

G/CET/318/2017-18, Dt. 19/04/2018

Email : erip_er@hqr.drdo.in
Tele : 011- 23017661
Fax : 011- 23017582

No. ERIP/ER/1504754/M/01/1719
Directorate of Extramural Research &
Intellectual Property Rights (ER&IPR)
Defence Res & Dev Orgn (DRDO)
DRDO Bhawan, Rajaji Marg
New Delhi-110 011



Dated: 2 Apr 2018

To Prof. S. Ramana Murthy
Professor
Department of Electronics and Communication Engg.
Geethanjali College of Engineering and Technology
Cheeryal (V), Keesara (M), RR District- 501 301
Telangana

To
Prof. S. Ramana
Murthy
Sik 9/19/18

Sub: Grants-in-Aid for research project titled "Development of Novel Carbon Nanotube/Polymer Nanocomposite Materials for EMI Applications".

Approval of the competent authority DG (TM) is hereby conveyed for a grant of **Rs. 45.81 Lakh** (Rupees Forty Five Lakh and Eighty One Thousand Only), to Geethanjali College of Engineering and Technology, Telangana, for pursuing the research on the subject titled project by Prof. S. Ramana Murthy, Professor, Department of Electronics and Communication Engg., Geethanjali College of Engineering and Technology, Cheeryal (V), Keesara (M), RR District- 501 301, Telangana, as Principal Investigator and Shri E. Rangacharulu of the same Institute as Co-Investigator.

2. The grant shall be spent as follows:

Expenditure on ↓ (Rs in lakh) during →	Year 1	Year 2	Year 3	Line Total
a) Staff : 01 JRF @ Rs. 25000/- pm + HRA @ 30%	3.90	3.90	3.90	11.70
b) Equipment (including spares thereof) Annex 'A'	22.52	-	-	22.52
c) Operation and maintenance	-	-	-	-
d) Expendables	2.00	2.50	2.50	7.00
e) Travel (Domestic)	0.50	0.50	0.50	1.50
f) Contingencies	0.40	0.40	0.25	1.05
g) Visiting faculty or Research Consultant	0.29	0.29	0.29	0.87
h) Procured services (other than (g)) and metered utilities	-	-	-	-
i) Institutional Overheads Charge @ 10% of (a)	0.78	0.39	-	1.17
Column Totals	30.39	7.98	7.44	45.81

Grand total: Rs. 45.81 Lakh (Rupees Forty Five Lakh and Eighty One Thousand Only).

- The project will last for **03 years** from the **date of release of the first installment by the PCDA (R&D)** and it will be governed by the terms and conditions given overleaf.
- The deliverables of the project are:-
 - An EMI shielding effectiveness (SE) upto 30 dB at the band range of 8.2-12.4 will be obtained for composites with 15%-20wt% SWCNT loading.
 - Single layer absorbers with different thickness will be designed, fabricated and tested for EM absorbing properties.
- This sanction issues in exercise of powers conferred to Sl. No. 3.1 of GOI Ministry of Defence letter No. DRDO/DBFA/FA/83226/M/01/2031/D (R&D) dated 30th July 2010.
- The release of funds will be authorized by Accounts Officer of the Directorate of ER&IPR.
- The expenditure is debitable to Major Head 2080 - Defence Services - Research & Development, Minor Head 004 - Research/Research & Development, Sub-Head (C)- Extramural Research (EMR) Code Head 852/06.
- This is issued with the concurrence of IFA(R&D) New Delhi vide their U.O. No. 1183/1557. Dated: 05.03.2018.
- The sanction code of ER&IPR is DG/TM/ERIPR/GIA/18-19/0408/001.
- Separate savings bank account to be maintained for the project.**
- Interest accrued to be refunded to DRDO through Demand Draft in favour of CDA (R&D), New Delhi.**

PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheeryal (V), Keesara (M), Medchal Dist. (R.R. Dist. 501 301)
(Sh. Anil Kumar Aggarwal)
Director

No. SR/FTP/ES-156/2014
SCIENCE & ENGINEERING RESEARCH BOARD (SERB)
(A Statutory Body of the Department of Science & Technology, Government of India)

5&5A, Lower Ground Floor,
Vasant Square Mall, Sector-B,
Pocket-5, Vasant Kunj,
New Delhi – 110070.
Dated: 23.10.2017

ORDER

Subject: Financial assistance for the Research Project entitled “*Investigation of Linear Combinations of GNSS Measurements to Mitigate the Effect of Ionosphere and Multipath*”.

PI: Dr. V. Satya Srinivas, Associate Professor, Electronics and Communication Engineering, Geethanjali College of Engineering and Technology, Cheeryal (V) Keesara (M), R. R. District, Telangana-501503, Hyderabad.

In continuation to the sanction order of even number dated 04.09.2015, Sanction of the SERB is accorded to the payment of **Rs. 2,50,000/- Only (Rupees Two Lakh Fifty Thousand Only)** under the recurring grant head to the **Principal, Geethanjali College of Engineering and Technology, Hyderabad** being the grant for the year 2017-18 for implementation of the said research project.

2. Sanction of the SERB is also accorded to the carry forward of the unspent balance of **Rs. 8,74,696/- (Rs. 7,51,140/- under non-recurring head and Rs. 1,23,556/- under recurring head)** under recurring head from the year 2015-16 to the current financial year 2016-17 (ex-post facto) for the same purpose for which it was sanctioned.

3. Sanction of the SERB is also accorded to the carry forward of the unspent balance of **Rs. 97,689/- under recurring head** from the year 2016-17 to the current financial year 2017-18 for the same purpose for which it was sanctioned.

4. The expenditure involved is debitable to

Fund for Science & Engineering Research (FSER)

This release is being made under **YSS- Earth and Atmospheric Sciences.**

5. The Sanction has been issued with the approval of the competent authority under delegated powers and vide Diary No. SERB/F/6971/2017-18 dated **20.10.2017**.

6. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

7. The total release amount of **Rs. 2,50,000/- (Rupees Two Lakh Fifty Thousand Only)** will be drawn by the Under Secretary of the SERB and will be disbursed to the “**Principal, Geethanjali College of Engineering and Technology, Hyderabad**” by means of RTGS transaction as per their Bank details given below:

Name of the Institute	Geethanjali College of Engineering and Technology (SERB)
Account Number	0606101558960
Bank Name, Branch	Canara Bank, Hyderabad ABID Road, Hyderabad, Telangana-500001
IFSC Code	CNRB0000606
PI's Email Address	sathyavemuri@gmail.com
Dr. Prahlad Ram, Scientist C	prahlad@serb.gov.in

Contd...-2-


PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.


RTGS/NEFT UTR/ TRANS No. - File No.- SR/FTP/ES-156/2014

Finance Wing, SERB <finance@serb.gov.in>
 To: sathyavemuri@gmail.com, info@gcet.edu.in
 Cc: "DR. PRAHLAD RAM,SCIENTIST-'C'" <prahlad@serb.gov.in>

9 February 2018 at 10:

Madam/Sir,

The below details are for Science & Engineering Research Board (SERB)Sanction Order (attached to this mail).

Sanction Order No	-	SR/FTP/ES-156/2014
Sanction Date	-	23-10-2017
PI Name	-	V SATYA SRINIVAS
Institute/University	-	GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
City Name	-	VALDLAMUDI
Account Number	-	0606101558960
Bank Name	-	Canara Bank
Branch Name	-	HYDERABAD ABID ROAD
Amount	-	₹250000
UTR No	-	UBINH18038229880 / SAA331151845
Transaction Date	-	07-02-2018

SERB Reference Number:

Bill No	-	GIA/7527
Diary No/Finance No	-	SERB/F/ 6971 /2017-2018

Confirmation of receipt of funds may be sent by email only.

