voltages at terminals 1, 4, and 5 should be found and used as DC voltage references in the DC droop controllers of these terminals.

Terminal 3 is a constant power terminal of known reference value and hence does not need any more data. A short MATLAB code was written for solving the given DC load flow problem. DC load flow analysis of the given DC grid (i.e., Fig. 3) together with the desired power flow pattern (i.e., Table III) gives the set of numerical solution shown in Table IV.

The values in Table IV were used as power and DC voltage references in the respective DC terminals. Steady-state powers and DC bus voltages observed from the PSCAD simulation are shown in Table V.



Now, the power reference of terminal 3 is changed from 750 to 800 MW. This corresponds to a change of 50 MW.

TABLE V: PSCAD SIMULATION RESULTS WITH DC VOLTAGE AND DC POWER REFERENCES COMING FROM TABLE IV

Terminal	DC Voltage (kV)	Power (MW)
1	500	750
2	510	750
3	520	800
4	530	750
5	540	750

The resulting steady-state power flow pattern after applying a change of 50 MW is shown in Table VI.

A. Comparison of Simulation Results With Estimation by Ideal Lossless Model

The total DC voltage response of the HVDC grid is given by:

$$V_{total} = \sum_{i=1}^{15} k d i P_{i,max} \quad V_{total} = \sum_{i=1}^{15} k d i P_{i,max}$$

Substituting relevant values of $k d k d$ from Table II and the value of $P_{i,max}$ from (33) into the expression of V_{total} in (18), we get:

$$V_{total} = 0.00015 \times 2000 + 0.0002 \times 2000 + 0.00025 \times 2000 + 0.0003 \times 2000 + 0.00035 \times 2000 = 2.15 \text{ kV}$$

$$= 0.00015 \times 2000 + 0.0002 \times 2000 + 0.00025 \times 2000 + 0.0003 \times 2000 + 0.00035 \times 2000 = 2.15 \text{ kV}$$

Decreasing power reference of terminal 3 by 50 MW (i.e., 50 MW) corresponds to the vector $\Delta P = [0, 0, -50, 0, 0]$ MW. Substituting this value of ΔP and the value of V_{total} from (34) into (18), we find the estimated changes in nodal power flow shown in Table VII. The changes in DC bus voltages are estimated by (15).

TABLE VII: COMPARISON OF ESTIMATED STEADY-STATE CHANGES (BY LOSSLESS MODEL) WITH PSCAD SIMULATION RESULTS

Terminal	Estimated Change in Power (MW)	Estimated Change in DC Voltage (kV)	Simulation Results Change in Power (MW)	Simulation Results Change in DC Voltage (kV)
1	-1.5	-1.5	-1.5	-1.5
2	-2	-2	-2	-2
3	-2.5	-2.5	-2.5	-2.5
4	-3	-3	-3	-3
5	-3.5	-3.5	-3.5	-3.5

From Table VII, it is evident that the ideal lossless model results in large errors in estimating the changes in DC bus voltages and nodal powers. It is also noticeable that, for terminals with droop control (i.e., 1, 2, 4, and 5), the estimation errors for change in power are nearly equal to the corresponding estimation error for change in DC bus voltage, suggesting that the DC bus voltage variations should be accounted for in order to accurately estimate the distribution of DC grid balancing power after the occurrence of power flow change at one terminal.

B. Estimation of Power Sharing by Proposed Analytical Expression

Now we try to estimate the power flow after a change in power reference of terminal 3 by 50 MW, but this time using the proposed analytical method which considers DC line voltage drops. In order to do so, we first have to compute the matrix $\partial P \partial V \partial V \partial P$. For the initial steady state given by Table V, the resulting Jacobian matrix JJ is given by (35), shown at the bottom of the page. This is computed by deriving the power flow equation of each node with respect to the DC bus voltage vector.

By substituting for $k d k d$ (from Table II) and JJ from (35) into (32), the matrix $\partial P \partial V \partial V \partial P$ becomes:



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VII. CONCLUSION

In this paper, the impact of DC line voltage drops on the distribution of balancing power is thoroughly investigated. It has been demonstrated that the response of each DC terminal to the instantaneous balancing power demand is influenced by several key factors:

1. **DC Grid Topology and Line Resistances:** The layout and resistances of the DC grid lines play a crucial role in determining how power flows through the system.
2. **Location of Power Deficit/Surplus:** The location within the DC grid where a power deficit or surplus occurs significantly affects how the system responds and redistributes power.
3. **Value of the DC Voltage Droop Constant:** The setting of the DC voltage droop constant applied in the DC grid influences the terminal responses and the overall power flow pattern.

Due to these factors, the power flow pattern following a change in injected power at a DC terminal exhibits significant deviations from what is predicted by a simplistic lossless DC grid model.

An analytical expression for accurately estimating terminal power has been proposed in this paper. The validity of this analytical expression has been demonstrated through close agreement between the results obtained using the proposed method and those obtained from dynamic simulations applied to a five-terminal MTDC test model.

By taking into account the complexities introduced by DC line voltage drops, this study provides valuable insights into the behavior of MTDC systems and offers a more accurate tool for analyzing and predicting their performance in practical applications.

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An effective GDI (Gate Diffusion Input) Based 16- bit Shift Register Design for Power and Area Optimization

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Abstract: Sequential circuit design is heavily influenced by power consumption and area reduction. Mainly consisted is shown here. Rather than using flip flops, pulsed latches are used to limit the amount of space these utilize. The shift register uses a minimal number of pulsed clock signals by combining the latches into numerous sub shifter registers and using Multiplexer and additional temporary storage latches. Multiple non-overlap delayed pulsed clock signal schemes are presented for data synchronization in a multi bit shift register to decrease power consumption. In order to maintain the current system, Tanner S- EDIT will be used with Taiwan Semiconductor (TSMC) 0.18mm technology. Designing low-power digital combinational circuits using Gate Diffusion Input(GDI) is a common practice nowadays. When used in particular operating conditions, the GDI approach restores the in-cell swing by implementing sophisticated logic functions on two transistors. This method reduces power consumption, propagation latency, and digital circuit size while maintaining low complexity of logic design. Dual Edge Triggered Flip Flop(DETFF) implementation using GDI technology is introduced as an improvement to the shift register design. This idea also takes into account time restrictions, which can be reduced with the least amount of management.

Keywords: Shift Register, Thermometer Code, Gate Diffusion Input, Dual Edge Triggered Flip-Flop, Propagation latency.

I. INTRODUCTION

Digital circuits employ a wide range of flip-flops and latches, which have a significant impact on the recycled elemental particles. Today's digital designs incorporate advanced pipelining techniques as well as multiple flip-flops and shift register files that are simple to multiply. A reduction in chip power can be achieved by reducing the clock power used by latches and flip-flops. Other than the D-Flip flop and its variations, such as T-flip flops and JK-flip flops, there are a variety of other, there are slew of new and innovative flip-flop structures to consider. Each of the clock periods two powerful falling edges or rising edges can be triggered by a Single Edge Triggered flip-flop. Due to battery-operated systems' need for low power consumption, high-performance designs with better reliability, custom-sized and low-power configurations have been developed over the past several years. This necessitates designs that use a less amount of electricity while keeping the same level of performance VLSI designers must therefore take

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GPU-Friendly Steiner-Tree Heuristic To Find A Minimum Cost Tree Spanning A Given Subset

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Rectilinear-Steiner-Minimum-Tree (RSMT) generation is a key step in VLSI routing. This paper describes a deterministic RSMT heuristic named SFP because it is simple, fast, and parallel. It is based on a rapid method for computing the optimal solution for three-pin nets, which it extends and applies to larger nets. Compared to FLUTE, a fast and high-quality RSMT algorithm, SFP incurs a wirelength penalty of 0.38 percent on the 16 ISPD 2008 inputs with 13 million nets. However, on a 16-core 2950X CPU, parallel SFP is 19 times faster than FLUTE, and on a Titan V GPU, it is 86 times faster. Serial SFP can generate an RSMT for a 10,000-pin net in under 1.5 seconds.

Keywords—GPU acceleration, Parallelism, Routing, RSMT heuristic, Steiner points

1. INTRODUCTION

Signal routing is an essential step in the physical design of a VLSI chip. Its goal is to determine where to run the wires that connect the logic blocks (e.g., macros, cells, and gates) while keeping certain factors like wirelength, signal-propagation time, and power consumption low. This study focuses on the Rectilinear-Steiner-Minimum-Tree generation—i.e., the first step of signal routing that involves minimizing the overall wirelength. The input is the location of the pins of each logic block as well as information about which pins to connect. A set of pins that must be connected is called a net. All nets together are referred to as the netlist.

Panel (a) in Fig. 1 provides an example of a net with three pins that connects the output (P1) of one logic gate to one input each (P2 and P3) of two other logic gates. The three pins can be connected as shown in panel (b) but doing so results in an unnecessarily long wirelength. Panel (c) shows a better solution that is optimal assuming we can only connect pins to pins. This solution can be found by computing the Minimum Spanning Tree (MST) of all possible pin connections. If waypoints, called

Steiner points [15], are allowed, the wirelength can be shortened further as illustrated in panel (d).

Due to manufacturing constraints, only rectilinear (horizontal and vertical) wires are typically allowed. Panels (e) through (h) of Fig. 1 show four possible rectilinear solutions. They are constructed by connecting the pins in P2-P1-P3 order using L-shaped wires with one turn. The solutions in panels (e), (f), and (g) all have the same suboptimal wirelength. The solution in panel (h) containing the Steiner point S is optimal. It is shorter because the part of the two L-wires between P1 and S is shared. In general, the goal of Rectilinear-Steiner-Minimum-Tree (RSMT) generation is to interconnect k pins in a plane using only horizontal and vertical wires such that the total wirelength is minimized.

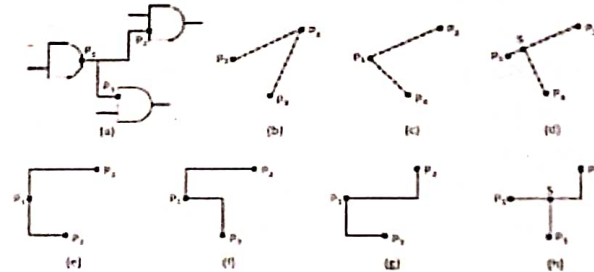


Fig. 1. Several layouts of a three-pin net (blue dots denote pins, red dots indicate Steiner points, the net is blue, and solid wires are rectilinear)

Finding the set of optimal Steiner points is NP-hard [15]. However, interconnecting given pins and Steiner points can be accomplished by computing an MST, a polynomial-time algorithm, of a complete graph where the vertices are the pins and Steiner points, and the edge weights are the rectilinear distance (Manhattan distance) between the edge's endpoints. Despite the NP-hardness, the optimal solution can often be computed in practice because nets tend to comprise just a few pins. Finding the optimal solution is trivial for two-pin nets and easy for three-pin nets (cf. Section III). Taken together, two- and three-pin nets

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**SMART UTILIZATION OF POWER USING NEW BIDIRECTIONAL INTELLIGENT
SOLID STATE TRANSFORMER**

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Abstract -This project proposes a smart grid application system using new bidirectional intelligent semiconductor transformer (BIST) With frequency range in terms of KHZ in which the magnitude and frequency of the operation voltage are various and high-quality power is required. It provides bidirectional power flow and hybrid switching using MOSFET and IGBT. The system comprises of high-voltage part and low-voltage part. The high-voltage part is composed of several half-bridge ac/dc converters connected in series through high-frequency transformers to cope with high input voltage. While the low-voltage part is composed of bidirectional half-bridge dc/dc converter and dc/ac PWM inverter. In the prototype BIST, the input voltage on the high-voltage side is 1900 V and the output voltage on the low-voltage side is 180V, and the intermediate DC-DC converter component output is found to be 1000V with improved power factor correction and compensation of sag and swell respectively so that the efficiency is improved and it posses small size

and light weight, with realization of three phase structure on a single module. This can be analysed MATLAB simulation.

I.INTRODUCTION

By using conventional transformer we can only step up or step down the voltage and it will not overcome the power quality problems. so it is not fit for smart grid applications. since in case of smart grid frequency mismatch is a major problem while connecting various renewable resources. so for this purposes, BIST(Bidirectional Intelligent Solid state Transformer) is used widely in railway stations and substations since it provides light weight. This single phase BIST is used in case of distribution automation. BIST operates at much higher frequency in terms of KHZ since it distributes DC power as well as AC power with compensation of sag, swell and harmonics and such that it can be implemented for smart grid which is also termed as Microgrid. In some cases bidirectional power flow can be achieved but power factor is not been controlled. In some other cases voltage sag and swell can

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Intrusion Detection Systems to Secure IoT Networks

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Abstract – The Internet of Things (IoT) and its rapid advancements will lead to everything being connected in the near future. The number of devices connected to the global network is increasing every day. IoT security challenges arise as a result of the large-scale incorporation of smart devices. Security issues on the Internet of Things have been the most focused area of research over the last decade. As IoT devices have less memory, processing capacity, and power consumption, the traditional security mechanisms are not suitable for IoT. A security mechanism called an Intrusion Detection System (IDS) has a crucial role in protecting the IoT nodes and networks. The lightweight nature of IoT nodes should be considered while designing IDS for the IoT. In this paper, the types of IDS, the major attacks on IoT, the recent research, and contributions to IDS in IoT networks are discussed, and an analytical survey is given based on the study. Though it is a promising area for research, IDS still needs further refinement to ensure high security for IoT networks and devices. Hence, further research, development, and lightweight mechanisms are required for IDS to provide a higher level of security to the resource-limited IoT network.

Index Terms – Attack, IoT, Intrusion, IDS, RPL, Security.

I. INTRODUCTION

The Internet of Things (IoT) is a robustly evolving trend that incorporates technical, scientific, social, and economic implications. It is essential to all facets of human life [1]. Healthcare, logistics, smart-cities, smart-homes, and agriculture are just a few of the applications for IoT. Due to its resource-constrained characteristics, the IoT tends to have more vulnerability that can be easily exploited by an attacker. The number of connected unsecured IoT devices on the global network is rapidly increasing [2]. Researchers are mainly focusing on various encryption and authentication mechanisms to ensure data confidentiality, authentication, and privacy among users and things. Most of the IoT devices have been developed without considering the fundamental security requirements [3].

The tools and techniques available for securing the IoT are inadequate because of the large number of interconnected devices. Moreover, the security mechanisms based on cryptography are mainly used to prevent external attacks such as eavesdropping and message alternation. When the cryptographic techniques hold the valid key and are compromised by the attack, they cannot detect the vulnerable nodes. Intruders can easily access the security details from the compromised nodes and immediately launch several internal attacks. Hence, to offer an extra level of security to the IoT, the Intrusion Detection System (IDS) acts as a tool [4].