IMPORTANT:

- SEPARATE Utilization Certificates (UCs)** for Recurring and Non-Recurring Grants (even if **DISBURSED BY SERB THROUGH ONE SANCTION ORDER** for your project) should be **sent directly** to the grant Sanctioning Authority by name (signatory of the sanction order) **within twelve months of the closure of the financial year in which the grants were released irrespective of whether the subsequent instalment of grant is due for release or not.**
- However, if any unspent balance is to be **refunded**, kindly ensure that the unutilized amount may be refunded immediately by way of an **a/c payee cheque/DD** drawn in favour of "**Fund for Science & Engineering Research**", payable at New Delhi and **forwarded to the undersigned at the address given below:**

Under Secretary

SCIENCE & ENGINEERING RESEARCH BOARD (SERB)
 (Established through an Act of Parliament: SERB ACT 2008
 Department of Science & Technology, Government of India)
 5&5A LGF,
 Vasant Square Mall,
 Vasant Kunj, New Delhi 110 070
 INDIA
 +91-9818223293-94
 +91-11-40000328, 352, 319, 349
 +91-11-40000329 Telefax

SERB: Making Good Ideas Work . . .

6971.pdf
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PRINCIPAL
 Geethanjali College of Engg. and Tech.
 Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.

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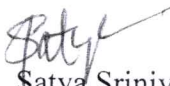
UTILISATION CERTIFICATE
[FOR THE FINANCIAL YEAR - 2017-18 (1st April 2017 to 31st MARCH 2018)]
(Recurring head)

1. Title of the Project/ Scheme: "Investigation of Linear Combinations of GNSS Measurements to Mitigate the Effect of Ionosphere and Multipath" under start up grant for young scientist scheme.
2. Name of the Institution: Geethanjali College of Engineering and Technology (GCET)
3. Name of the Principal Investigator: Dr. V. Satya Srinivas
4. Science & Engineering Research Board (SERB)
Sanction order No & date sanctioning the project: SR/FTP/ES-156/2014, dt: 4th Sept. 2015
(First financial sanction order)
5. Head of account as given in the original sanction order: B. Recurring Items (General):
 1. General A (Consumables, Contingencies, Travel-domestic).
 2. General B (Overhead Charges).
6. Amount brought forward from the previous Financial year quoting SERB letter no and date in which the authority to carry forward the said amount was given : i. Amount: **Rs.97,689/-**
ii. Letter No.: SR/FTP/ES-156/2014
iii. Date: 4th Sept. 2015
7. Amount received during the financial year (Please give SERB Sanction order no and date) : i. Amount: **Rs.2,50,000/-**
ii. Order No: SR/FTP/ES-156/2014
iii. Date: 23.10.2017
8. Interest earned : **Rs.1,216/-**
9. Total amount that was available for expenditure (excluding commitments) during the financial year (Sr. No. 6+7+8) : **Rs.3,48,905/-**
9. Actual Expenditure (excluding commitments) Incurred during the financial year (upto 31st March) : **Rs.3,20,172/-**
10. Balance amount available at the end of the financial year: **Rs.28,733/-**
11. Unspent balance refunded, if any (please give details of cheque no etc.): -Nil-
12. Amount to be carried forward to the next financial year (if applicable): **Rs.28,733/-**

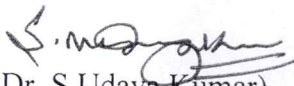

PRINCIPAL
 Geethanjali College of Engg. and Tech.
 Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.

UTILISATION CERTIFICATE
(Recurring head)


Certified that out of **Rs.2,50,000/- (Rupees Two Lakhs Fifty Thousand)** of grants-in-aid sanctioned during the year **2017-18** in favour of Geethanjali College of Engg. & Tech., vide SERB order No. **SR/FTP/ES-156/2014**, dated: 23rd October 2017 and **Rs.97,689/- (Rupees Ninety Seven Thousand Six Hundred and Eighty Nine)** on account of unspent balance of the previous year, **Rs.1,216/- (Rupees One Thousand Two Hundred and Sixteen)** earned as interest during FY.2017-18, and out of total available balance of **Rs.3,48,905/- (Rupees Three Lakhs Forty Eight Thousand Nine Hundred and Five)**, a sum of **Rs.3,20,172/- (Rupees Three Lakhs Twenty Thousand One Hundred and Seventy Two)** has been utilised for the purpose of execution of the project entitled "Investigation of Linear Combinations of GNSS Measurements to Mitigate the Effect of Ionosphere and Multipath" for which it was sanctioned and that the balance of **Rs.28,733/- (Twenty Eight Thousand Seven Hundred and Thirty Three)** remaining unutilised at the end of the year will be adjusted towards the grants-in-aid payable during the next year i.e. 2018-19.

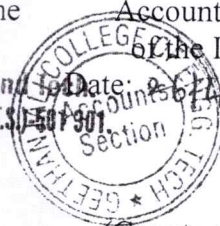

(Dr. V. Satya Srinivas)
Signature of PI

Date: 26/4/2018


(Dr. S. Udaya Kumar)
Signature of Head of the
Institute

PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheerl (V), Keesara (M), Medchal Dist.(T.S.)-501 301.


(B. Mallešham)
Accounts Officer
of the Institute

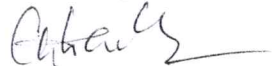


(Countersigned in SERB)

Signature:
Designation:
Date:

HARI BABU & ASSOCIATES
Chartered Accountants
Plot No. 10, Flat No: 20, AR. Residency,
Ravi Co-op Housing Society
Trimulgherry, Secunderabad - 500 015.
PH: 040 - 27741549

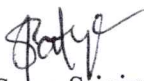
Auditor
For HARI BABU & ASSOCIATES
CHARTERED ACCOUNTANTS
Regn. No. 001064S


(Ch. HARI BABU) Partner
M. No. 022361

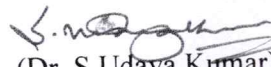

PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheerl (V), Keesara (M), Medchal Dist.(T.S.)-501 301.

UTILISATION CERTIFICATE
(Recurring head)

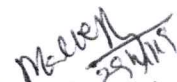
Certified that out of **Rs.1,50,000/- (Rupees One Lakh Fifty Thousand)** of grants-in-aid sanctioned during the year **2018-19** in favour of Geethanjali College of Engg. & Tech., vide SERB order No. **SR/FTP/ES-156/2014**, dated: **27th September 2018** and **Rs.28,733/- (Rupees Twenty Eight Thousand Seven Hundred and Thirty Three)** on account of unspent balance of the previous year, **Rs.3,559/- (Rupees Five Hundred and Fifty Nine)** earned as interest during FY.2018-19, and out of total available balance of **Rs. 1,82,292/- (Rupees One Lakh Eighty Two Thousand Two Hundred and Ninety Two)**, a sum of **Rs.1,83,051/- (Rupees One Lakh Eighty Three Thousand Fifty One)** has been utilised for the purpose of execution of the project entitled "Investigation of Linear Combinations of GNSS Measurements to Mitigate the Effect of Ionosphere and Multipath" for which it was sanctioned and that the balance of **Rs.-Nil-** (remaining unutilized at the end of the year will be adjusted towards the grants-in-aid payable during the next year i.e. 2019-20.


(Dr. V. Satya Srinivas)
Signature of PI

Date: 29/4/19



(Dr. S. Udaya Kumar)
Signature of Head of the
Institute

Geethanjali College of Engg. and Tech.
Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.
Date: 29/4/19


(B. Mallesham)
Accounts Officer
of the Institute

Date:

HARI BABU & ASSOCIATES
CHARTERED ACCOUNTANTS
Firm Regn. No. 022301


(Ch. HARI BABU) Partner
Auditor
M. No. 022301

Date: 30/4/19

UDIN No :-

19022361AAAAAD2782

(Countersigned in SERB)

Signature:

Designation:

Date:


PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.



Geethanjali

Phone : 9533791618
Fax : +91-40-24220320
Website : www.geethanjalinstitutions.com
info@gcet.edu.in

Geethanjali College of Engineering and Technology

AUTONOMOUS

(Accredited by NBA, Approved by AICTE, New Delhi)

Sy.No. 33 & 34, Cheeryal (V), Keesara (M), Medchal District. - 501 301.

No.GCET/ECE/R&D/SERB/2017

Date:6th September 2017

To
Dr. Umesh Kumar Sharma
Scientist-E
Earth and Atmospheric Sciences,
Science and Engineering Research Board (SERB),
5&5A, Lower Ground floor,
Vasant Square Mall, Sector-B, Pocket-5,
Vasant Kunj, New Delhi - 110070

Sub:- Request for release of 2nd installment of grant-Reg.

Ref1: DST Sanction Order No: SR/FTP/ES-156/2014, dt: 4th September 2015

Ref2: GCET/ECE/R&D/SERB/2017, dt:20th May 2017

Dear Sir,

With reference to the subject cited above, I enclosed herewith revised/corrected utilization certificate (Recurring Head) for your kind perusal. I request you to kindly release the second installment of grant. Kindly do the needful.

Thanking you,

Yours Sincerely,


Dr. V. Satya Srinivas

(Principal Investigator)



PRINCIPAL
Geethanjali College of Engg. and Tech.
Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.

Sponsored by TEJA EDUCATIONAL SOCIETY, HYDERABAD

Office : Sy. No. 33 & 34, Cheeryal (V), Keesara (M), Medchal Dist. - 501 301.

Phones : 9533791618, 7306295152


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Statement of Expenditure

(Period: 1st April 2017 to 31st March 2018)

Sr. No.	Sanctioned Heads	Total Funds Allocated (indicate sanctioned or revised)	Expenditure Incurred			Total Expenditure till 31 st March 2018	Balance as on 31 st March 2017	Requirement of Funds upto 31 st March 2018	Remarks (if any)
			1 st Year (23 rd Sep. 2015 to 31 st March 2016)	2 nd Year (1 st April 2016 to 31 st March 2017)	3 rd Year (1 st April 2017 to 31 st March 2018)				
(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)		
1.	Non-recurring (Capital Items) Equipments [GNSS Receiver, Work Station and Printer]	Rs.15,00,000/-	Rs.7,48,860/-	Rs.7,48,859/-	-NA-	Rs.14,97,719/-	-Nil-*	-Nil-	* Balance amount (Rs.2,281/-) return to SEB DST
2.	Recurring Items (General) General-A: (Consumables, Contingencies & Travel-domestic) General-B: (Overhead Charges) Total	Rs.3,50,000/- Rs.3,00,000/- Rs.21,50,000/-	Rs.40,679/- Rs.58,500/- Rs.8,48,039/-	Rs.36,962/- -Nil- Rs.7,85,821/-	Rs.78,672/- Rs.2,41,500/- Rs.3,20,172/-	Rs.1,56,313/- 3,00,000/- Rs.19,54,032/-	Rs.1,93,687/- -Nil- Rs.1,93,687/-	Rs.1,93,687/- -Nil- Rs.1,93,687/-	-Nil- -Nil- -Nil-

* Balance amount of Rs.2,281/- under head non-recurring has been returned to SERB DST (Canara Bank DD no.071504, dt:12/12/2017)


 (Dr. V. Satya Srinivas)
 Signature of PI
 Date: 26/4/2018


 (Dr. S. Udaya Kumar)
 Signature of Head of the Institute (with seal)
 Date: 26/4/2018
 Geethanjali College of Engg. and Tech.
 Cheerayal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.


 (B. Malleshham)
 Accounts Officer of the Institute
 Date: 26/4/2018
 Accounts Section
 Geethanjali College of Engg. and Tech.

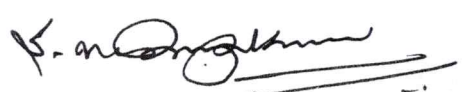

Auditor
 For HARI BABU & ASSOCIATES
 CHARTERED ACCOUNTANTS
 Firm Regn. No. 001066/S

 (Ch. HARI BABU) Partner
 M. No. 022301



Contract for Acquisition of Research Services (CARS)
 Signature of Authority identified at (11) below, DRDO hereby contract on the Profession Service Provider identified at (3), the provision of Professional Services described at (6), within the time stated at (8), for payments at (9.2), and subject to other conditions overleaf.

AMENDMENT - I

1. Title or DRDO's Research Service Qualitative Requirements (RSQR) "Design of solenoid magnet system for Backward Wave Oscillator"			2. CARS No. MTRDC/MMG/17111/LPO/134/18-19/BUP Dt.29.11.18			
3. R. S. Q. R. Document Ref. No. Nil, Dt. Nil	4. Date of issue			5. Issuing DRDO Lab/Estt./Project MTRDC, DRDO, Bangalore	6. CARS No. MTRDC/MMG/17111/LPO/134/18-19/BUP	
	Year 2018	Months 11	Date 29			7. Date of CARS 29.11.2018
8. Name and Address of RSP in CARS Name : Dr. R. S. Raju Designation: Professor Deptt. ECE and Dean, R&D, Geethanjali College of Engineering and Technology (GCET), Hyderabad						
This contract will be required a formal amendment if the following key professional are not available to RSP: Prof. R. S. Raju						
RSP is authorized to substitute/change/add key professionals/research consultants as follows: Principal technical features of Research Service to be provided by RSP (Annexure - A) DRDO will make available the following DRDO owned equipment to RSP : NA						
9. The Technical performance of this contract shall be completed when RSP submit the final report before (date) : 15 Months						
9.1	Estimated expenditure			Rs. in lakhs		
				Amount	Total Rs.	
a)	Personal Junior Research Fellow (JRF)/Project Assistant for one year			3.72	3.72	
b)	Equipment#			1.90	1.90	
c)	Others:			0.40	0.40	
	1. Expendables (consumables)					
	2. Travel + Conference :			0.6	0.6	
	3. Contingency :			0.4	0.4	
	Total			7.02	7.02	
	Overhead 15%			1.053	1.053	
	Grand Total			-	8.073	
Payment will be made within 45 days of receipt by L/E/P of contingency Bill						
10.	General conditions of CARS remain unchanged. Other specific conditions in CARS amended to read					
11.	RSP's Signatory to original contract:  Name : Dr Udaya Kumar Susarla Designation: Principal Date : January 29, 2020 PRINCIPAL Geethanjali College of Engg. and Tech. Cheeryal (V), Keesara (M), Medchal Dist.(T.S.)-501 301.			12. Signature of L/E/P contract administrator:  Name: डॉ. एस उमामहेश्वर रेड्डी Designation: Dr. S Umamaheswara Reddy Date: निदेशक / Director सूक्ष्मतरंग नलिका अनुसंधान तथा विकास केन्द्र Microwave Tube R&D Centre डी.आर.डी.ओ., रक्षा मंत्रालय DRDO, Ministry of Defence जालहल्ली, बेंगलूरु/Jalahalli, Bengaluru - 13		

TEJA EDUCATIONAL SOCIETY(GCET)
 Sub-Ledger Bio Electrical & Energy Systems Fee 01-04-2017 To 31-03-2018