Anthea Mayzaud et al. [5] categorized the Routing Protocol for Low Power Lossy Networks (RPL) attacks into

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Highly Solar active green oxidant combined W, N Co-doped ZnO powder : Synthesis Characterization and Photo catalytic Degeneration of textile Dye

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Abstract: The photocatalytic degradation of Reactive Blue 4 (RB 4) under solar irradiation was investigated using W, N co-doped ZnO. Various mole ratios (0.02 mol%, 0.03 mol%, 0.04 mol%, 0.05 mol%, and 0.06 mol%) of W, N co-doped ZnO photocatalysts were prepared via the sol-gel technique. Pure ZnO exhibited low photocatalytic activity due to poor surface properties, photo-corrosion, and limited utilization of visible light. These drawbacks were mitigated by doping ZnO with W, N. The photocatalytic activity of W, N co-doped ZnO significantly surpassed that of pure ZnO. XRD, SEM, UV-DRS, PL, and FTIR analyses confirmed the enhanced photocatalytic properties of W, N co-doped ZnO. Furthermore, W, N co-doped ZnO exhibited photostability and long-term durability.

Keywords: W, N Codoped ZnO, Sol-gel route, photocatalytic degradation, Reactive Blue 4, solar light

1. INTRODUCTION

The last centuries have seen a steady increase in human activities, causing remarkable technological development and soaring human populations. However, the industrial expansion has brought atmospheric, ground, and water pollution, all harmful to humans and the environment. Indeed, major pollution can cause human diseases like breathing problems, cardiovascular problems, cancers, neurobehavioral disorders, etc. It can also affect global warming, which worsens climate change, increases sea level rises, and causes serious damage to animals and flora.

Among the water pollutants, synthetic dyes pose significant issues. Synthetic dyes are commonly used by various industries, especially textile ones. These physically and chemically stable compounds are harmful to the environment. Synthetic dyes are recalcitrant compounds that exhibit high solubility in water and accumulate in both wastewater and industrial effluents. Consequently, the recovery of wastewater by conventional methods is not suitable for emergent pollutants. Heterogeneous photocatalysis can be satisfactorily applied for the decontamination of natural samples through the photocatalytic degradation of toxic pollutants from complex matrices, such as river water and wastewater. All renewable technologies have become a promising alternative for both energy generation and wastewater treatments. Solar photocatalysis is a suitable option to degrade recalcitrant pollutants from water.

The absorption of a photon initiates the photodecomposition of a semiconductor with energy greater than or equal to the bandgap of the semiconductor, producing electron-hole pairs. It is important for prolonging electron-hole recombination before a designated chemical reaction occurs on the semiconductor surface. Several semiconductor photocatalysts such as TiO_2 , ZnO, WO_3 , SnO_2 , CdS, and ZnS have been used for the treatment of wastewater pollutants under visible light irradiation. Among semiconductors, zinc oxide (ZnO) has

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Investigation of Properties and Dynamics Mechanical Analysis of Glass fiber / Human hair / Coir fiber reinforced epoxy polymer Hybrid Composites

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ABSTRACT

This paper presents the study of the mechanical and water absorption characteristics of the Glass fiber / Human hair / Coir fiber reinforced epoxy polymer composites. G-H-C-G, C-H-G-C, and H-C-G-H reinforced epoxy resin matrix composites have been developed by hand lay-up technique with varying process parameters such as fiber condition. Tensile strength varies from 42 Mpa to 56 Mpa, Tensile modulus varies from 48 GPa to 52 GPa, flexural strength varies from 46 MPa to 52 MPa, flexural modulus varies from 42 Gpa to 50 Gpa, shear study and fracture study was carried out. Effects of central open hole on the tensile strengths of the composites were studied by five sets of tensile specimens containing central open holes of five different diameters. Dynamic mechanical analyzer (DMA) was used to examine the dynamic mechanical properties of composite laminates with increasing temperature. The optimum mechanical properties were obtained in the treated fiber composite. Results showed that the composite sample, which has human fabric at the outer layers, has the highest storage and loss modulus. Besides, it was observed that glass transition temperature (T_g) of samples are close to each other and at about 75 °C. The fracture surface of the composite shows that pull out and de bonding of fiber is occurred.

Keywords: Glass fiber / Human hair / Coir fiber fiber hybrid, mechanical, open hole, DMA, SEM.

INTRODUCTION:

Natural fibers are derived from plants, animals and mineral sources. In modern days, the natural fibers from plants like sisal, banana and jute mixed with the glass fiber are used to get high strength (HS) hybrid composite materials which are widely used in many applications. High strength composite materials are replacing the metallic materials when used in the aerospace, structural and automobile industries.

Hybrid laminates exhibited superior dynamic mechanical performance, even compared to the pure glass laminate. Lower tan delta peak height (related to better fiber-matrix interaction) values and higher T_g were reported for the [C/G/ G]s and [G/C/ C]s samples which, together with the [G/C/ G]s sample, exhibited the best results for reinforcement effectiveness and loss modulus peak height [1]. Polyester based hybrid composites are prepared by Hand lay-up technique followed by static

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A REVIEW ON BIO COMPOSITE MATERIALS

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ABSTRACT:

Bio composites are natural fiber reinforced biopolymers, due to their excellent properties and less weight, Composite materials are considered as a significant part of our day to day life. Bio composites are fabricated by combining natural fibers in a matrix material. The matrix material can be biodegradable, non-biodegradable, or synthetic. Synthetic matrix materials, along with natural fibers, are used to form hybrid bio-composites. Natural fibers are abundant and have low harvesting costs with adequate mechanical properties, eco-friendly nature and sustainability, so the natural fibers are getting attention from researchers and academicians. This review article provides a review of the widely used natural fiber reinforced polymer composites and their applications. Drawbacks of natural fiber composites such as higher water absorption, low fire resistance, and mechanical properties limited its application also the applications of natural bio composites in automobile, construction, marine, aerospace industry are discussed.

Keywords: Bio-composites, Synthetic matrix, Natural fibers.

1.INTRODUCTION:

A bio composite material is a combination of matrices such as polymer and reinforced natural fibers. These composites mimic the morphology of the living materials with excellent biocompatibility. The polymer matrix protects the fibers from mechanical damage and environmental degradation. Moreover, bio fibers are natural fibers produced from biological origins such as wood, crops, and regenerated cellulose. Bio composites enhance the safety in their production.

2.BIO COMPOSITE CONSTITUENTS:

The term 'bio-composites' for the most part covers composite materials where in any event one segment ought to be bio-based:

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EXPERIMENTAL BEHAVIOR OF FIBER REINFORCED CONCRETE USING RECYCLED AGGREGATE WITH AGRO-WASTE REPLACEMENT

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ABSTRACT:

Utilization of industrial waste materials in concrete compensates the lack of natural resources, solving the disposal problem of waste and to find alternative technique to safeguard the nature. There are a number of agro wastes used as fully or partial replacement of coarse aggregates or fine aggregates. This review carries out a assessment about agro waste substances, which can be adequately utilized in concrete as fine aggregate substitution. This paper reviewed some of these materials like fiber reinforced concrete, recycled aggregates, groundnut shell, superplasticizers are the replacement in concrete. Different physical and mechanical properties of recycled fine aggregates and recycled coarse aggregates as well as agro waste materials has been substituted and it has been reviewed and comparisons are made between them. Deflection and leaching study review are carried out additionally and compared. It can observed that the concrete where river sand is replaced by M – sand and natural aggregates is replaced aggregates which exhibits improved strength and durability properties, but it's slump increases as the rate of replacement increase in the case of superplasticizers and the slump decreases in the case of superplasticizers. There is a less research work reported on agro waste ad groundnut shell, so it is felt that further detailed investigation are required. ready mix concrete each year. It is used in highways, big apartments, bridges, dams, and numerous other applications. Sand is used as fine aggregate in mortars and concrete. Natural river sand is the most preferred choice as the fine aggregate materials.

River sand is a product of natural weathering of rocks over a period of millions of years. It is mined from the river beds and sand mining has disastrous environmental consequences. River sand is becoming a scarce commodity and hence exploring alternatives to it has become imminent. Fiber Reinforced Concrete, Groundnut shell powder, Recycled Coarse aggregates are the alternative materials is used.

Concrete is a mixture comprised of cement (10-15 percent), coarse and fine aggregates (60-75 percent) and water (15-20 percent) by volume. Fiber Reinforced Concrete, Groundnut

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DESIGN AND ANALYSIS OF KNUCKLE JOINT USING FEA SOFTWARE

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ABSTRACT:

Knuckle joint is a joint between two parts allowing movement in one plane only. It is a kind of hinged joint between two rods, often like a ball and socket joint. Knuckle joints are most common in steering and drive train applications where it needs to move something but also need to allow for offset angles. The main aim of this project work is to study and calculate the maximum stresses induced in Knuckle joint, The load carrying capacity is considerably very low in mild steel pin. So we can also use high strength, high modulus molybdenum pin that can augment the capacity to withstand higher loads. The knuckle joint is proposed to develop in this study for an applied force of 150 KN. The diameter of the pin is planned, expected to be 24 mm. The material of the knuckle joint is considered as molybdenum material, in order to do the stress analysis the knuckle joint is designed using CATIA software and the mesh was developed for the same using ANSYS software. Based on the analytical calculations and ANSYS result, it shows that a pin of 24mm diameter can resist a load of 150 KN.

1) INTRODUCTION:

A knuckle joint is used when two or more rods subjected to tensile and compressive forces are fastened together such that their axes are not in alignment but meet in a point. Knuckle joint is a joint between two parts allowing movement in one plane only. It is a kind of hinged joint between two rods, often like a ball and socket joint. There are many situations where two parts of machines are required to be restrained, for example two rods may be joined coaxially and when these rods are pulled apart they should not separate i.e. should not have relative motion and continue to transmit force. Similarly if a cylindrical part is fitted on another cylinder (the internal surface of one contacting the external surface of the other) then there should be no slip along the circle of contact. Such situations of no slip or no displacements are achieved through placing a third part or two parts at the jointing regions. A knuckle joint is understood to be a hinged joint in which projection in one part enters the recess of the other part and two are held together by passing a pin through coaxial holes in two cylindrical parts should not have relative motion and continue to transmit force.

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EXPERIMENTAL BEHAVIOR OF FIBER REINFORCED CONCRETE USING RECYCLED AGGREGATE WITH AGRO-WASTE REPLACEMENT

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ABSTRACT:

Utilization of industrial waste materials in concrete compensates the lack of natural resources, solving the disposal problem of waste and to find alternative technique to safeguard the nature. There are a number of agro wastes used as fully or partial replacement of coarse aggregates or fine aggregates. This review carries out a assessment about agro waste substances, which can be adequately utilized in concrete as fine aggregate substitution. This paper reviewed some of these materials like fiber reinforced concrete, recycled aggregates, groundnut shell, super plasticizers are the replacement in concrete. Different physical and mechanical properties of recycled fine aggregates and recycled coarse aggregates as well as agro waste materials has been substituted and it has been reviewed and comparisons are made between them. Deflection and leaching study review are carried out additionally and compared. It can observed that the concrete where river sand is replaced by M – sand and natural aggregates is replaced aggregates which exhibits improved strength and durability properties, but it's slump increases as the rate of replacement increase in the case of superplasticizers and the slump decreases in the case of superplasticizers. There is a less research work reported on agro waste ad groundnut shell, so it is felt that further detailed investigation are required. ready mix concrete each year. It is used in highways, big apartments, bridges, dams, and numerous other applications. Sand is used as fine aggregate in mortars and concrete. Natural river sand is the most preferred choice as the fine aggregate materials.

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INVESTIGATION OF PROPERTIES AND MACHINABILITY OF LUFFA WITH GROUNDNUT SHELL FIBER REINFORCED EPOXY POLYMER HYBRID COMPOSITES

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ABSTRACT

This paper presents the study of the mechanical, thermal properties and water absorption characteristics of the luffa with ground nut fiber reinforced epoxy polymer composites. luffa with ground nut fiber reinforced epoxy resin matrix composites have been developed by hand lay-up technique with varying process parameters such as fiber condition (treated, untreated), chopped randomly oriented and different volume fraction (30%, 40% and 50%). Tensile strength varies from 18 Mpa to 23.5 Mpa, compressive strength varies from 41.5 MPa to 56.2 MPa, flexural strength varies from 61.22 MPa to 73.6 MPa and impact energy varies from 1.1 Joules to 1.6 Joules, as a function of fiber volume fraction. Effects of central open hole on the tensile and impact strengths of the composites were studied by five sets of tensile specimens containing central open holes of five different diameters. The machinability study was performed by drilling experiments using a CNC drilling machine with drill tool dynamometer. Two input parameters, cutting speed and feed rate and the one output parameter, thrust force, were used for the drilling process. The optimum mechanical properties were obtained in 40% of fiber volume fraction of the treated fiber composite. The fracture surface of the composite shows that pull out and de bonding of fiber is occurred.

Keywords: luffa / ground nut fiber hybrid, mechanical and thermal properties, open hole, machinability, SEM.

1. INTRODUCTION

Synthetic fiber reinforced composites are being widely used in polymer composites because of their high stiffness and strength properties. The natural fibers such as jute, ramie, sisal, coir, pineapple leaf, and kenaf have the potential to be used as a replacement for glass or other traditional reinforcement materials in composites. These fibers are abundant, cheap and renewable. Martinez-Lopez et al., aims to study the Polymer Concrete were reinforced with Loofah fibers in order to improve the compressive and flexural

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CHARACTERIZATION ANALYSIS ON ALGAE METHYL ESTER (AME) BIO- DIESEL INJECTED IN AUTOMOTIVE CI ENGINE

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ABSTRACT

Biodiesel is derived primarily from the base catalytic trans-etherification reaction of oils or fats and lipids. Biodiesel has become highly attractive due to its biodegradable, renewable, and non-toxic nature. Currently, biodiesel is being promoted by researchers as an alternative fuel. Biodiesel quality analysis is important because consistency and high quality are critical to the success of its commercialization and market acceptance. Appropriate and accurate analysis methods are needed to meet this requirement. Some analytical techniques, such as high-performance liquid chromatography (HPLC), infrared spectroscopy (IR), CHN analysis and physical properties are considered and used in algae methyl ester (AME) biodiesel analysis. In the spectroscopic technique, the infrared spectrum plays an important role. This experimental study is focused on performance, emission and combustion characteristics of CRDI automotive diesel engine developments in biodiesel quality analysis with appropriate spectroscopy techniques. The use of biodiesel has been found to lower air pollutant and greenhouse gas emissions, but can be potentially harmful to the engines if it contains impurities. This paper proposes a method using high-performance liquid chromatography to test the quality of biodiesel. This method can also be used to optimize the procedure used to make the biodiesel. An optimized production procedure and a test method to assess the final product will ensure high quality fuel that can be used with confidence in diesel engines. This will likely add strength to proposals to increase the use of the on-campus reactor and produce biodiesel for campus grounds equipment from waste vegetable oil. In a results of CRDI engine based on performance biodiesel blend B60 and B80 shows higher brake thermal efficiency, based on emission HC and NO are lower in blend of B60 and B20.

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KINETIC STUDY ON THE EFFECT OF WATER HYACINTHS IN FOODWASTE BIOGAS PRODUCTION

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ABSTRACT:

Due to rapid growth of population and industrial globalization day to day energy demand increases and has an adverse effect on the fossil fuel depletion. This is the major problem accounted for the present and future economy. So in order to reduce our energy demands, there should be a need of distinguishing new concepts on renewable energy source because they are ecofriendly in nature. In the present paper, kinetics study on the effect of water hyacinths in food waste biogas production was carried out. The experiments consists of bio digester setup of 75litres capacity with 10% solid concentration at mesophilic temperature range of 35°C and 20days retention times and by using modified Gompertz equation kinetics were determined for each bio digester. The kinetic parameters are Biogas yield potential (P), Maximum biogas production rate (R_m) and the Duration of lag phase (λ) were estimated for each bio digester. In the experiments cow manure is used as the inoculums and food waste is added daily .The results show that the mixture of water hyacinths and food waste will enhancing the biogas productions of about 1.2% when compared with food waste substrate alone.

Keywords: Anaerobic Digestion (AD), Food waste (FW), Cow Manure (CM), Water Hyacinths (WH), Hydraulic Retention Time (HRT)

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Due to rapid growth of population and industrial globalization day to day energy demand increases and has an adverse effect on the fossil fuel depletion. This is the major problem accounted for the present and future economy. So in order to reduce our energy demands, there should be a need of distinguishing new concepts on renewable energy source because they are ecofriendly in nature. In the present paper, kinetics study on the effect of water hyacinths in food waste biogas production was carried out. The experiments consists of bio digester setup of 75litres capacity with 10% solid concentration at mesophilic temperature range of 35°C and 20days retention times and by using modified Gompertz equation kinetics were determined for each bio digester. The kinetic parameters are Biogas yield potential (P), Maximum biogas production rate (R_m) and the Duration of lag phase (λ) were estimated for each bio digester. In the experiments cow manure is used as the inoculums and food waste is added daily .The results show that the mixture of water hyacinths and food waste will enhancing the biogas productions of about 1.2% when compared with food waste substrate alone.

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ASSESSMENT OF OPEN CENTRAL HOLE ON THE STRESS CONCENTRATION FACTOR OF GLASS FIBRE-COCONUT COIR-HUMAN HAIR HYBRID COMPOSITE

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ABSTRACT

The recent research attempts in polymer composites are indicative of a shift of choice to synthetic fillers from natural fillers as the low eco-compatibility of the former is posing serious environmental hazards. Anyhow, the comparatively lower mechanical properties of the natural fibre reinforced polymer composites have restricted their entry into many sectors. A complementary measure by presenting a combination of natural and synthetic fibres in the polymer matrix can achieve a good balance between the degradability and performance of the material. In the recent past, a few research attempts were made on the feasibility of hybridization using selected natural and synthetic fillers.

Most of the assembling operations of fibre reinforced plastic sheets involve a number of riveted joints which require the presence of holes which naturally give rise to zones of stress concentration. This factor has made the analysis of open hole behaviour of these laminate composites, a crucial step in defining their suitability for applications.

The open hole mechanical properties of human hair-coconut coir-glass fibre-human hair hybrid composite (HCGHRP) are studied in this paper. The composite samples were prepared by hand lay-up. Eight sets of tensile and impact specimens with each set comprising of specimens with centrally drilled holes of a particular diameter were prepared and the experimental tensile and impact values were recorded. Additionally, Whitney Nusimer point stress model was validated for these values. The stress distribution in the open hole specimens were studied by Finite Element Method. In all these Increase in hole diameter was found to cause an increase in hole sensitivity. The finite element analysis of the loaded

specimens indicated a much higher concentration of load in the regions surrounding the hole.

Keywords: Stress concentration factor, open central hole, glass fibre, human hair

INTRODUCTION

Green environment campaign has forced the researcher to change their approach in polymer composites reinforcement material from synthetic fillers to natural fillers to enhance polymer composites properties. The key is a low eco-compatibility of the synthetic fillers is posing serious environmental hazards. Since comparatively lower mechanical properties of the natural fibre reinforced polymer composites as restricted their entry into many sectors. A complementary measure has been taken by presenting a combination of natural and synthetic fibres in the polymer matrix can achieve a good balance between the degradability and performance of the material. In the recent past, a few research attempts were made on the feasibility of hybridization using natural and synthetic fillers. Raghavendra et al., studied an effect of hybrid combination of jute and glass fibres in epoxy matrix. They reported that composite with glass fiber showed tensile strength of 78MPa and this value was approximately equal to the average of the tensile strength of the composites reinforced by jute and glass fibres. Hazizan et al., investigated on the mechanical behavior of pultruded jute/glass fibre composites which shows much higher mechanical properties. Atiqah et al., have been investigated mechanical properties of kenaf and glass fibres reinforced in epoxy and unsaturated polyester. This combination has produced good mechanical properties in case of epoxy, but unsaturated polyester composite showed no

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TWO-WHEELER DESIGN AND FABRICATION TO PREVENT TRIPLE RIDERS AND ACCIDENTS

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Abstract

Road site visitor accidents (RTAs) are becoming a critical public health issue that require a multidisciplinary response. In countries like India, the trend of RTA accidents and deaths is becoming concerning. The approach used to enforce the laws and regulations available to stop traffic accidents is frequently unsuccessful. The majority of bike accidents are caused by more than two riders who are not wearing safety helmets. These incidents can be prevented by designing bikes with smart device integration. We provide a bike with an integrated helmet detector, a piezoelectric sensor, a load phone device, and an electricity-generating gadget. The number of rides on the two-wheeler is realized using a load movable system and a piezoelectric sensor, which can assist prevent triple riders. Helmet detector; employing a Raspberry Pi 3, it can identify individuals who wear helmets or not. These ingenious bike safety measures will lower bike accidents. Furthermore, power is generated via thermoelectric conversion, which operates on the Peltier effect principle.

Keywords—smart bike , bike built helmet detector , avoiding triple riders, power generation system replacing dynamometer

1. INTRODUCTION

Mostly the usage of 4 wheelers is extensively decreased than the two wheelers. Which means usage of two wheelers by way of the society had extended more? Riding on two wheelers with over load, more than two members on bike and not wearing the helmet humans are regularly located on India. This is an essential trouble that leads to unexpected and tremendous accidents. To reduce the probability of accident the format

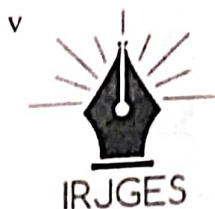
and implementation of clever bikes with clever units have been preceded.

The World Health Organization (WHO) reports, India is susceptible for street accidents and most of the instances are of two wheeler accidents. From the latest surveys in India 4 individuals are loss of life for each and every one hour due to no longer wearing helmet and additionally many accidents are taking place due to more than 2 riders on bike. On the basis of these troubles we added a device which is to

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Development of Smart Control System for Improved Energy Management in Building

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Abstract:

The advancement of technology has led to a rapid increase in modern appliances, transitioning from time-consuming manual processes to advanced smart control systems. However, many circuits, especially power supply circuitry, utilize inductors and transformers that draw higher currents than specified by manufacturers. Oversizing or undersizing these components can lead to adverse effects such as fire outbreaks or reduced equipment lifespan, ultimately costing more to replace. In response, this research proposes a smart control system to monitor, regulate, and balance energy demand and supply, employing load shedding in critical situations based on priority scheduling. The system, designed using Arduino IDE software for monitoring and decision-making, and simulated using Proteus software with the Senate building in FUTO as a case study, aims to optimize energy consumption and conserve usage. A hardware prototype validates the proposed control system, demonstrating organized shedding during peak load periods and reducing manual intervention. The proposed system offers a payback period of 2 months if implemented in the Senate building, providing efficiency, reliability, and cost savings.

Indexed Terms: Total Connected Load Current (CABC), Section A&B Load Current (CAB), Section A Load Current (CA), Renewable Energy Source Current (CRES), Battery Voltage (VB).

I. Introduction:

Despite increasing integration of renewable energy sources, residential energy supply still

heavily relies on non-renewable resources through public utility services. Efforts to minimize energy usage, including adjusting usage times and employing efficient devices, are incentivized by governments to promote energy efficiency [1]. Efficient energy consumption is vital for balancing supply and demand, leading to benefits such as increased financial capital, environmental quality, and human comfort [2].

II. Objective:

The rapid increase in energy demand due to technological advancement poses challenges, particularly in power supply circuitry, where inductors and transformers draw significant inrush currents. Additionally, the efficiency of solar panels declines over time due to exposure to UV light and adverse weather conditions. Poorly sized systems can lead to fire outbreaks or reduced battery lifespan, necessitating costly replacements. To address these issues, a smart control system is proposed to monitor and compare renewable energy source power output with electrical load, prioritizing based on need. This system aims to reduce human intervention while ensuring resilience and reliability.

The primary objective of this research is to develop a smart control system for managing specific renewable energy resources at FUTO. To accomplish this, the following secondary objectives will be pursued:

- Develop a block diagram for the smart control system.
- Create a system algorithm and flowchart.
- Design a circuit diagram for the smart control system.
- Assess load demand and available resources at the Senate Building, FUTO.
- Develop and implement a



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NON-VERBAL COMMUNICATION: FOCUS ON RECRUITMENT INTERVIEW FOR FRESHERS

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ABSTRACT.

For years, the psychology is concerned with the study of communication, and time is entered in the enterprise. This study probes the impact of nonverbal communication in the outcome of the over-all interview. They examined the nonverbal behaviors of the candidates to the talks, in particular: posture, eye contact, hand gestures and facial expressions, nonverbal behaviors were recorded at regular time intervals for the first 10 minutes of interview, for a total of 20 surveys per candidate. At the same time, the study examines the impact of the style of the interviewer (measured on the scale SYMLOG) and the experience gained by the candidate. The assumptions included: 1. Candidates with work experience have a non-verbal behavior than candidates without experience. 2. The style of interviewer may influence nonverbal behavior of the candidate: the attitude more or less friendly breeder can cause certain non-verbal styles in the selected data were analyzed by ANOVA results that confirm the hypothesis: The level of experience, nonverbal behaviors and style of the interviewer are expressed in significant interaction between them.

Keywords: non verbal Communication, recruitent interview, work experience, facial expression, body posture.

INTRODUCTION

The professional contexts, are characterized by the assumption people's well-defined and specific roles. It happens then that nonverbal behaviors in human interaction are determined from the physician or the patient, the candidate rather than the interviewer in a job interview, or from any public official rather than the citizen.

What is interesting is groped to identify those non-verbal behavior patterns and thus for the most part unconscious and unaware that help us understand who we face if a person is important or not, whether confident or not or whether it is manipulated or not.

Rozelle, Drukman and Baxter (1986), propose to consider the 'non-verbal' as a skill you can develop and manage. Edinger and Patterson (1983), they also stress this possibility, arguing that the ability to manage nonverbal behaviors would lead to an improvement in working relationships and facilitating a comfortable interaction.

If the behavior is of interest as non-verbal skills, you can think of it as a potential that they may develop or learn, which, converging with the verbal communication skills, making people more competent and effective in their interpersonal relationships.

Noting the importance of the latter in organizational contexts, it was considered important to

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ENGLISH LANGUAGE TEACHING AND CONVERSATIONAL

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Abstract

There has been extensive discourse about the role of conversational methods in English language teaching (ELT), generating both agreement and disagreement among scholars. A review of the literature reveals that ELT is deeply rooted in the discipline and sub-disciplines of linguistics, roots which it has never fully severed. This paper aims to trace the influence of linguistics on ELT over the last six decades, highlighting the linear and nonlinear relationships that linguistics maintains with ELT. The core objective is to elucidate how linguistic theories and methodologies have shaped and continue to shape the field of English language teaching.

Keywords: Discourse, ELT, Improvement, Innovation, Conversational

Introduction

The question of whether linguistics plays a role in English Language Teaching (ELT) is highly pertinent and has been the subject of much debate. Reviewing literature on the topic reveals a spectrum of opinions: some scholars assert that linguistics and ELT are intrinsically linked, while others believe they are distinct fields. This intense partisanship and lack of objectivity complicate the task of evaluating the role of linguistics in ELT.

Examining the history of linguistics over the past hundred years, and particularly the last six decades, shows that linguistics and its sub-disciplines have profoundly impacted all phases of language teaching. The evolution of theoretical linguistics—from traditional Grammar to Structuralism, from Transformational Generative Grammar to Systemic Functional Grammar, and the current emphasis on Semantics, Pragmatics, and Sociolinguistics—illustrates this influence. These linguistic theories and their associated methods have significantly shaped the design and implementation of ELT curricula and methodologies.

Linguistics has provided a theoretical foundation that informs various approaches to language teaching. For instance, the structuralist approach emphasized the systematic study of language structures, leading to methods that focus on grammar and syntax. Transformational Generative Grammar introduced concepts of deep structure and surface structure, influencing approaches that emphasize understanding the underlying rules of language use. Systemic Functional Grammar, with its focus on language function and use in context, has informed communicative language teaching methods that prioritize real-world language use.

Moreover, the rise of Semantics, Pragmatics, and Sociolinguistics has shifted the focus toward meaning, context, and the social aspects of language. These fields emphasize the importance of understanding language in use, which has led to the development of teaching methods that incorporate authentic language materials and real-life communication scenarios.



The interplay between linguistics and ELT is complex and multifaceted. Linguistic theories provide essential insights and tools that have shaped, and continue to shape, effective language teaching practices. This paper seeks to explore these relationships in depth, shedding light on the ongoing dialogue between linguistics and ELT, and highlighting the innovations and improvements that have arisen from this dynamic interaction.