Date Number	Voucher R.no	Cheq. No Amount	Account	Debit	Credit Narration
17-02-18	Jrn:884		* R & D Project Exp (DST & SERB)	300,000.00	Towards Paid for R&D Project Breif Review Exp
17-02-18	Pmt:3705	6111326	CANARA BANK-(OD-A/c.No:55580-TEJA)	150,000.00	Towards Paid for R&D Dept Project Expenses by college
			Total (Rupee)	150000	300000

TEJA EDUCATIONAL SOCIETY(GCET)
 Sub-Ledger Bio Electrical & Energy Systems Fee 01-04-2018 To 31-03-2019

Date Number	Voucher R.no	Cheq. No Amount	Account	Debit	Credit Narration
13-06-18	Jrn:135		TDS Payable	6,000.00	Towards TDS Deduct 2% (300000*2%)
13-06-18	Pmt:847	269311	SBH Bank -a/c(PGCET-62079625817)	144,000.00	Towards Paid for R& D Project Work Order balance amt-ALQPL1356F
26-02-19	Jrn:1116		R & D Project Exp (DST & SERB)	100,000.00	Towards Invoice No:GCET-003
08-03-19	Jrn:1074		TDS Payable	2,000.00	Towards TDS Deduct 2% (100000*2%)
08-03-19	Pmt:4302	829058	SBH Bank -a/c(PGCET-62079625817)	98,000.00	Towards Paid for Adv Payment
			Total (Rupee)	250,000.00	100,000.00

TEJA EDUCATIONAL SOCIETY(GCET)
 Sub-Ledger Bio Electrical & Energy Systems Fee 01-04-2019 To 31-03-2020

Date Number	Voucher R.no	Cheq. No Amount	Account	Debit	Credit Narration
09-08-19	Jrn:282		TDS Payable	4,000.00	Towards TDS Deduct 2% (200000*2%)
09-08-19	Pmt:1560	141195	CANARA BANK-(OD-A/c.No:55580-TEJA)	196,000.00	Towards Paid for R& D Project Purpose Adv Payment
16-09-19	Jrn:389		R & D Project Expenses	200,000.00	Towards Paid Invoice No:GCET-004
28-10-19	Jrn:509		TDS Payable	1,960.00	Towards TDS Deduct 2% (98000*2%)
28-10-19	Pmt:2436	756725	SBI Bank -a/c(PGCET-62079625817)	96,040.00	Towards Paid for R& D Project Purpose Balance Payment
27-12-19	Jrn:735		R & D Project Expenses	98,000.00	Towards Invoice No:GCET-004 Bill Date:19/08/19
			Total (Rupee)	298,000.00	298,000.00



AN IMPROVED DOARP ROUTING PROTOCOL FOR MOBILE AD HOC NETWORKS

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Abstract:

In lightweight hierarchical routing model, Way Point Routing Protocol (WPRP) nodes taken as the number of intermediate nodes for routing the waypoints and the route is separated into segments by the waypoints. Waypoints, including the source and the destination, run a high-level intersegment routing protocol (DSRP), while the nodes on each segment run a low-level intra segment routing protocol (AODVRP). One discrete advantage of proposed model depends on the mobility of a node in the route may out or fails, so instead of removal the whole actual route and discovering a novel route from the source to the destination, only the two waypoint nodes of the broken section have to find a new segment. In contrast, the ZRP and CGSR maintain hierarchies for existing hierarchical routing protocols for the complete network. We maintain initialization intended for WPRP to use DSRP and AODV. Hence it can view as DSRP over AODVRP that is DOARP routing protocol. The MANNET's are the set of radio enabled nodes in which it communicates with each other through broadcasting. There is a lack of infrastructure to organize and communicate to NWS because the dynamic configurations of MANETs, finds a recite from a source to a destination when might be very difficult. Most of the modern routing protocols works best based on or demand fashion. It includes the Ad hoc On-demand Distance Vector protocol (AODV) and dynamic Source Routing protocols (DSRP) are the two renowned on demand routing protocols for MANETs. It is combined into single hierarchical routing protocol and become two special cases of the proposed protocol. Again, one of the methodologies for DOARP is a multi destination route discovery. By using NS-3 tool these protocols were simulated and compared in terms of average control packets, average routing length, average packet delivery ratio and end to end delay.

Keywords: Routing Protocol; MANETs; NS-3.

1. Introduction

Ad-hoc networks have the ability to maintain networks at anytime, everywhere. MANETs typically a collection of moving nodes which forms a dynamic network temporarily without using existing centralized administration or already available network infrastructure. At this age of research focuses on mobile Ad-hoc networks. The routing protocol does a major role in two hosts or two senders or receivers which we want to send packets, thought it may not able to exchange messages directly. In Ad-hoc networks all the mobile nodes are to be connected dynamically in a random fashion. But all these mobile node of these networks acts as routers and be in a group to identify and maintain the routes for the other ad-hoc nodes in the mobile network. These scenarios become more complex if more mobile nodes are accelerated in the network. The ad-hoc nodes must be routed according to certain protocol and select the best route between the mobile nodes in order to optimize the bandwidth overhead and to enable for providing proper routing, so that it minimize the time required to converge after the topology changes.[1]

DETERMINATION OF RESOURCE USAGE CHARACTERISTICS FOR HADOOP MAP REDUCE TASKS

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ABSTRACT:

Hadoop is a common frame work used to process large amounts of data. It uses map reduce framework to divide the data and process it parallel on multiple nodes. Different jobs have different resource usages of CPU and IO and similarly different nodes have different loads. If resource usage of jobs and resource availability of nodes are considered in the decision of scheduling of multiple map and reduce tasks of different jobs, an optimized execution time can be obtained. It is more useful in cloud environment as map/reduce tasks execute on virtual machines in spite of physical machines. As parts of research conducted to build a dynamic scheduler for map reduce applications considering job and VM characteristics, this paper proposes a technique to study the job characteristic in terms of CPU and IO of usage.

Keywords: Hadoop, Big data, map reduce scheduler, Resource Manager

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Experimental analysis of image encryption using elgamal and block-substitution method for color images

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Abstract

This paper presents an encryption technique for color images. In this method byte code is extracted from the color image which is converted into binary data. Cipher text is generated by applying Block substitution encryption method on the obtained binary data. The effectiveness of the proposed method has been estimated by computing chi-square value. Obtained results show that the encryption method is suitable for both symmetric and asymmetric images of larger size.

Keywords: Image encryption, Block cipher, Byte code, Block substitution.

1. Introduction

The rapid growth of digital and multimedia data is developed and transmitted through the networks in science and technology,

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Temperature Field and Residual Stress of Butt Welding for IN182 Plate

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Abstract

The welding process is a nonlinear phenomenon in nature which leads to deformation and residual stresses in weldments. To overcome structural changes in the weldments the computational packages can be effectively used for analyzing the changes in its life. Inconel alloys have excellent mechanical properties and are used in the industrial applications. The present simulation is carried out for single pass butt-joint. Simulation studies are used for effective selection of process parameters for improving mechanical properties in weld structures. In this work, coupled thermo-mechanical simulation process was carried out for predicting the temperatures, distortion and residual stress distribution in the weldments using Finite element analysis at the transverse direction on the welded surface.

Keywords: GTAW welding process, Heat flux, FEA, Transient analysis, Residual stress.