Structuralism

Structural linguistics developed as a reaction against traditional grammar, fundamentally altering scholars' perceptions of grammar. Richards and Rodgers (2006, p.54) noted that this reaction was influenced by the movement towards positivism and empiricism, spurred by Darwin's *The Origin of Species*. Structuralism emphasized treating linguistics as a scientific study of language, advocating for objectivity, verifiable descriptions, discovery procedures, the primacy of oral language, and the unique patterns of each language. These principles provided sound theories and techniques for language teaching.

Structuralists offered a more comprehensive and detailed description of language, which significantly influenced both the theory and methods of the Audio-lingual Method (ALM). They viewed language as a highly structured, rule-governed system that is meaningful within a given cultural community. Grammar was seen as "the set of formal patterns in which the words of a language are arranged to convey larger meanings" (Richards and Rodgers, 2006, p.55). Structural linguists analyzed language by identifying the smallest meaningful sounds (phonemes) and grammatical units (morphemes, stems, prefixes, suffixes) and then larger units such as phrases, clauses, and sentences. Language was viewed as a system of structurally related elements used to encode meaning, with these elements being phonemes, morphemes, and words. Language learning, according to structuralists, meant mastering these building blocks and the rules for combining them from phoneme to morpheme to word to phrases and sentences (Richards and Rodgers, 2006, p.55). This belief led to the development of the Audio-lingual Method, which focused on the mastery of speech through the four skills of listening, speaking, reading, and writing.

The structuralist notion of language as a system allowed for viewing second or foreign language learning as the juxtaposition of two systems. Fries and Pike (1949, as cited in Richards, 1974, p.4) suggested that this juxtaposition could lead to a new system combining features of both languages, and even to inter-systematic interference (Weinreich, 1953, as cited in Richards, 1974, p.4). This idea of interference resonated with both linguists and language teachers, as it seemed to explain the challenges of second language learning. This led to the emergence of the Contrastive Analysis (CA) approach.

The origins of CA were pedagogic, and it helped language teachers by identifying similarities and differences between the learner's native language and the target language, thus highlighting areas of facilitation and interference (Ellis, 1986, p.23). As S.P. Corder (1973, p.280) proposed, language teachers should leverage the similarities, emphasizing both facilitation and interference. Although CA did not always predict errors accurately, it was useful for retrospectively explaining errors.



Structuralism provided a robust framework for understanding and teaching languages. By emphasizing the systematic and scientific study of language, it laid the groundwork for methods like the Audio-lingual Method, which sought to develop language skills through structured practice and mastery of linguistic elements. The introduction of concepts like interference and the development of Contrastive Analysis further enriched the field of language teaching, offering valuable insights into the complexities of learning a second language.

Error Analysis and Transformational Generative Grammar

As an alternative to Contrastive Analysis (CA), a more refined approach known as Error Analysis (EA) evolved. This approach shifted the focus from merely identifying similarities and differences between languages to systematically studying the errors learners make. Errors were viewed as a window into the learner's competence, offering insights into what the learner has mastered and what still needs to be learned. This systematic study of errors provided valuable feedback to teachers about the effectiveness of their instruction and the areas where learners needed more support.

With the publication of *Syntactic Structures* by Noam Chomsky in 1957, the emphasis in linguistic theory shifted from describing language to understanding the internalization of language. Chomsky's work marked a departure from the behaviorist view of language learning as habit formation and memorization of dialogues. Instead, Chomsky posited that language learning involves the acquisition of an abstract set of rules that enable speakers to generate grammatically correct sentences.

Chomsky's focus was on characterizing the abstract abilities that speakers possess, which allow them to produce grammatically correct sentences in a language (Richards and Rodgers, 1986, p.159). He introduced the concept of Transformational Generative Grammar, which claims that knowledge of a few basic sentence structures (kernel sentences) and transformational rules enables learners to generate a wide variety of sentences. According to Chomsky, "the grammar is a device for generating the sentences in a language" (Thomas, 1967, p.197).

A kernel sentence is a simple, active, declarative sentence. All other sentences are derived from these kernel sentences by applying transformational rules. Transformational rules either introduce new elements (e.g., negatives, adjectives), rearrange elements of a kernel sentence (e.g., interrogatives), or do both (e.g., passives). Chomsky implies that passive, interrogative, negative sentences, and those with adjectives, adverbs, and conjunctions, are more sophisticated than kernel sentences (Thomas, 1967, p.197).

For teachers, this notion of kernel sentences and transformational rules proved to be very helpful. It allowed for the organization of language instruction according to the increasing sophistication of structures. By teaching learners simple, active, declarative sentences and some transformational rules, teachers could help them produce grammatically correct and more complex sentences. This approach provided a logical order for selecting and arranging grammatical elements, building effectively on preceding material.

The most important contribution of Chomsky's theory is that it permits a teacher to select and arrange grammatical elements in a logical sequence, making it easier to build on previous



lessons. This method not only aids in teaching grammar systematically but also enhances learners' ability to generate creative and grammatically correct sentences in the target language. By focusing on the internal rules that govern sentence construction, teachers can help students develop a deeper understanding of the language, moving beyond rote memorization to true linguistic competence.

Besides this, Chomsky's theory of competence and performance, along with the concept of the Language Acquisition Device (LAD), provided evidence that language learning is a mental phenomenon. It involves processes of trial and error and the deduction of rules from the input to which learners are exposed. According to Chomsky, if a person has competence in a language, they can produce grammatically correct sentences and distinguish between grammatical and ungrammatical sentences.

However, Chomsky's theory faced criticism from sociolinguists like Campbell and Wales (1970) and Dell Hymes (1971). Campbell and Wales argued that Chomsky's idea of competence omitted "by far the most important linguistic ability... the ability to produce and understand utterances which are not so much grammatical, but, more importantly, appropriate to the context in which they are made" (Campbell and Wales, 1970, as quoted in George, 1992, p.135). Dell Hymes proposed that a native speaker must not only produce grammatically well-formed sentences but also understand and produce sentences appropriate to the context (Corder, 1973, p.92). George (1992) quotes Newmeyer, who in turn quotes Lakoff, suggesting that Chomsky's framework "sets up artificial boundaries and rules out of the study of language such things as context, social interaction, and deixis" (Newmeyer, 1982, as quoted in George, 1992, p.135).

This critique led to the concept of communicative competence, highlighting the importance of developing learners' ability to use language appropriately in various contexts. Hymes (1971) emphasized that communicative competence involves not only grammatical correctness but also the ability to use language effectively and appropriately in social contexts. This shift in focus was foundational for the development of the Communicative Language Teaching (CLT) approach.

Michael Halliday's (1975) focus on the functions of language rather than its forms, and Canale and Swain's (1980) notion of communicative competence, provided the linguistic foundation for CLT. These theories underscored the need to teach language as a tool for communication, not just as a set of grammatical rules. CLT methods emphasize interaction and real-life communication, preparing learners to use language in various social contexts. This approach influenced several language teaching methods, including Wilkins' Notional-Functional Approach, Widdowson's discourse-oriented approach, and English for Specific Purposes (ESP) approaches.

Stevens (1965, p.73) remarked that "the place of linguistics is behind the classroom teachers." He argued that the real contribution of linguistics is to enhance the teacher's understanding of the nature of language, making them more competent and effective. Linguistically oriented teaching materials yield satisfactory results only when used by teachers who are aware of the linguistic ideas and assumptions upon which they are based (Verma, 1993, p.76).



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The question posed at the beginning—"What has linguistics contributed to the field of English language teaching?"—can still be answered only partially and semi-objectively. Despite this, it is clear that linguistics has made significant contributions to ELT, particularly in terms of methods and techniques. While acknowledging the ongoing debates and evolving perspectives, it is evident that linguistic theories have profoundly shaped the way English is taught and learned, enhancing both pedagogical practices and learner outcomes.

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Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance

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Abstract—A new asymmetrical multilevel inverter topology is reported that is capable to operate satisfactorily with wide variation in dc-link voltage, while feeding power to the ac grid. A topological building block is first introduced that has one full-bridge inverter connected in series with a level doubling network. Following this, the interconnection of such building blocks is attempted to increase the number of levels at the output voltage waveform. The investigation reveals that for a three-phase system, a converter configuration with two such building blocks is capable to generate a nominal asymmetry of 14:7:2:1 using only four voltage sources. In solar Photovoltaic (PV) applications, one main source may be fed by PV array and the other three auxiliary sources may be fed through separate dc/dc converters, each having power rating of 3.2% of the peak power rating of PV arrays. The proposed converter can generate 3097 space vectors. Asymmetrical hexagonal decomposition is modified (to ensure satisfactory operation of LDN and to eliminate any dc component in the phase voltage waveform) to control such converter. The converter is extensively simulated in MATLAB/Simulink. A solar PV system of 9.4 kWp available in the laboratory is used to feed power to the grid at different irradiance. Simulation results match well with the prototype experiments confirming the usefulness of the proposed topological alternative for solar PV applications.

Index Terms—Grid connected photovoltaic inverter, central inverter, multilevel inverter, level doubling network, inverter topology.

INTRODUCTION

PHOTOVOLTAIC inverter is in the core of a grid connected Photovoltaic (PV) system. Leakage current (due to stray capacitance between the terminal and frame of PV module) is a key issue that influences selection of topology for such inverters.

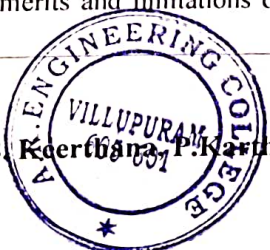
Energy yield from a PV power plant depends on both *efficiency* and *reliability* of these inverters [1].

While a great attention is paid to increase the efficiency to enhance energy capture, a considerable loss in the evacuation of power is observed due to inverter failure. The main reason for inverter failure is high frequency switching of few hundreds of ampere of output current. This current could be reduced by elevating the voltage level of the PV arrays. However, this is not recommended due to several issues such as potential induced degradation (PID) [2], dielectric breakdown [3] etc., those limit the PV array voltage to a maximum of 600–900 volts. This leaves no other alternative but to have a central inverter with rated current of hundreds of ampere.

The key design constraints for a PV inverter are:

- 1) Leakage current must be below recommended standards,
- 2) Peak dc bus voltage has to be limited to 600–900 V,
- 3) Power quality has to be maintained as per grid code,
- 4) The solar park should not inject unbalanced current in to the grid.

To satisfy the above requirements, many PV converter topologies came up in last three decades. This section briefly highlights the merits and limitations of few potentially important topologies.



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EXPERIMENTAL INVESTIGATION AND BUCKLING ANALYSIS OF WOVEN GLASS EPOXY LAMINATED COMPOSITE PLATE

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ABSTRACT

In this project the Buckling behavior of laminated composite plates subjected to in-plane loads is an important consideration in the preliminary design of aircraft components. The sizing of many structural subcomponents of the aircraft structures is often determined by stability constraints. The objective of the current study is to understand the influence of the length-to-thickness ratio, the aspect ratio, the fiber orientation and the cut-out shapes on the buckling load for the woven glass epoxy laminated composite plate in clamped-free-clamped-free configuration by finite element analysis using ANSYS software. Initially buckling analysis was carried out on woven glass epoxy laminated composite plate, both; experimentally and numerically; for the two different geometric configurations to predict the critical buckling load and the test results were compared with the FEA predictions, to check the validity of the analysis methodology. The same methodology was further followed for analyzing the buckling behavior of the composite plates. The results shows the effect of orientation of fiber, aspect ratio, cut-out shape and length-to-thickness ratio on the buckling of the glass epoxy laminated composite plate.

Keywords: - Plate buckling, woven glass epoxy laminate, length-to-thickness ratio, aspect ratio, fiber orientation, cut-out shapes.

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Enhanced Photocatalytic Degradation of Textile Dye Using W, N Co-Doped ZnO Powder: Synthesis, Characterization, and Solar Activity

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Abstract: The photocatalytic degradation of Reactive Blue 4 (RB 4) under solar irradiation was investigated using W, N co-doped ZnO. Various mole ratios (0.02 mol%, 0.03 mol%, 0.04 mol%, 0.05 mol%, and 0.06 mol%) of W, N co-doped ZnO photocatalysts were prepared via the sol-gel technique. Pure ZnO exhibited low photocatalytic activity due to poor surface properties, photo-corrosion, and limited utilization of visible light. These drawbacks were mitigated by doping ZnO with W, N. The photocatalytic activity of W, N co-doped ZnO significantly surpassed that of pure ZnO. XRD, SEM, UV-DRS, PL, and FTIR analyses confirmed the enhanced photocatalytic properties of W, N co-doped ZnO. Furthermore, W, N co-doped ZnO exhibited photostability and long-term durability.

Keywords: W, N Codoped ZnO, Sol-gel route, photocatalytic degradation, Reactive Blue 4, solar light

1. INTRODUCTION

The last centuries have seen a steady increase in human activities, causing remarkable technological development and soaring human populations. However, the industrial expansion has brought atmospheric, ground, and water pollution, all harmful to humans and the environment. Indeed, major pollution can cause human diseases like breathing problems, cardiovascular problems, cancers, neurobehavioral disorders, etc. It can also affect global warming, which worsens climate change, increases sea level rises, and causes serious damage to animals and flora.

Among the water pollutants, synthetic dyes pose significant issues. Synthetic dyes are commonly used by various industries, especially textile ones. These physically and chemically stable compounds are harmful to the environment. Synthetic dyes are recalcitrant compounds that exhibit high solubility in water and accumulate in both wastewater and industrial effluents. Consequently, the recovery of wastewater by conventional methods is not suitable for emergent pollutants. Heterogeneous photocatalysis can be satisfactorily applied for the decontamination of natural samples through the photocatalytic degradation of toxic pollutants from complex matrices, such as river water and wastewater. All renewable technologies have become a promising alternative for both energy generation and wastewater treatments. Solar photocatalysis is a suitable option to degrade recalcitrant pollutants from water.

The absorption of a photon initiates the photodecomposition of a semiconductor with energy greater than or equal to the bandgap of the semiconductor, producing electron-hole pairs. It is important for prolonging electron-hole recombination before a designated chemical reaction occurs on the semiconductor surface. Several semiconductor photocatalysts such as TiO_2 , ZnO, WO_3 , SnO_2 , CdS, and ZnS have been used for the treatment of wastewater pollutants under visible light irradiation. Among semiconductors, zinc oxide (ZnO) has attracted attention due to its environmental stability as compared to other metal oxides. The application of photocatalysis, especially using semiconductors such as ZnO, appears to be a more appealing option.

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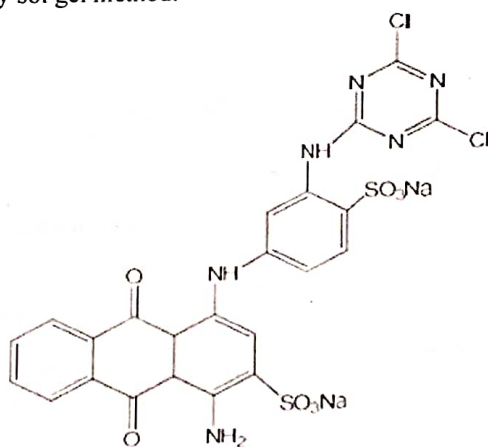
Approach to Photocatalysis

ZnO serves as a superior alternative to conventional chemical oxidation methods for the decomposition of toxic compounds due to its nonhazardous product[12]. This is because semiconductors have unique properties such as inexpensive, non-toxic, high surface area, broad absorption spectra, and facilitating multi-electron transfer processes. ZnO has been demonstrated as an improved photocatalyst as compared to commercialized TiO₂ based on its more significant rate of activities and higher absorption efficacy of solar radiations[13]. However, ZnO has almost the same bandgap as TiO₂. Surface area and surface defects play an essential role in the photocatalytic activities of metal oxide. The photocatalytic activity of ZnO is restricted to the irradiation wavelengths in the UV region because of its wide bandgap of about 3.2 eV and low quantum efficiency[14]. The fast recombination of ZnO's electrons poses additional constraints to its application. Some alternative strategies to extend ZnO's photoresponse in the visible light region are: (a) ZnO doping[15], (b) co-doping [16], (c) coupling with lower band gap semiconductors[17], (d) surface plasmon resonance[18], (e) quantum dots[19], and (f) sensitization with natural and synthetic dyes[20].

Several attempts have also been made to improve the efficiency of photocatalysts by using doping materials. Doping is required to improve the efficiency of photocatalysts. The reduction of the optical energy gap of ZnO by doping is an advantage for use in photocatalytic devices. Among these doping materials, Ag-doped ZnO[21], N-doped ZnO[22], Mg-doping on ZnO[23] shows good photocatalytic activity.

Doping of non-metallic elements can form an intermediate energy level in the band gap of ZnO, which can reduce the band gap of ZnO and increase the photocatalytic activity of visible light. Anion doping can achieve better optical response of ZnO, especially in V group elements N, P, As[24]. Substitution by N doping is one of the best ways to lower down the band gap of ZnO, owing to the atomic size and electronegativity of the non-metal element N and the closest to O atom[25], and the mixing p state of N and 2p state of O narrow the band gap of semiconductor oxide[26]. Furthermore, the introduction of N atoms into ZnO lattice will bring the energy band into intermediate energy level and reduce the absorption energy, which can increase photocatalytic activity[27].

The combination between the properties of the nonmetals with that of transition metals may induce desirable optical and photocatalytic properties in ZnO. The integration between the visible-light responsive properties of nonmetal and the metal as trap centers can prompt more efficiency for practical applications. A. M. Youssef and S. M. Yakout designed effective visible light photocatalysts composed of C/La or Ce codoped ZnO nanostructures were prepared by sol gel method.



Chemical structure of Reactive Blue 4

2.2. Preparation of W, N- codoped ZnO photocatalyst

10 g of zinc chloride and 0.01 mol% of Sodium tungstate and Urea were dissolved in 100 ml of double distilled water for the preparation of W, N- codoped ZnO photocatalyst. The dopant concentrations were added at the ratios like 0 to 0.05 mol percentage. To that solution required amount of sodium bicarbonate was then added in portions with vigorous stirring for several minutes, finally the precipitate was formed. The doped photocatalysts are washed several times with distilled water to remove NaCl formed. The precipitate was then dried at 100°C to remove the water. The obtained precipitate was grinded in an agate mortar and pressed into a ceramic

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crucible. The material was calcinated at 500°C for 4 hrs. The undoped ZnO was also synthesized in the same procedure without adding dopant concentration.

2.3. Characterization

X-ray powder diffraction (XRD) patterns of the photocatalysts were recorded on a Philips X'pert-MPD diffractometer in the 2θ range 20-80° using Cu-Kα radiation. The data were collected with a step of 0.028°. The atom temperature. Determe structure of the products was determined by comparing the experimental X-ray powder patterns to the standard compiled by the Joint Committee on Powder Diffraction and Standards (JCPDS). The crystallite sizes were calculated from the peak width using the Scherrer equation. The surface morphologies and particle size were observed by Scanning Electron Microscopy (JEOL, JSM-6360LV). UV-Visible diffuse reflectance spectra were acquired by a PerkinElmer Lambda 35 spectrometer. BaSO₄ was used as the reflectance standard. The photoluminescence emission spectra of the samples were measured at room temperature using Perkin-Elmer LS 55 Luminescence spectrophotometer.

2.4. Photocatalytic studies

2.4.1. Photocatalytic degradation study of RB 4

All the photocatalytic experiments were performed under natural sunlight on clear sky days during the period of June to October 2020. In a typical experiment, 50 ml of dye solution (concentration 50 mg·l⁻¹) was taken with 50 mg of photocatalyst in a 250 ml glass beaker. Then the dye solution was kept in direct sunlight with continuous aeration and the concentration of the dye remains was measured periodically by measuring its light absorbance at the visible λ_{max} by using Elco SL-171 Visible spectrophotometer. To avoid variation in results due to fluctuation in the intensity of the sunlight, a set of experiments have been carried out simultaneously. For pH studies the pH of the dye solutions were modified to different values (3, 5, 7, 9 and 12) by using 0.1M HCl and NaOH solution.

2.4.2. Chemical Oxygen Demand Analysis

The chemical oxygen demand (COD) is the indirect measurement of the oxygen needed for the complete oxidation of all the compounds present in solution. The COD of the degraded dye solution were analyzed in standard dichromate method. For the analysis, 0.4g of HgSO₄ was added to 20ml of the degraded dye solution in a 250 ml round bottom flask. To that 10ml of 0.25N K₂Cr₂O₇ was added and mixed well. Then 30 ml of H₂SO₄-Ag₂SO₄ reagent (prepared by dissolving 0.5g of Ag₂SO₄ in 30ml of Concentrated H₂SO₄) was added slowly with constant stirring. After that few pieces of pumice stones were added and the flask was fitted with a condenser and refluxed for 2 hours. The solution was cooled and diluted to 150ml with distilled water and the entire content was titrated against 0.25N Ferrous Ammonium Sulphate (FAS) solution using ferroin as indicator.

$$\text{COD in mg}\cdot\text{l}^{-1} = (V_1 - V_2) \times N \times 8 \times 1000 / V_{\text{sample}} \times 1000$$

Where V₁ & V₂ are the volume of FAS solution consumed for blank and test sample respectively, N is the normality of FAS solution and V_{sample} is the volume of sample taken for analysis.

3. RESULTS AND DISCUSSION

3.1 Physicochemical characterization of the photocatalyst

3.1.1 X-ray Diffraction Studies

The powder XRD patterns of ZnO and 0.04 mol% W, N- codoped ZnO were as shown in Figure 1. Both samples were identified as a single phase wurtzite ZnO by XRD analysis (JCPDS card nos.: 89-1397, 89-0511). The W, N codoped ZnO shows high intensity of the peaks, indicating that the samples are highly crystalline. On the other hand, codopants such as W and N incorporation on ZnO lattice increased the crystallinity. The mean crystallite sizes of the samples calculated by using the Scherrer formula for ZnO and W, N- codoped ZnO was given in Table 1. The results show that W, N doping decreases the particle size of the ZnO. An XRD pattern of W, N- codoped ZnO indicates the uniform dispersion of W and N ions. Moreover, the bulk structure remains virtually unchanged by the W and N- incorporation.

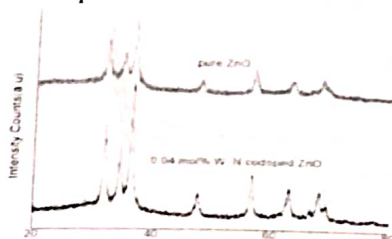


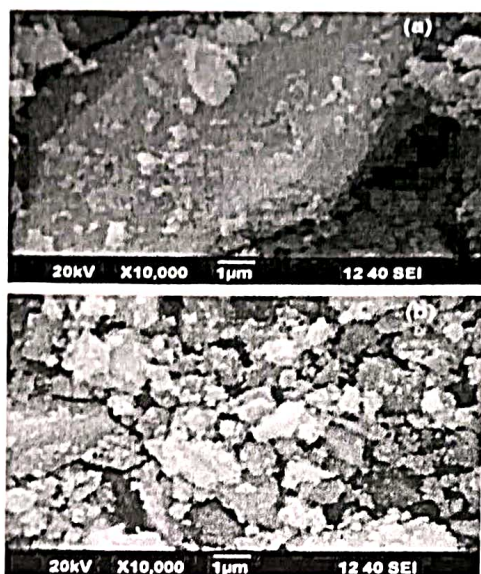
Figure 1: XRD patterns of ZnO and W, N- codoped ZnO.

Table 1: XRD Calculation Results of ZnO and W, N- codoped ZnO

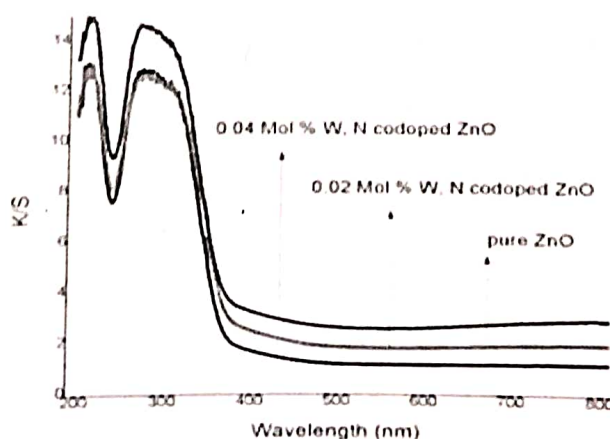
Photocatalyst	d(101)-spacing (Å)	Full Width Half Maximum (nm)	Average Crystallite Size (nm)
ZnO	2.4753	0.342°	73
0.04% W, N- codoped ZnO	2.4710	0.400°	38

3.1.2 SEM Analysis of the Photocatalyst

The SEM micrographs of ZnO and 0.04% W, N- codoped ZnO photocatalysts were shown in Figure 2 a, b respectively. The micrographs show that ZnO particles have blunter particle morphology whereas W, N- codoped ZnO has irregular arrangement patterns composed of spherical ZnO. This type of morphology could be able to completely degrade dye solutions. The reason is doped photocatalyst has shown a highly rough surface.

**Figure 2: SEM micrograph of (a) ZnO, (b) 0.04% W, N codoped ZnO photocatalyst.****3.1.3 Diffused Reflectance UV-Visible Analysis of the Photocatalyst**

Diffused reflectance spectra UV-visible spectra of ZnO and W, N- codoped ZnO absorption in Figure 3. The results show that the absorption onset of ZnO and W, N- codoped ZnO were 390 nm and 480 nm respectively. Therefore W, N- codoped ZnO can utilize visible light than the pure ZnO for photoexcitation process and expected to have more activity in the solar radiation than the undoped ZnO. The red shift in the light absorption of ZnO on W and N doping has been interpreted by Kim et al., as the sp-d exchange interaction between the band electrons and the localized "d" electrons of the transition metal ion at the cationic site.

**Figure 3: Diffused Reflectance UV-Visible spectra of ZnO and W, N-codoped ZnO.**

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3.1.4 Photoluminescence Spectra

To study the optical properties of the synthesized solar active W, N codoped ZnO, the photoluminescence (PL) spectrum is recorded at room temperature. The PL spectrum compared with pure ZnO powder and W, N codoped ZnO are shown in Figure 4.

The UV emission located at 391 nm is the band-edge emission resulting from the recombination of free excitons, and the broad green emission centered at 451 nm is caused by the radiative recombination of the photogenerated holes with electrons around the surface oxygen vacancy. In comparison with the pure spectrum of as-prepared ZnO, the UV emission of W, N codoped ZnO is enhanced, while the electron hole recombination might be suppressed. This phenomenon can be attributed to the reduction of band gap energy while doping W and N. The similar observation has been reported previously[32].

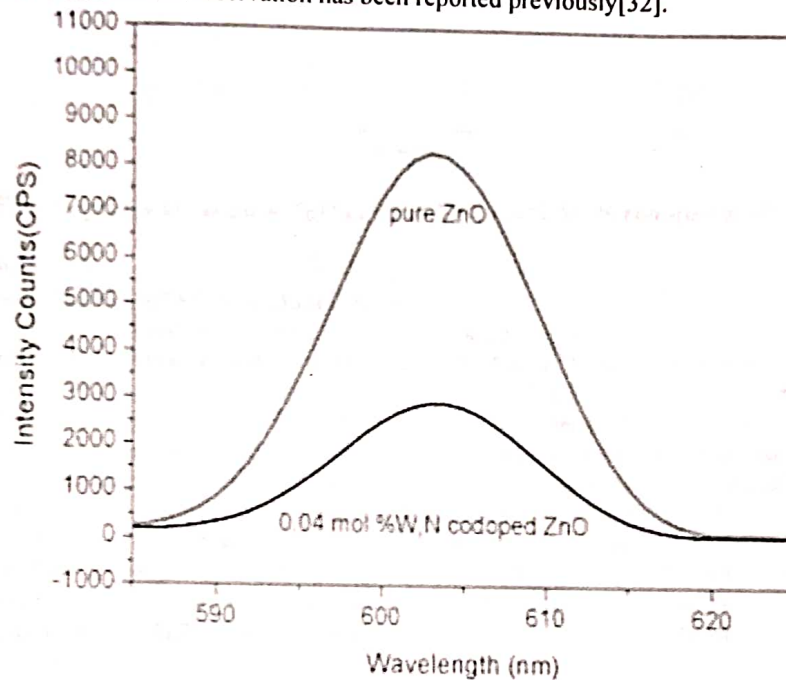


Figure 4: Photoluminescence spectrum of pure ZnO and 0.04 mol% W, N codoped ZnO.

3.1.5 FT-IR Spectroscopic Analysis

Fourier transform infrared spectroscopy of the hydrolyzed particles (Fig. 5) show strong peaks at 1564 cm^{-1} and at 1399 cm^{-1} . The previously mentioned peak at 1564 cm^{-1} indicates the formation of ZnO[33]. When tungsten doping is with ZnO, the peak value shifted to 1627 , this indicates O-W bond has elongated. Peaks at 475 cm^{-1} and 452 cm^{-1} correspond to N-O stretching and bending. These peaks confirm integration of tungsten (W) ion and nitrogen (N) with zinc (Zn) ion.