Introduction

Welding is one of the important manufacturing process and Inconel materials are typically used in the manufacture of ships, automobiles, chemical industries, gas turbine components and aerospace etc. In weld structures, the weld residual stresses and distortions are caused due to the presence of localized heat in the weld beads. Distortion in weldments leads to inaccuracy in dimensions and causes difficulty during assemblies and increases the fabrication overheads. Changheui Jang et al[1] have reported the similar welding for understanding the behavior of microstructural and mechanical properties in the weldments. Welding process includes transient thermal heating and undergoes expansion and contraction, based on the physical properties of the materials. The welded components will be subjected to residual stresses and undergo distortion in the structures. The welding simulation of the butt joints with thermal history, residual stresses and distortion in weldment for similar and dissimilar weldings have been carried out in various zones in weld surface[2-3]. The similar joining of SS316 to IN182 was carried out to study the micro hardness and micro structural properties[4]. A three-dimensional model of the joint for tube-block with J-groove for austenitic stainless steel was simulated using Quick Welder software to understand the residual stress and distortions developed in multi-pass joints [5]. Welding of thin plate structures was simulated for distortions which cause an effect in the assembly of the structures. The welding distortion of weldments was estimated by simulation with two computational approach by a thermo-elastic-plastic finite element method and an elastic finite element method [6-7]. The two and three-dimensional welding simulations on stainless steel plate SUS304 by GTAW was carried out with ABAQUS finite element analysis for understanding the thermal behavior of the material transient condition that leads to residual stress in the simulated structures [8]. The welding simulation on stainless steels of

different grades have been reported with two and three-dimensional finite element models using the appropriate heat flux for laser beam and arc welding process to be aware of heat transfer and its response on distortion and residual stresses [9-10]. Simulation of welding of multipass pipe girth thick plate was investigated with two-dimensional axisymmetric model using finite element analysis for residual stress [11].

In this paper, thermo-mechanical analysis has been carried out for the temperature distribution and studied residual stress distribution with single pass butt welded joint of Inconel 182 alloys. The double ellipsoidal heat flux was used for simulation, which helps to optimise parameters for reducing the residual stresses in the weldments.

2. Finite Element Analysis

For the analysis, the thermal element SOLID 90[12] which is a higher order version of the three dimensional eight node thermal element SOLID70 and has 20 nodes with a single degree of freedom, temperature at each node is used. The 20-node elements have compatible temperature shapes and are well suited to model curved boundaries. If the model/containing this element is also to be analyzed structurally, the element should be replaced by the equivalent structural element. The geometry, node locations, and the coordinate system of the element are shown in Fig.1. Fig.2 shows the well known double ellipsoidal heat source model, which was proposed by Goldak[13] for three-dimensional numerical welding simulation for arc welding process. The temperature dependent thermal and mechanical properties are shown in Fig.3a and structural properties like yield strength, young modulus Poisson's ratio and thermal expansion are shown in Fig.3b.



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DESIGN OF FUZZY LOGIC CONTROLLER OF RESIDENTIAL ELECTRIC WATER HEATERS

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ABSTRACT:

With the impending deregulation of electric utility industry, customer satisfaction with utility services will be crucial. Utilities will need to place a greater emphasis on their customer's preferences and desires. This paper describes a fuzzy logic-based control strategy for shifting the average power demand of residential electric water heaters from period of high demand for electricity to off-peak periods. A minimum temperature for hot water, defined as customer comfort level, is used as a control variable. Water temperature is not allowed to fall below the minimum temperature set by the customer. Simulation result show that the proposed strategy can shift the average power demand of residential water heater to improve the load factor of residential load profile.

Key words: Fuzzy Logic control, mat lab tool box, Electric water Heater.

I. Introduction:

An Englishman Benjamin Maugham, in 1868 invented the first instant water heater called "The Geyser", a device where the water was heated as it flowed into the bath. They were known to be quite dangerous. Maughn's invention influenced the designs of a Norwegian mechanical engineer by the name of Edwin Ruud, who immigrated to Pittsburg. Ruud who invented the electric water heater (automatic storage) in 1889, founded the Ruud Manufacturing Company, which is still in operation today, and pioneered the advancement of water heaters, in both the residential and commercial market.

Population growth along with technological growth force the utility

companies to continue struggling to meet the ever-increasing need for electricity. With the majority of residents conforming to the 8 AM-5PM work schedule, the utility companies experience overwhelming demand peak associated with large amount of power being consumed at the same time. Complementing this effect are periods of low demand. Although over a period of time, the average amount of power consumed by community may be easily generated by a utility, that utility still has to provide enough generation to meet its highest power demand peak. It is in the best interest of the utility companies as well as the consumer to try to reduce these high peak demand periods and out their power demand profiles as much as possible.

One way this can be accomplished is by controlling residential electric water heaters. The Electric water heater accounts for the single largest contributor to the total power consumption of a residence. Existing electric water heater DSM (Demand-side management) strategies focus on on/off control of the water heater, where a group of heater are disabled during certain periods of time using a direct load control strategy [5]. When water heater are energized, they are either on consuming a fixed amount of power, i.e. 4.5kW, or they are off. The paper presents a fuzzy logic based variable power control strategy, where the power consumed by the water heater can be controlled based on the information available from the water heater such as water temperature, maximum and minimum water temperature allowed (or desired), and distribution level power demand. Based on the status of the above variables, the fuzzy controller will determine



NANO SCALED LIB/STATCOM FOR POWER QUALITY IMPROVEMENT IN A GRID INTERCONNECTED RES

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Abstract

The Renewable energy systems, particularly 'Wind Energy' development, showed its remarkable growth in the recent years, that can create pollution less and environment friendly atmosphere. The Nano Scaled Li-ion batteries are getting enormous attention as power sources and energy storage devices in Renewable energy system. Interconnecting the wind energy into the grid effects the power quality due to variable wind speed components. This paper shows the existence and mitigation of power quality problem due to installation of wind turbine with the grid i.e Harmonics. LIB plays critical role under clean energy system because it contribute for reduction of greenhouse gas emission. The performance of LIB is improved by developing high energy density electrode materials at Nano scale. A novel Nano Scaled LIB/STATCOM control scheme for grid connected wind Energy system has been developed using the MATLAB/SIMULINK to mitigate the power quality problems. In this the STATCOM is inputted by the Nano Scaled Li-Ion Battery Energy Storage system (LIB) it rapidly injects or absorbed reactive power to stabilize the grid system. Finally the results with LIB/ STATCOM, with STATCOM and without LIB and without LIB/STATCOM are compared and a mark reduction in total harmonic reduction is observed.

Keywords: LIB Li-ion battery energy storage; Nano Scale; PQ power quality; STATCOM;

I. INTRODUCTION

There is a current global need for clean and renewable energy sources where renewable energy sources can curb our need for fossil fuels. Fossil fuels are non-renewable and require finite resources, which are dwindling because of high cost and environmentally damaging retrieval techniques. So, the need for cheap and obtainable resources is greatly needed. The efficient and more feasible alternative option is solar, wind etc. Nano technology is the best tool for achieving breakthrough in Li-ion battery electrode material. In order to improve the performance of batteries it is desired to develop high energy density cathode materials using Nano materials. Now a day's Lead acid batteries have been used for solar electric systems but Li-ion offers higher energy density, longer cycle life, and no memory effect compared to lead acid batteries. [1]-[2]

A conventional STATCOM is a shunt-connected device which consists of a Voltage Source Inverter (VSI) and a dc capacitor. Since the dc capacitor is not a bulk energy storage device, the STATCOM does not have the ability of active power compensation. If an energy storage system, such as a Nano Scaled Li-ion battery, is connected to the dc capacitor, the power regulation ability of the STATCOM can be expanded to both reactive and active power compensation. The Active power control function can work faster than conventional synchronous generators and so, it has better performance. On the other hand, the reactive power control can enhance the power quality of

Novel Method for Loss Reduction and Voltage Profile Improvement with Multiple DGs

¹Azra Zaineb, ²J. Sridevi

Abstract — Distributed generation (DG) can be integrated into distribution systems to meet the increasing load demand. This paper discusses the sizing and siting issue of DG placement in radial distribution systems using novel method. The main objective of the work is to minimize the active and reactive power loss and enhance voltage profile of overall system. This paper presents a methodology for optimal distributed generation (DG) location and sizing in distribution systems. The main objective of the added DG units is minimizing the total electrical network losses with acceptable voltage profile. The effectiveness of the novel method has been successfully tested on IEEE 33 bus radial distribution system in ETAP software and the results are found to be in very good agreement.