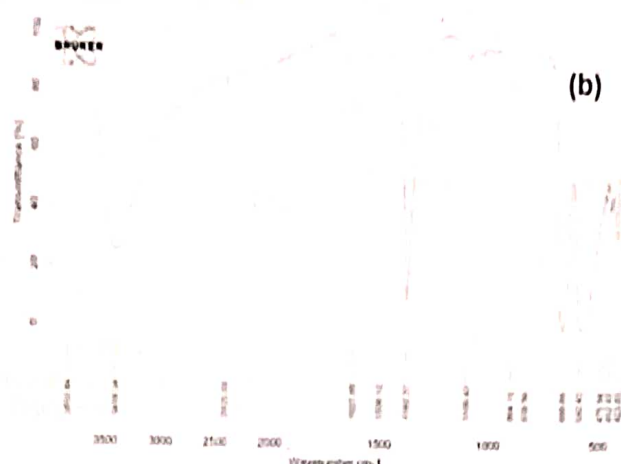


Figure 5: FT-IR spectra of (a) pure ZnO and (b) 0.04 mol% W, N codoped ZnO photocatalyst.

3.2 Photocatalytic Studies

3.2.1 Photocatalytic Activity of W, N-codoped ZnO

The photocatalytic activity of the W, N-codoped ZnO photocatalysts has been evaluated from their activity in the degradation of Reactive Blue 4 (RB 4) in the presence of solar light. This dye has been chosen for the studies since it has a strong light absorption in UV-visible region. The UV-visible transmittance spectrum of the RB 4 solution show that more than 80% of incident light in the wavelength range 200-450 nm was absorbed by 50 mg·l⁻¹ dye solution in a path length of 1 cm. Hence, the degradation of the RB 4 solution with concentration above 50 mg·l⁻¹ in a simple photocatalytic process over a UV active photocatalyst like ZnO is difficult and will take more treatment time for complete degradation. The degradation of 50 mg·l⁻¹ RB 4 on W, N-codoped ZnO in a photocatalytic process was shown in Figure 6. The results show that W, N-codoped ZnO have higher activity than pure ZnO in simple photocatalytic process. The W, N-codoped ZnO with 0.01 mol % W, N content has shown maximum activity for the degradation of the dye and increase of W, N ion above 0.04 mol % decreases the activity of the ZnO. The high activity of the above 0.04 mol % W, N-codoped ZnO might suggest.

HO₂ (hydroperoxyl radicals) are less reactive than both hydroxyl radicals and hydrogen [37].

Figure - 11: Effect of concentration of H₂O₂ on the efficiency of degradation of RB 4

(Initial concentration C₀= 100 mg l⁻¹; pH=5; Photocatalyst dosage 1 g l⁻¹)

4. CONCLUSION

Pure ZnO and W, N codoped ZnO powder prepared in co-precipitation method followed by thermal treatment at 500°C for 5 hours has shown good activity for the degradation of reactive dyes in solar light. The prepared photocatalyst characterized by various techniques also compared them photocatalytic activity. 0.04 mol% W, N codoped ZnO demonstrated highest activity for the degradation of RB 4 with a chlorotriazine functional group. The rate of degradation of RB 4 over W, N codoped ZnO was maximum when the solution pH was 5, and the dosage of the photocatalyst was 1 g l⁻¹. A hydrogen peroxide concentration of 10 mM was found to be optimum for the achieving the maximum activity in a oxidant combined Photocatalytic process. The 0.04 mol% W, N codoped ZnO also has good reusability; the 0.04 mol% W, N codoped ZnO completely degraded RB 4 in 120 minutes even in oxidant combined photocatalytic processes in its fourth reuse. Hence oxidant combined photocatalytic process over 0.04 mol% W, N codoped ZnO will be an efficient and cost-effective method for the degradation of organic dyes and other organic pollutants in industrial effluent.

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PREPARATION, PROPERTIES AND MACHINABILITY STUDY OF GROUNDNUT SHELL-BROOM FIBRE- REINFORCED EPOXY COMPOSITE

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Abstract. The need for eco-friendly materials and non-polluting processing techniques has made natural fibre reinforced polymer composites potential candidates to replace GFRPs and CFRPs in semi structural applications. Ground nutshell and broom fibre (fibre strands extracted from broom grass) are easily available in market at low cost. Polymer composites consisting of 30% and 40% volume fractions of a hybrid reinforcement containing groundnut shell and broom fibre in epoxy resin were fabricated by compression moulding. The mechanical characterization of these composites was carried out by standard tensile, compressive and flexural tests in a Universal Testing Machine with appropriate set-up. The machinability study was performed by drilling experiments using a CNC drilling machine with drill tool dynamometer. Two input parameters, cutting speed and feed rate and the one output parameter, thrust force, were used for drilling process. TiAlN coated solid carbide and HSS drills were employed in the drilling experiments and a comparative study was made based on the output parameters. Solid carbide resulted in lower thrust force values and feed rate proved to be the most influential parameter on thrust force.

Keywords: Natural fibre, compression moulding, Solid carbide tool, Drilling

1 Introduction

Recently, the research attempts in natural fibre reinforced polymer composites have greatly increased. Natural fibre reinforced polymer composites involve simple processing techniques, easily procurable raw materials and relatively high biodegradability levels among all the engineering materials. Apart from researchers, manufacturers have also shown increased interest in natural fibre composites from the past decade. To substantiate this claim, the increased in use of the natural fibres in German cars from around 10000 tonnes in the year of 2000 to 19000 tonnes in 2005 could be mentioned [1]. Hemp, sisal, kenaf, and bamboo are the natural fillers which have undergone many evaluation procedures and declared fit for a good number of applications. The mechanical properties of natural fibers and the composites developed by incorporating them in different polymer matrices and various processing techniques for fabricating them have been studied by many researchers [2-4]. Groundnut shell is highly

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Distributed Detection of Minimum Cuts in Wireless Multi-Hop Networks

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Abstract

A wireless sensor network can get separated into multiple connected components due to the failure of some of its nodes, which is called a “cut”. Here consider the problem of detecting cuts by the remaining nodes of a wireless sensor network. Here propose an algorithm that allows (i) every node to detect when the connectivity to a specially designated node has been lost, and (ii) one or more nodes (that are connected to the special node after the cut) to detect the occurrence of the cut. The algorithm is distributed and asynchronous: every node needs to communicate with only those nodes that are within its communication range. The algorithm is based on the iterative computation of a fictitious “electrical potential” of the nodes. The convergence rate of the underlying iterative scheme is independent of the size and structure of the network. All cut nodes information is been updated and created into a log file of system and filtered log records of cut nodes are maintained.

I. INTRODUCTION

Wireless sensor networks (WSNs) are a promising technology for monitoring large regions at high spatial and temporal resolution. In fact, node failure is expected to be quite common due to the typically limited energy budget of the nodes that are powered by small batteries. Failure of a set of nodes will reduce the number of multi-hop paths in the network. Such failures can cause a subset of nodes that have not failed to become disconnected from the rest, resulting in a “cut”. Two nodes are said to be disconnected if there is no path between them. Wireless sensor networks (WSNs), consisting of large numbers of low-cost and low-power.

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GPU-friendly Steiner-Tree Heuristic to Find a Minimum Cost Tree Spanning a Given Subset

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Rectilinear-Steiner-Minimum-Tree (RSMT) generation is a key step in VLSI routing. This paper describes a deterministic RSMT heuristic named SFP because it is simple, fast, and parallel. It is based on a rapid method for computing the optimal solution for three-pin nets, which it extends and applies to larger nets. Compared to FLUTE, a fast and high-quality RSMT algorithm, SFP incurs a wirelength penalty of 0.38 percent on the 16 ISPD 2008 inputs with 13 million nets. However, on a 16-core 2950X CPU, parallel SFP is 19 times faster than FLUTE, and on a Titan V GPU, it is 86 times faster. Serial SFP can generate an RSMT for a 10,000-pin net in under 1.5 seconds.

Keywords—GPU acceleration, Parallelism, Routing, RSMT heuristic, Steiner points

1. INTRODUCTION

Signal routing is an essential step in the physical design of a VLSI chip. Its goal is to determine where to run the wires that connect the logic blocks (e.g., macros, cells, and gates) while keeping certain factors like wirelength, signal-propagation time, and power consumption low. This study focuses on the Rectilinear Steiner-Minimum-Tree generation—i.e., the first step of signal routing that involves minimizing the overall wirelength. The input is the location of the pins of each logic block as well as information about which pins to connect. A set of pins that must be connected is called a net. All nets together are referred to as the netlist.

Panel (a) in Fig. 1 provides an example of a net with three pins that connects the output (P1) of one logic gate to one input each (P2 and P3) of two other logic gates. The three pins can be connected as shown in panel (b) but doing so results in an unnecessarily long wirelength. Panel (c) shows a better solution that is optimal assuming we can only connect pins to pins. This solution can be found by computing the Minimum Spanning Tree (MST) of all possible pin connections. If waypoints, called

Steiner points [15], are allowed, the wirelength can be shortened further as illustrated in panel (d).

Due to manufacturing constraints, only rectilinear (horizontal and vertical) wires are typically allowed. Panels (e) through (h) of Fig. 1 show four possible rectilinear solutions. They are constructed by connecting the pins in P2-P1-P3 order using L-shaped wires with one turn. The solutions in panels (e), (f), and (g) all have the same suboptimal wirelength. The solution in panel (h) containing the Steiner point S is optimal. It is shorter because the part of the two L-wires between P1 and S is shared. In general, the goal of Rectilinear-Steiner-Minimum-Tree (RSMT) generation is to interconnect k pins in a plane using only horizontal and vertical wires such that the total wirelength is minimized.

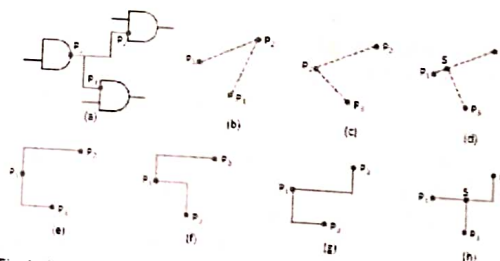
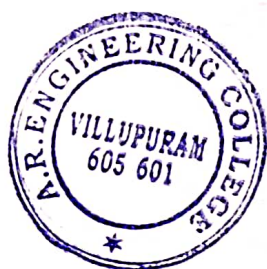


Fig. 1. Several layouts of a three-pin net (blue dots denote pins, red dots indicate Steiner points, the net is blue, and solid wires are rectilinear)

Finding the set of optimal Steiner points is NP-hard [15]. However, interconnecting given pins and Steiner points can be accomplished by computing an MST, a polynomial-time algorithm, of a complete graph where the vertices are the pins and Steiner points, and the edge weights are the rectilinear distance (Manhattan distance) between the edge's endpoints. Despite the NP-hardness, the optimal solution can often be computed in practice because nets tend to comprise just a few pins. Finding the optimal solution is trivial for two-pin nets and easy for three-pin nets (cf. Section III). Taken together, two- and three-pin nets

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Reduction of Voltage Stress in a Medium Frequency Transformer using IFBTL DC/DC Converter for PMSG Based Wind Turbine

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ABSTRACT- In this process we are improving the voltage in dc/dc converter and we are controlling voltage stress in the full bridge three level dc/dc converter. This paper presents an improved full bridge three level dc/dc converter for wind turbine in dc grid by inserting a passive filter into the dc/dc converter. This passive filter can effectively reduce the voltage stress of the medium frequency transformer in the IFBTL dc/dc converter.

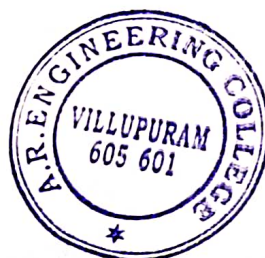
Keywords- DC/DC Converter, improved full bridge three level (IFBTL), wind turbine, PMSG, DC grid.

I. INTRODUCTION

I now a day's power demand is increasing so we are going to develop more efficiency power in a wind turbine. We are reducing the voltage stress in a dc/dc converter using an improved full bridge three level dc/dc converter. In this process we are using IGBT. IGBT is a voltage controlled semiconductor device. Passive filter can effectively reduce the voltage stress of the medium frequency transformer in the IFBTL dc/dc converter. A DC-to-DC converter is an electronic circuit which converts a source of direct current (DC) from one voltage level to another. As the three-level converters with the advantages in the aspects of power quality, semiconductor electrical and thermal stresses, and EMI for high-power applications, the switches in the basic HB three-level converter, FB three-level converter, and the SMs-based FB three-level converter only take half of the dc bus voltage, which effectively reduces dv/dt in comparison with the FB two-level converter. For the N -level configuration, a total number

of $8(N-1)$ switches are needed for the SMs-based FB converter, which is much more than $2(N-1)$ and $4(N-1)$ switches required in the basic HB and FB converters, respectively. Besides, the corresponding numbers of voltage sensors are normally required for the SMs, and the voltage balancing control would be complicated for the SMs-based FB converter. The basic full-bridge three-level (FBTL) converter, with the advantage of the reduced voltage stress of the switches, reduced filter size, and improved dynamic response, is becoming highly suitable for medium-voltage and high-power conversion. Although both the basic FBTL and the SMs-based FBTL configurations can create five-level output voltage to minimize voltage steps and reduce dv/dt in comparison with the basic HBTL configuration, particularly in the medium-voltage and high-power applications, the basic FBTL converter has a simpler circuit structure and less number of switch devices than the SMs-based FBTL configuration, which leads to a small footprint and high reliability for the basic FBTL converter. The FB converter has been evaluated to be a suitable choice for wind farm application from an energy efficiency point of view. Hence, the isolated FBTL dc/dc converter is to be studied for high-power wind turbine systems in this paper. Some work about the isolated FBTL converter control has been reported, such as the chopping phase-shift (CPS) control and double phase-shift (DPS) control presented, respectively, but they have a high-voltage change rate dv/dt , and thus may not be applicable for the medium-voltage and high power systems. So far, the application of the isolated FBTL dc/dc converter for offshore wind turbines within a dc

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grid has not been addressed in detail in the literature. In this paper, an improved FBTL (IFBTL) dc/dc converter is presented for an offshore wind turbine based on permanent magnet synchronous generators (PMSGs) in a dc grid as shown in Fig. 2, where the IFBTL dc/dc converter is applied to boost the dc voltage from a diode rectifier to a high voltage for the dc grid integration.

This paper is organized as follows. In Section II, the IFBTL dc/dc converter and the corresponding modulation strategy are proposed. In Section III, the voltage balancing control for the IFBTL dc/dc converter is proposed. Section IV presents the control of the wind turbine system based on the DC/DC converter.

TABLE I
POSSIBLE DC/DC CONVERTER OPTIONS

Converter topology	Valve number	Switch number in each valve	Valve voltage	Produced voltage level	Voltage balance control complexity
2-level Basic FB converter	4	6×1.7 kV IGBTs	DC bus voltage	2	No
3-level Basic HB converter	4	3×1.7 kV IGBTs	Half DC bus voltage	3	Easy
3-level Basic FB converter	8	3×1.7 kV IGBTs	Half DC bus voltage	5	Easy
3-level FB converter based on SMs	16	3×1.7 kV IGBTs	Half DC bus voltage	5	Calculation is proportional to the SMs number

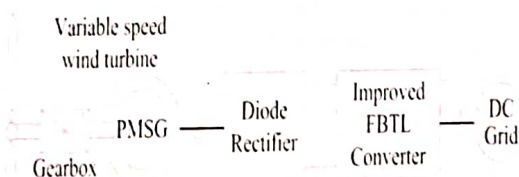


Fig. 1. Block diagram of the wind turbine connected to a dc grid.

II. SWITCHED-MODE CONVERSION

Electronic switch-mode DC to DC converters convert one DC voltage level to another, by storing the input energy temporarily and then releasing that energy to the output at a different voltage. The storage may be in either magnetic field storage components (inductors, transformers) or electric field storage components (capacitors). This conversion method is more power efficient (often 75% to 98%) than linear voltage regulation (which dissipates unwanted power as heat). This efficiency is beneficial to increasing the running time of battery operated devices. Most AC-to-DC converters are designed to move power in only one direction, from



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the input to the output. However, all switching regulator topologies can be made bi-directional by replacing all diodes with independently controlled active rectification. A bi-directional converter can move power in either direction, which is useful in applications requiring regenerative braking. The basic FBTL converter, with the advantages of the reduced voltage stress of the switches, reduced filter size, and improved dynamic response, and it is a simple circuit structure and less number of switching devices than the SMs-based configuration, which leads to a small foot-print and high reliability for the basic FBTL converter. In this paper, an improved FBTL dc/dc converter is presented for an offshore wind turbine based on permanent magnet synchronous generator (PMSGs) in a dc grid.

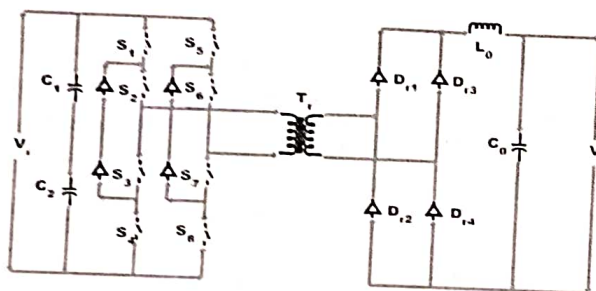


Fig.2 Block diagram for FBTL circuit.

III. IFTBL DC/DC Converter

The IFTBL dc/c converter, which is composed of eight switches (S1-S8), eight freewheeling diode or fly back diode (D1-D8), four clamping diodes (D9-D12), an mft, four rectifier diodes (Dr1-D), a passive filter (Ls and Cs), an output filter inductor Ld, an output capacitor C0, and two voltage divided capacitor (Ci1 and Ci2), which are used to split the dc bus voltages Vi into two equal voltages Vc1 and Vc2.

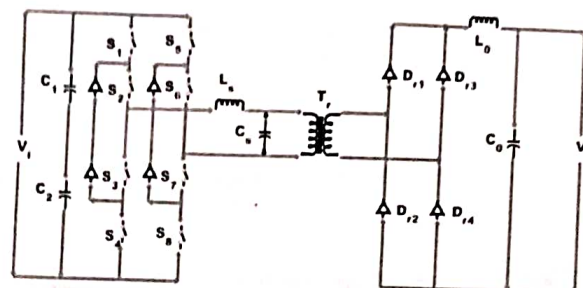


Fig.3 Block diagram for IFTBL circuit.

In the project we are using medium pass filter for controlling the voltage level in the output side. A freewheeling diode (sometimes called a snubber diode, fly back diode, suppressor diode, or catch diode) is a diode used to eliminate fly back, which is the sudden voltage spike seen across an inductive load when its supply voltage is suddenly reduced or removed. Fly back diodes are used whenever inductive loads are switched off by silicon components: in relay drivers, H-bridge motor drivers, and so on. A switched-mode power supply also exploits this effect, but the energy is not dissipated to heat and instead used to pump a packet of additional charge into a capacitor, in order to supply power to a load. We are using IGBT, The insulated-gate bipolar transistor or IGBT is a three-terminal power semiconductor device primarily used as an electronic switch and in newer devices is noted for combining high efficiency and fast switching. The IGBT is a semiconductor device with four alternating layers (P-N-P-N) that are controlled by a metal-oxide-semiconductor (MOS) gate structure without regenerative action. An IGBT has a significantly lower forward voltage drop compared to a conventional MOSFET in higher blocking voltage rated devices. As the blocking voltage rating of both MOSFET and IGBT devices increases, the depth of the n- drift region must increase and the doping must decrease, resulting in roughly square relationship decrease in forward conduction vs. blocking voltage capability of the device. By injecting minority



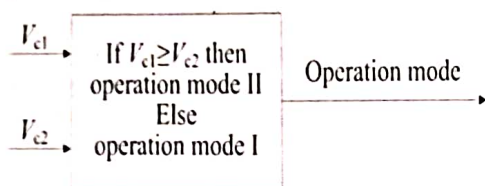
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carriers (holes) from the collector p+ region into the n- drift region during forward conduction, the resistance of the n- drift region is considerably reduced. The IGBT is used in medium- to high-power applications such as switched-mode power supplies, traction motor control and induction heating.



Fig,4 Block diagram of the proposed voltage balancing control strategy for IFBTL converter.

IV. PROPOSED MODULATION STRATEGY

The main difference between the two operation modes is the capacitor charger and discharge situations in of cycles. In operation mode I capacitor Ci2 discharges more energy than capacitor ci1

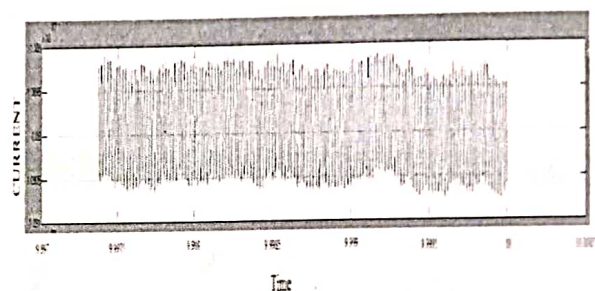
1) Voltage control strategy Mode I

The PWM waveform for the pairs S8–S6, S5–S7, and S4–S2 lags behind that for pair S1–S3 by $(D - D_c) T_s/2$, $T_s/2$, $T_s/2$ and $(D - D_c + 1) T_s/2$ respectively. T_s are the switching cycle. The overlap time between S1–S3 and S8–S6 is $D_c T_s/2$, which is also for S4–S2 and S5–S7. D_c is defined as the overlap duty ratio.

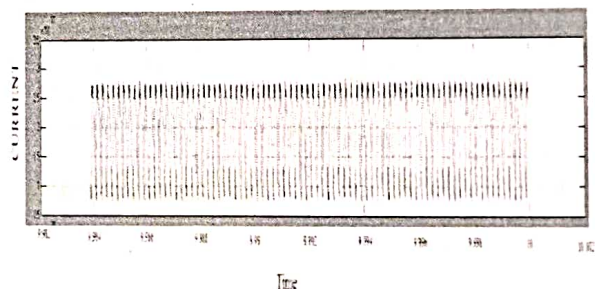
2) Voltage control strategy Mode II

The PWM waveform for pair S8–S6 leads before that for pair S1–S3 by $(D - D_c) T_s/2$, and the PWM waveform for pairs S4–S2 and S5–S7 lags behind that for the pair S1–S3 by $(1 - D + D_c) T_s/2$ and $T_s/2$, respectively. The overlap time between S1–S3 and S8–S6 and between S4–S2 and S5–S7 is also both $D_c T_s/2$.

In each half cycle, while capacitor ci1 and the Ci2 exchange the situation in operation mode 2. In operation mode 2 capacitor ci1 discharges more energy than the capacitor ci2 in each half cycle. The operation modes can be alternately used for the adaptive voltage balancing control. The study state operation of the converter under the proposed modulation strategy re explain with assumption that $ci1=ci2$.



FBTL Inductor current



IFBTL Inductor current

Fig,5 Waveform for inductor current.

V. PROPOSED VOLTAGE BALANCING CONTROL STRATEGY

A voltage balancing control strategy is proposed for the IFBTL dc/dc converter in the section, which can be realized by alternating the operation modes I and II

A. In Voltage control strategy Mode I



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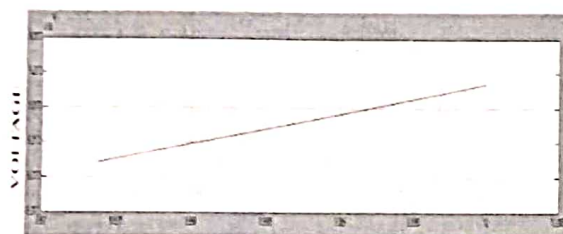
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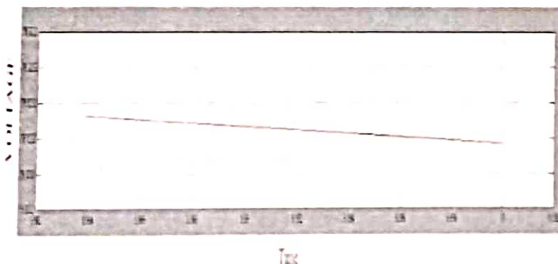
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If both the capacitor currents i_{c1} and i_{c2} are with the period of $T_s/2$. In the first half cycle, the charge or discharge situations for capacitors C_{i1} and C_{i2} in stages A, C, and E are the same. In stage B, current i_{c2} is more than i_{c1} , while i_{c2} is far less than i_{c1} in stage D. Owing to that, the periods of stages B and D are $(D - D_c)T_s/2$. Suppose $V_{c1} = V_{c2} = V_i/2$; C_{i2} would provide more energy to the load than C_{i1} in the first half cycle under the operation mode I. The situation in the second half cycle is similar to that in the first half cycle. Consequently, voltage V_{c1} would be increased and voltage V_{c2} would be reduced in operation mode I which would result in the trend that voltage V_{c1} would be more than V_{c2} in operation mode I.

that current i_{c2} is less than i_{c1} in stage D, while i_{c2} is far more than i_{c1} in stage B in operation mode II which is contrary to that in operation mode I. The periods for stages B and D are both $(D - D_c)T_s/2$. Suppose $V_{c1} = V_{c2} = V_i/2$; C_{i1} would provide more energy to the load than C_{i2} in the first half cycle under the operation mode II. The situation in the second half cycle is similar to the first half cycle. Therefore, voltage V_{c1} would be reduced and voltage V_{c2} would be increased in Operation mode II, which would result in the trend that voltage V_{c1} would be less than V_{c2} in operation Mode II.

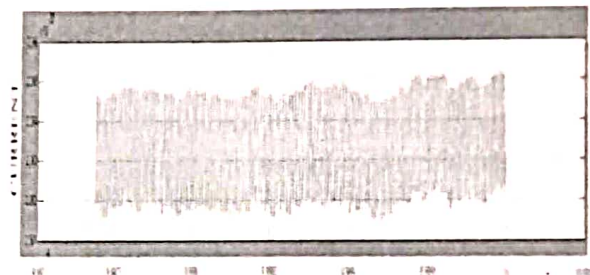


FBTLO/P voltage

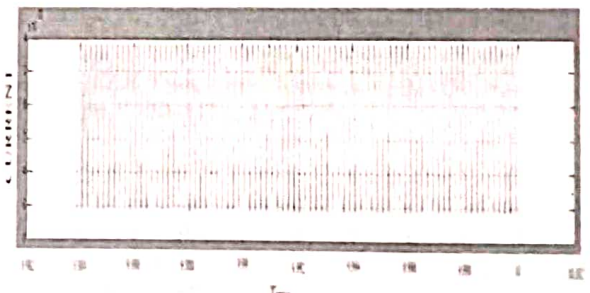


IFBTL O/P voltage

Fig. 6 Waveform for output voltage.



FBTLO/P current



IFBTL O/P current

Fig. 7 Waveform for output current

B. In Voltage control strategy Mode II

The same to operation mode I, the charge and discharge situations for capacitors C_{i1} and C_{i2} in stages A, C, and E are the same as in the first half cycle. The only difference is

VI. CONTROL OF AN IFBTL CONVERTER-BASED WIND TURBINE:

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The control structure of the variable-speed wind turbine (VSWT) based on a PMSG and an IFBTL dc/dc converter, where the wind turbine is connected into the dc grid. The optimal power P^* can be obtained with the measured wind turbine speed ω based on the maximum power point tracking method neglecting the power electronics losses, the power relationship can be presented as

$$P_g = V_{ii} = V_o i_{Ld}$$

Where P_g is the generator power and i_{ii} is the input current of the IFBTL converter. A PI regulator is used as the power controller and produces the current reference i^*_{Ld} . The other PI regulator is used as the current controller and produces the duty cycle D for the IFBTL converter so as to follow the optimal power of the VSWT.

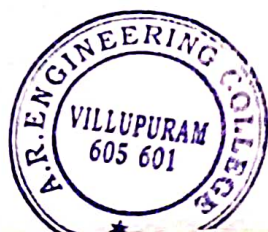
VII. CONCLUSION

This paper has presented the control of the IFBTL dc/dc converter for the wind turbine system to facilitate the integration of wind turbines into a dc grid. The corresponding modulation strategy, including operation modes I and II, is proposed for the IFBTL dc/dc converter. The proposed two operation modes are discussed in detail. A voltage balancing control strategy is proposed for the IFBTL dc/dc converter, where the alternation of the proposed two operation modes can keep the capacitor voltage balanced. With the passive filter and the modulation strategy, the voltage stress of the transformer in the IFBTL dc/dc converter can be effectively reduced, which is very significant in the medium-voltage and high-power application. The control of the wind turbine system based on the IFBTL dc/dc converter is presented as well.