Index Terms — Voltage profile, real power losses, reactive power losses, radial distribution system, distributed generation,

1 INTRODUCTION

The electric utility system is usually divided into three sub-systems which are generation, transmission, and distribution. The distribution system is commonly broken down into three components: distribution substation, distribution primary and secondary. At the substation level, the voltage is decreased and the power is distributed in smaller amounts to the customers. Consequently, one substation will supply many customers with power. Thus, the number of transmission lines in the distribution systems is many times that of the transmission systems. Furthermore, most customers are connected to only one of the three phases in the distribution system.

When you on the traditional power grid energy generation and distribution was relatively simple. The generator produced electricity at plant and the transmission system carried electricity from the plant to substations. At the substation, voltage was reduced and electricity continued to travel along the distribution system where transformers converted into voltage used by customer. At the customer site electricity passed through the meter which recorded usage as electricity was consumed. Energy flow was essentially one way. On a smart grid with distributed generation, energy can be generated close to the point of use and those who produce this power have the option to resell it to the utility [1],[2].

A generator is installed behind the metre to provide power. When this generator is not in operation power can be drawn from the grid. However, if there is an outage or when power prices peak, users can go off-grid and use a private generator to produce power. Solar, wind and thermal energy are renewable sources that can generate energy close to the point of use. Unlike major power stations, renewable energy resources can be installed in small increments and they have extremely low on-going costs. Though renewable energy resources are less predictable than the power generated by traditional means, hybrid systems can utilize both renewable and traditional power. With access to distributed generation re-

sources within a smart grid, utilities can configure the existing systems to meet peak power needs and diversify the range of energy resources to increase the reliability of energy flow [3],[4]. For customers distributed generation supports

- (i) Reduced energy costs
- (ii) Reduced reliance on fossil fuels and
- (iii) Increased use of renewable resources

Despite its relative unpredictability, renewable energy can fit with the load curve. For instance, in summer the sun produces high energy during the hardest part of the day when air conditioning is required, so solar energy is in affect converted into electric energy for cooling. Within the smart grid, integrated into the smart home and monitored by smart metering distributed generation is a new paradigm for energy distribution and use. For the first time energy flows to users as well as away from the users enabling utilities and their customers to work together to ensure that power is high quality, reliable, green and low cost.

Distribution systems hold a very significant position in the power system since it is the main point of link between bulk power and consumers. Effective planning of radial distribution network is required to meet the present growing domestic, industrial and commercial load day by day.

2 LOAD FLOW ANALYSIS

Consider a branch connected between buses 1 and 2 as shown in Fig. 1

HYBRID SIGNED DIGIT PARALLEL AND MULTI OPERAND BCD ADDERS

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June 25, 2018

Abstract

Decimal Arithmetic is having its own significance in many fields like commercial, financial, industrial and scientific applications. It plays a vital role in Floating point and Fixed point Decimal Processors. Adders and Multipliers are basic building blocks of any arithmetic unit. This paper presents a new method for the decimal signed digit addition based on the vinculum digit set $\{-5, 5\}$ where the delay associated with carry generation and propagation is significantly reduced. The proposed Hybrid signed digit adder, adds two N-digit operands using binary fast adders in parallel. The correction logic is parallel applied along with one previous stage hybrid carry. This reduced the critical path delay very significantly. Multi operand BCD addition up to 8 operands is successfully implemented using the above mentioned parallelism in binary tree method. The proposed multi-operand BCD adder is 3 times faster compared to the method proposed in Signed Digit Adder multi operand adder of [17]. All the designs are implemented in Verilog HDL and tested exhaustively on FPGA and cadence digital encounter tools 0.18m technology and the results show that the proposed

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EFFICIENT VEDIC SIGNED DIGIT DECIMAL ADDER

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ABSTRACT:

Decimal arithmetic is convenient for financial calculations and other database manipulations as compared to binary arithmetic. Research is still going on to have specialized decimal arithmetic hardware processing units to make these tasks more efficient in terms speed, power and hardware to supports these applications. In this paper, we propose a new approach to decimal addition that is simple in concept, appealing and efficient in terms of speed and hardware. The proposed decimal adder utilises a signed 2's complement vinculum representation of the decimal numbers. The design although generates a dual carry, i.e. a positive and a negative carry, analysis of the adder has revealed a much lower probability of carry generation as compared to the conventional decimal adder allowing the possibility of parallel decimal addition. The proposed VBCD adder is tested up to 16-digit on vertex 6 FPGA platform and also on 180 nm Cadence digital Encounter Tools

Keywords: BCD Adder, BCD Subtractor, Two's complement number system, Vinculum numbers

1. INTRODUCTION:

Decimal Arithmetic plays a very vital role in many financial, business and commercial applications for which binary arithmetic is not suitable. Thus in such systems the decimal hardware eliminates the need of internal binary conversions. From the last decade lot of research is going on decimal arithmetic [18] [14]. The literature available mostly concentrates on conversion of Decimal to Binary and from Binary to Decimal Numbers with Encoding and Decoding schemes like commonly available weighted and un-weighted codes, ASCII and EBIDIC codes [7] [17]. In recent literature there is a growing interest for computing Decimal arithmetic using Vedic mathematics [2] [19]. Our studies show that Vedic mathematics is a promising and emerging field for decimal arithmetic. Survey shows that faster and efficient arithmetic circuits can be designed using Vedic mathematics [8].

In this paper we have proposed a new method for decimal addition and subtraction using two's complement number system and Vedic vinculum number representation. Our simulation results indicate that this approach is viable and efficient. The synthesis results show a good amount improvement in speed.

The outline of the paper is arranged as follows. In Section 2 Vedic Vinculum number representation is explained with suitable examples. In Section 3 existing BCD Adder/Subtractor is given. In Section 4 Proposed Single digit VBCD Adder. In Section 5 Extension of VBCD Adder to 64 bit is proposed. Synthesis results are discussed in Section 6 and Conclusion with Future scope is provided in Section 7.

2. BASIC BACKGROUND ON VEDIC VINCULUM NUMBER REPRESENTATION:

It is a well-known and accepted fact that in ancient India (Vedic era) Vedic civilizations were known for being skilled in geometry, algebra and computational mathematics [8]. Even complex mathematical concepts like irrational numbers, calculus etc. was known to exist. They were studied and compiled by a Hindu scholar and mathematician, [Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaj] during the early part of the 20th century [8] [2] [19].

In this paper we have made an attempt to use the vinculum number representation to solve the problem of BCD Addition and Subtraction.

2.1 Vinculum Representation of Numbers

Vinculum number representation allows BCD digits to take values from -5 to 5. If a higher digit, say 7 occurs it has to be converted into $1\bar{3}$. This type of representation allows only smaller +ve and -ve digits and hence it significantly reduces the probability of carry generation as illustrated in the Section 6.