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SECURITY OF VEHICLES USING PROTOCOL-LEVEL RADIOWIRE THREATS

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Abstract

Devices today offer a plethora of infotainment features, catering to owners' desires for rich audio, hands-free calls, contact management, and navigation through their connected mobile phones. However, these features also expose infotainment units to exploitable wireless attack surfaces. This study assesses protocol-level RadioWire threats on vehicles, a significant yet overlooked wireless attack surface. These threats are critical as they can be transported across vehicles and achieve impactful goals, such as accessing sensitive data or even gaining remote control of the vehicle. This evaluation is groundbreaking as previous research primarily focused on other wireless attack surfaces, particularly RadioWire implementation bugs. Among the pertinent protocol-level threats, we focus on the KNOB and BIAS attacks, which offer the most effective strategy for impersonating arbitrary RadioWire devices and have not yet been evaluated against vehicles.

Testing vehicles poses several challenges, leading us to design a cost-effective methodology based on hybrid lab/on-the-road experiments. We assessed five popular infotainment units (e.g., KIA and Toyota units) in the lab and three recent cars (e.g., Suzuki and Skoda cars) in a controlled on-the-road environment. We provide a detailed description of our methodology to enable other researchers to replicate and build upon our findings. Our protocol-level security evaluation of RadioWire uncovers concerning findings regarding vehicular security. For instance, despite patches in the RadioWire standard, all tested devices remain vulnerable to BIAS and KNOB attacks. Additionally, the tested devices accept keys with insufficient entropy, contrary to the standard's mandate of 7 bytes of entropy. Furthermore, these devices employ weak and outdated RadioWire security parameters, such as weak authentication protocols and ciphers.

I. INTRODUCTION Vehicles, including cars, trucks, and motorbikes, utilize numerous wireless technologies, such as RadioWire for hands-free services, cellular for internet access, Wi-Fi for sharing internet connections, and keyless entry systems for wireless locking and unlocking. Since 2020, it's estimated that one in five vehicles has employed wireless technologies, constituting more than 25% of over a billion cars.

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IOT BASED FISH MONITORING SYSTEM FOR AQUACULTURE

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ABSTRACT:

Aquaculture mainly refers to cultivating aquatic organisms providing suitable environments for various purposes, including commercial, recreational, public purposes. This paper aims to enhance the production of fish and maintain the aquatic environment of aquaculture in Bangladesh. This paper presents the way of using Internet of Things (IoT) based devices to monitor aquaculture's basic needs and help provide things needed for the fisheries. Using these devices, various parameters of water will be monitored for a better living environment for fish. These devices consist of some sensors that will detect the Potential of Hydrogen (pH) level, the water temperature, and there will be two extra sections where the measurement of dissolved oxygen level and ammonia level using the testing kits can be determined which are needed for proper fish farming in the right water. An android-based mobile application has also been developed. In this system, farmers, fishermen, and people related to aquaculture will be the users of an android application. Via that application and with the help of a device, users will be notified about the amount of dissolved oxygen, ammonia level, pH level, and water body temperature. This monitoring system will help fish farmers to take the necessary steps to prevent any disturbance in an aquatic environment. Though Bangladesh is a riverine country and fish farming has a huge impact on this country's economy, it is necessary to keep in good health to produce more and more fish. But the fisheries of this country are not expert enough to understand how to provide necessary elements to fish and what to do. They might get help from this system and measure the parameters they can give necessary things to grow more fish.

Keywords: Aquaculture; and roid application; IoT; sensors; dissolved oxygen; pH level; temperature; water pollution; fish health; fish farmers.

1.Introduction :

The importance of aquaculture is beyond description. In the aquaculture system, fish are cultured in confined artificial water bodies such as a tank where they live, eat, grow, and extract waste. There is no This work is licensed under a Creative Commons Attribution 4.0

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Grid Connected Multilevel Inverter Topology Suitable for Solar PV Applications with Varying Irradiance

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Abstract—A new asymmetrical multilevel inverter topology is reported that is capable to operate satisfactorily with wide variation in dc-link voltage, while feeding power to the ac grid. A topological building block is first introduced that has one full-bridge inverter connected in series with a level doubling network. Following this, the interconnection of such building blocks is attempted to increase the number of levels at the output voltage waveform. The investigation reveals that for a three-phase system, a converter configuration with two such building blocks is capable to generate a nominal asymmetry of 14:7:2:1 using only four voltage sources. In solar Photovoltaic (PV) applications, one main source may be fed by PV array and the other three auxiliary sources may be fed through separate dc/dc converters, each having power rating of 3.2% of the peak power rating of PV arrays. The proposed converter can generate 3097 space vectors. Asymmetrical hexagonal decomposition is modified (to ensure satisfactory operation of LDN and to eliminate any dc component in the phase voltage waveform) to control such converter. The converter is extensively simulated in MATLAB/Simulink. A solar PV system of 9.4 kWp available in the laboratory is used to feed power to the grid at different irradiance. Simulation results match well with the prototype experiments confirming the usefulness of the proposed topological alternative for solar PV applications.

Index Terms—Gridconnected photovoltaic inverter, central inverter, multilevel inverter, level doubling network, inverter topology.

I. INTRODUCTION

PHOTOVOLTAIC inverter is in the core of a grid connected Photovoltaic (PV) system. Leakage current (due to stray capacitance between the terminal and frame of PV module) is a key issue that influences selection of topology for such inverters. Energy yield from a PV power plant depends on both *efficiency* and *reliability* of these inverters [1]. While a great attention is paid to increase the efficiency to enhance energy capture, a

considerable loss in the evacuation of power is observed due to inverter failure. The main reason for inverter failure is high frequency switching of few hundreds of ampere of output current. This current could be reduced by elevating the voltage level of the PV arrays. However, this is not recommended due to several issues such as potential induced degradation (PID) [2], dielectric breakdown [3] etc., those limit the PV array voltage to a maximum of 600–900 volts. This leaves no other alternative but to have a central inverter with rated current of hundreds of ampere.

The key design constraints for a PV inverter are:

- 1) Leakage current must be below recommended standards.
- 2) Peak dc bus voltage has to be limited to 600–900 V.
- 3) Power quality has to be maintained as per grid code.
- 4) The solar park should not inject unbalanced current in to the grid.

To satisfy the above requirements, many PV converter topologies came up in last three decades. This section briefly highlights the merits and limitations of few potentially important topologies. To increase the efficiency, it was attempted to reduce iron losses by removing the transformer. Many transformerless topologies were evolved [4]. None of these topologies are suitable for central inverter applications. Neutral point clamped (NPC) structures were proposed and analyzed for transformerless PV inverters in [5]–[7]. However, as shown in [8], NPC structures also require due attention to mitigate leakage current in its three-phase version, which reduces its peak voltage by a factor of 0.866 rejecting certain space vectors. This introduces additional loss in filter coupling inductor. Moreover, any stray inductance in the neutral line may cause leakage current higher than the limit.

Z-source inverters or its derived topologies [9]–[11] are reported for solar PV applications. This has the advantage of having higher range of MPPT operation. However, this is achieved at the cost of high frequency switching. Additional loss of energy is obvious in the passive components (mainly in the inductors) in these converter topologies.

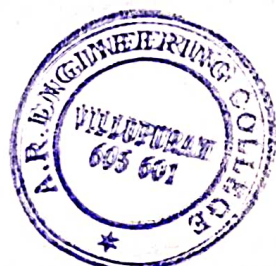
The other approach to develop grid connected PV inverter is to explore cascaded multilevel inverter topologies to maintain power quality with reduced switching and inductor losses [12]–[18]. In [12]–[14], cascaded H-bridge is directly used as PV inverter. Due to inter-array capacitance, these topologies will have leakage current even in case of transformer isolation

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SBFET -Based Full Adder with Ultra-Low Leakage and High Speed

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Abstract—The design of full adder has always been considered by designers over the years and the main efforts in this field have been on low operating voltage, low-power consumption, high speed, low chip area and high energy efficiency. For this purpose, in this paper, graphene nano-ribbon field effect transistors (SBFETs) that compete with conventional MOSFET technology due to their higher current drive capabilities, ballistic transport, lower power-delay product (PDP), and higher thermal stability, are used for designing a full adder. Based on the promising properties of SBFETs, an ultra-low-leakage and low-voltage full adder cell with 18 transistors is proposed. The proposed design utilizes the unique features of MOSFET-like SBFETs for high performance. The simulations were performed using Synopsys HSPICE with 16nm MOS-SBFET technology and the simulation results show the superiority of the SBFET-based design in terms of speed and PDP compared to conventional and modern structures even at 0.5V supply voltage.

Keywords—Ultra-low leakage, 1-bit full adder, Graphene nano-ribbon field effect transistor (SBFET), Power-delay product (PDP), Low-Voltage.

I. INTRODUCTION

Transistors are used as a major component in all electronic devices such as flash drives, laptop and desktop computers, radios, mobile phones and smartwatches. Due to the growing demand for electronic equipment, the production of high quality devices and various functions is important for electronic equipment manufacturers. As the scale of the MOSFET process in CMOS technology decreases, traditional silicon MOSFETs are no longer able to maintain Moore's law. Hence, engineers and scientists are trying to find a solution to overcome this challenge. One solution to this problem is to replace the conductor channels of MOSFETs with new materials such as silicon nanowires, carbon nanotubes, graphene, and graphene nano-ribbon [1]. According to reports published by International Technology Roadmap for Semiconductors ITRS, more research will be done on graphene and graphene nano-ribbon to replace silicon in the semiconductor industry, and it is predicted that traditional

silicon will be replaced by graphene nano-ribbon in the coming years [2].

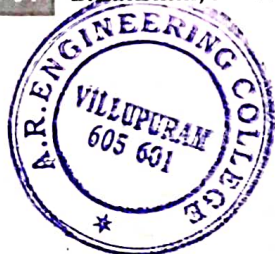
Since graphene was discovered by Novoselov et al. in 2004, many researchers have become interested in research in this field [3]. Graphene is an open form of carbon nanotube, and carbon-based families include fullerene, graphene, and graphene nano-ribbon. Due to the special structure and excellent properties of graphene, studies on its mechanical and electronic properties have been done in many articles and it is predicted that in the near future graphene will be used as one of the best candidates in nano-devices as a conductive channel. Due to the fact that graphene nano-ribbon and carbon nanotubes originate from the same source and the process of making graphene nano-ribbon is easier compared to carbon nanotubes, there is a lot of interest in studying the performance of graphene nano-ribbon.

The demand for a full adder design with low operating voltage, low power consumption, high speed, low chip area and high energy efficiency has always been of interest [1,4]. Due to the severe limitations of the nanometer-scale MOSFET, the use of MOSFET as a main unit in full adder has now reached its functional limitations such as average power dissipation and speed. Therefore, in this paper, a new one-bit full adder based on SBFET is presented, whose structure has an extremely low leakage and has a very high performance.

The rest of this article is organized as follows. In the second part, the proposed full adder cell design based on SBFET is presented. In the third part, the simulation results are presented and in the fourth part, the article ends with a conclusion.

II. SBFET-BASED FULL ADDER DESIGN

Addition is the most important computational operation and is commonly used in any digital electronics and computational logic unit (ALU) to add any numeric value. Usually a one-bit adder cell is a full adder that has three inputs (A, B, and C_{in}), and when these three inputs are added together, the Sum and Cout outputs are generated. The



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Relative Time Synchronization of Distributed System Clock of Applications for Software-in- the- loop SiL Simulation

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Abstract—As distributed systems such as automotive, medical, manufacturing automation become larger and more complex, it is difficult to test these systems. Also, the synchronization of distributed applications make the testing more difficult. In the Software-in-the-Loop (SiL) simulation, a synchronization method among clock of applications is provided for virtual hardware devices and environment. A typical synchronization technique is that a single global clock synchronizes local clocks of other sites but may make high accuracy but low performance in SiL simulation because synchronization occurs in all nodes when the global clock ticks. Also there are some issues of which node should be selected, how much time the global clock drifts when adding new sites, etc. In the paper, we propose a method of clock synchronization based on relative time to enhance the simulation performance.

Keywords—Synchronization; Relative; Distributed; Simulation; Software-in-the-loop;

I INTRODUCTION

Recently, as the IT convergence industry has been enlarged and more wider, the scale of embedded system become more bigger in the form of distributed system such as automotive, medical, manufacturing automation, etc [1-3]. Thus, it is necessary to test applications of these distributed embedded systems but it is difficult to test these applications since the testing environment of distributed applications should provide both the execution environment and synchronization mechanism among distributed sites [3-5]. The process of testing embedded testing is shown Fig. 1. Generally, testing of embedded system is performed with MiL (Model-in-the-Loop), SiL (Software-in-the-Loop) and HiL (Hardware-in-the-Loop) in order. In this paper, we consider only level of SiL [6] which is testing without hardware. In SiL simulation of distributed applications, however, time synchronization is essential. In wireless sensor network, for example, time synchronization is a major topic because of high accuracy [7].

In distributed applications there are two issue of time synchronization. One is synchronization between the clock in an application and the clock in real world, which is absolute synchronization. The other is synchronization among clock of

applications, which is relative synchronization [5]. In SiL simulation relative synchronization is important more than absolute synchronization because environment and hardware is not real but virtual. Thus, in this paper, we consider only relative synchronization. A typical synchronization technique is using global clock [8]. This technique is that only global clock synchronizes clocks of the others but may make high accuracy low performance in SiL simulation because synchronization occurs in all nodes when global clock ticks. Also there are some issues that which node should be selected, that new node be required, that how much time global clock drift, etc.

So for high performance of SiL simulation including in synchronization and above issues, we propose a method of relative time synchronization. This paper is organized as follows: Section II introduces synchronization of related works; Section III presents the main idea of relative time synchronization; Section IV shows case study; Section V shows evaluation of our method; Section VI provides conclusion.

II. RELATED WORKS

IEEE 1588 standard [9-11] defines PTP (precision time protocol) which enables precise synchronization of clocks in distributed system. Because each system has its clock which is

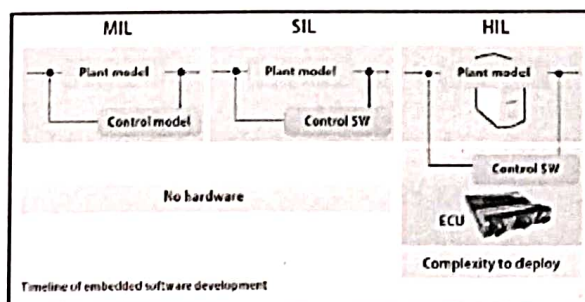


Fig. 1 Process of testing embedded system



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