A NOVEL APPROACH TO THE LEARNING OF VINCULUM NUMBERS IN TWO'S COMPLIMENT METHOD FOR BCD ARITHMETIC OPERATIONS

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ABSTRACT: This paper proposes a new approach of representing decimal number system using Vinculum number representation. Vinculum number system consists of numerals 0,1,2,3,4,5 same as decimal number system and 6,7,8 and 9 are represented using negative numbers less than or equal to 5. Therefore Vinculum number system consists a set of numbers as {0, 1, 2, 3, 4, 5, -4, -3, -2, -1}. Hence complexity of higher order numerals like 6,7,8 and 9 are converted into less complex numbers. Vinculum is the Vedic method of representing decimal number system. Decimal numbers are representing in Binary Coded Decimal numbers for getting compatibility with Computer systems. Similarly we have used 2's complement number system for representing Vinculum numbers. This helped in representing signed Vinculum numbers. A unique set of tuples are represented in Vinculum number system which are suitable for any decimal arithmetic operation.

Keywords: Decimal numbers, BCD numbers, Vinculum numbers

Introduction:

Decimal Arithmetic plays a very vital role in many Finance, Business and Commercial Applications for which binary arithmetic is not suitable. From the last decade lot of research is going on decimal arithmetic and Decimal Floating point number systems [4][5]. The literature available mostly concentrates on conversion of Decimal to Binary and from Binary to Decimal numbers with various Encoding and Decoding schemes like weighted, non-weighted, Excess 3 code, Gray code etc. [1] [2] [4][6]. In recent literature there is a growing interest for computing Decimal arithmetic using Vedic mathematics [13]. The studies show that Vedic mathematics is a promising and emerging field for decimal arithmetic systems.

In this paper we have proposed a new method for decimal addition and subtraction using two's complement number system and Vedic vinculum method. Two's complement approach is normally used in binary addition and subtraction. To our knowledge very little literature is available on BCD Addition and Subtraction using Vedic mathematics. We have tried to investigate the use of 2's complement number system to represent vinculum numbers to solve the problem of BCD Addition and subtraction. Our Analysis shows that this

approach is viable and efficient. Theoretical analysis shows that the number of carry bits generated from one digit to other digit are very less when compare to conventional (decimal) number systems.

The outline of the paper is arranged as follows. In Section 2 Various forms of Binary number systems are presented. In Section 3 Decimal number system using vinculum method were explained and concepts of Vinculum numbers, its Algorithm with examples are discussed, in Section 4 and Conclusion with Future scope in Section 5.

2 Overview of Number systems:

All human beings are familiar with their regional languages but one number system is common which is nothing but Decimal number system. Computers does not understand the words and letters of various languages. All those are translated into numbers where computers talk and understand each other. Although we are comfortable with decimal number system a student or a mathematician must be aware of various number systems and their working principle and their conversions from one form to another in various aspects.

2.1 Digits:

Before numbers are converted from one number system to another, the digit of a number system must be understood. The first digit in any numbering system is always a zero. For example, a base 2 (binary) numbers contains 2 digits: 0 and 1, a base 8 (octal) numbers contains 8 digits: 0 through 7, a base 10 (decimal) numbers contains 10 digits 0 through 9, a base 16 (Hexa means six and decimal means 10) numbers contains 16 different digits: 0 through 9 and 10 to 15 in decimal is represented as A,B,C,D,E and F.

Once the digits of a number system are understood, larger numbers are constructed by using positional notation. As in decimal the position to the left of the units position was the tens position, the position to the left of the tens position was the hundreds position and so forth. Here, the units position has a weight of 10^0 , or 1; the tens position has a weight of 10^1 , or 10; and the hundreds position has a weight of 10^2 , or 100. The exponential powers of the positions are critical for



LOW POWER TEST PATTERN GENERATION USING TEST-PER-SCAN TECHNIQUE FOR BIST IMPLEMENTATION

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ABSTRACT

This paper introduces the function of test cases with minimal power for Built-In-Self-Test (BIST) implementation. This method intends Test-Per-Scan (TPS) based test cases using Multiple Single Input Change (MSIC) architecture. Multiple SIC patterns are developed by using EX-OR operation of twisted ring counter and test design algorithms like Linear Feedback Shift Register (LFSR), Bit-Swapping LFSR (BSLFSR), and Cellular Automata (CA). These patterns are used to a diminish number of transitions in the test patterns that are generated. The preferred method uses Test-Per-Scan technique for generating Multiple SIC test patterns. TPS diminished the power consumption during test mode. The seed generator used in TPS is modified LFSR's i.e., BS-LFSR, Cellular Automata (CA). BS-LFSR is composed of with an LFSR with a multiplexer. In CA, it also presents a variation on a BIST technique, which is from a one-dimensional cellular automaton; the pseudo random bit generator is generated. The proposed Hybrid Cellular Automata (HCA) using the rules 90 and 150 to generate the pseudo random designs. Moreover, the CA implementations illustrates properties of data compression like LFSRs and that they exhibit locally and with topological consistency significant attributes for a VLSI design. In this proposed method, LFSR is replaced with BS-LFSR, and HCA. Simulation and synthesis outcome with ISCAS c432 benchmark determine that Multiple SIC can reduce the power consumption.

Index Terms: BIST, MSIC, LFSR, BSLFSR, CA, HCA, circuit under test, test-per-scan, single input change, test response analyzer, pseudo random generator.

1. INTRODUCTION

Built-In-Self-Test scheme can adequately minimize the more complex VLSI analysis problems, by generating test hardware into the Circuit-Under-Test (CUT). The Linear Feedback Shift Register (LFSR) is generally exploited as Test Pattern Generators (TPGs) and Test Response Analyzers (TRAs) in traditional BIST technique. Amainsnag of these techniques is that the pseudorandom test cases produced by the LFSR causes a notably huge switching activity in the CUT, which can lead to enormous power dissipation and also blow the circuit and reduce the product yield. The LFSR generally requires very lengthy pseudorandom patterns in order to attain the required fault coverage in BIST implementation.

A. History work on BIST

There are a number of contrives that are used to generate design necessary for testing CUT. It has been founded that power consumption is more in test mode comparatively with normal mode [12]. The main idea behind low power techniques is to minimize the power consumption in test mode. Different kinds of test generation methods are required to develops table Built-In Self-Test (BIST) techniques. The utmost familiar test pattern design generation is based on pseudorandom pattern generators (PRPGs). The simple hardware on-chip test generation can be developed by pseudorandom tests patterns. Therefore, there are two major forms of PRPGs which is derived. Generally, the linear feedback shift registers and 1- Dimensional (1-D) Linear Hybrid Cellular Automata (LHCA) are major forms of PRPGs.

In spite of few coincidences, the series of states is consistently distinct between the LHCA and the LFSR, the LHCA can generates far good randomized test patterns [21]. The CA-based test generators will be an option to traditional LFSR algorithms. Further to meliorated randomization attributes, novel pseudorandom test design algorithms also have benefit in that they can be implemented for only contiguous neighbor communication and the physical length of the pattern generator. These can be elevated or diminished by only summate or deducting the cells. However, the investigation of aliasing function is a secondary controllable job for the CA than LFSR. The architecture in [7], presents Seeded Autonomous Circular Shift Register (SACSR) producing Single-Input-Change (SIC) patterns of maximum unique vectors. One of the ways to minimize power consumption is by reducing the transitions between the consequent patterns. Many techniques are introduced to minimize the transitions. The architecture in [3] presents Bit Swapping LFSR which is unlike from conventional LFSR reduces 33% of the transitions. BIST technique should generate test sequences with shallow power and area overhead and high fault coverage.

The architecture in [8] the introduced method has to decrease scan input bit transitions along operations of scan shifting. The architectures in [9], [11], [13] introduced various new techniques for reducing switching activities and also area overhead. The architecture in [2] introduces a new technique for generating the test designs with only single bit change compared with the previous patterns and generated using the XOR of the counter output with LFSR. The architecture in [5] power is



SHORT COMMUNICATION

Attenuation Effect as a Tool to Explain sp^3 Carbon ($-CH_2-$) is a Good Electron Insulator and a sp^2 Carbon ($-CH=CH-$) is a Good Electron Transmitter: An Undergraduate 1-h Chemistry Classroom Tutorial

R. Sanjeev¹ · R. Ravi² · V. Jagannadham³ Received: 15 March 2018 / Revised: 30 June 2018 / Accepted: 12 February 2019
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Abstract Physical basis of chemical reactivity in organic molecules was to determine the electronic effects which govern the rate of a reaction put forth by the substituents during the course of a given reaction. This is known as “*substituent effect*.” This concept was first developed by Hammett in the form of a linear free-energy relationship (LFER) popularly known as “*Hammett equation*.” This substituent effect would generally attenuate in an exponential manner as the distance between the reaction center and the substituent increases. This was developed by Williams (Free-energy relationships in organic and bioorganic chemistry, Royal Society of Chemistry, Cambridge, 2003) in the form of an empirical exponential equation. Using the Hammett equation and with help of Williams 2003 explanations on attenuation effect, we have tried to explain why a sp^3 carbon is a good σ -electron insulator and a sp^2 carbon is a good π -electron transmitter.

Keywords Hammett equation · Attenuation effect · Electron insulator and electron transmitter · Classroom tutorial

Introduction

The term “attenuation” in general implies that it is the exponential depletion of some property either physical or chemical with time, medium and distance. In this direction, study of the attenuation effect in aromatic [2, 3] and aliphatic systems [4] is a major breakthrough from our laboratory not reported earlier. The ultimate conclusion is the hybridization of carbon would eventually affect the magnitude of Hammett ρ in the carboxylic acid dissociation equilibria [2, 3]. Using the magnitude of Hammett ρ values of dissociation equilibria of homologous series of carboxylic acids, we have given a simple and lucid explanation for why sp^3 carbon ($-CH_2-$) is a good electron insulator and a sp^2 carbon ($-CH=CH-$) is a good electron transmitter.

Advance of the work in broad context All the scientists/professors who are involved in the research of studying the substituent effects (Linear Free-Energy Relationships) that is application of Hammett's equation will be interested in the outcome of this article. The outcome of this article will be useful for research students involved in the application of Hammett's equation and reaction mechanisms.

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Methods

All chemical structures were drawn using “Chemdraw” software.

Discussion

Hammett equation,

$$\log K_X/K_H = \rho\sigma \text{ or}$$

$$\log k_X/k_H = \rho\sigma$$

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The 'Yard Stick' to Interpret the Entropy of Activation in Chemical Kinetics: A Physical-Organic Chemistry Exercise

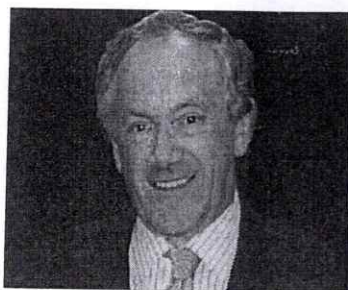
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Abstract No physical or physical-organic chemistry laboratory goes without a single instrument. To measure conductance we use conductometer, pH meter for measuring pH, colorimeter for absorbance, viscometer for viscosity, potentiometer for emf, polarimeter for angle of rotation, and several other instruments for different physical properties. But when it comes to the turn of thermodynamic or activation parameters, we don't have any meters. The only way to evaluate all the thermodynamic or activation parameters is the use of some empirical equations available in many physical chemistry text books. Most often it is very easy to interpret the enthalpy change and free energy change in thermodynamics and the corresponding activation parameters in chemical kinetics. When it comes to interpretation of change of entropy or change of entropy of activation, more often it frightens than enlightens a new teacher while teaching and the students while learning. The classical thermodynamic entropy change is well explained by Atkins [1] in terms of a sneeze in a busy street generates less additional disorder than the same sneeze in a quiet library (Figure 1) [2]. The two environments are analogues of high and low temperatures, respectively. In this article making use of Eyring equation a factor usually called 'universal factor' is derived and made use as a 'yard stick' to interpreting the change in entropy of activation for physical or physical-organic chemistry senior undergraduate and graduate students' class-room.



Peter Atkins



Figure 1.

Keywords: entropy, universal factor, kinetics

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1. Introduction

Thermodynamic properties like enthalpy, free energy and entropy of several thousands of organic and organometallic compounds were well documented and a very authoritative explanations and expert critical comments were offered [3,4]. As shown in the Figure 2, as an example taking any property ($X = G$ free energy, or H

enthalpy, or S entropy), thermodynamic and activation parameters could be distinguished between thermodynamics and kinetics. The nature of any property accompanied in chemical reactions in terms of energy considerations is nothing but an amalgamation of activation barrier (ΔX^\ddagger) and thermodynamic driving force (ΔX°). Marcus equation [5,6,7] is a successful treatise for treating kinetic data of electron transfer reactions to separate activation (ΔX^\ddagger) and thermodynamic quantities (ΔX°). The change in thermodynamic quantities could be interpreted in terms of



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Cooxidation not to be Confused with Catalysis: A Chemical Education Article to Physical-organic Chemists

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ABSTRACT

Two substrates (A) and (B) are oxidized separately by an oxidant (Oxi) with the rate constants k_1 and k_2 and they are oxidized taken together (A + B) under similar conditions with a rate constant k_3 , if the value of $k_3 = (k_1 + k_2)$, then it is said to be an example of two reactions "going parallel". If the value of $k_3 \gg \gg (k_1 + k_2)$, then the redox process is termed as "co-oxidation" (Hasan and Rocek 1972, *JACS*). In this process in the mixture the two substrates are oxidized synchronously by a direct three electron transfer route if the oxidant happens to be Cr(VI) and by a direct four electron transfer route if the oxidant happens to be Mn(VII) (Jagannadham *et al.*, 1986, *Oxidation Communications*). It was realized that the essential condition of the synchronous oxidation of two substrates A and B is that one substrate must have two functional groups and the other must have one functional group or vice-versa. The compound with two functional groups must be a good chelating agent with the metal ion oxidant. A substrate (A) is oxidized by an oxidant (Oxi) with a rate constant k_4 and is oxidized in presence of a catalyst (Cat) with a rate constant k_5 , if $k_5 > k_4$ the redox process is termed as "catalyzed process". It is to be noted that in the catalytic process the catalyst (Cat) is not oxidized and its concentration does not change during the reaction. It only increases the rate of oxidation with lower activation energies. If $k_5 = k_4$ it is to be understood that there is "no catalysis". If $k_5 < k_4$ it is to be understood that the catalyst is called a negative catalyst or "inhibitor" and the reaction goes with higher activation energy. In this paper a lucid description is given for the two processes "co-oxidation" and "catalysis" with putative examples.

Keyword: Cooxidation, Catalysis, Chemical education.

INTRODUCTION

Hasan and Rocek were the first to report a direct synchronous three electron oxidation

process where in isopropyl alcohol and oxalic acids were oxidized¹. Later several publications appeared from his laboratory²⁻¹⁸. Sequel to Rocek's discovery¹ of one step three electron oxidations several



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17-18-(16)

A Class Of Univalent Analytic Functions With Fixed Second And Third Coefficients

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Abstract: In this paper we defined a new class of univalent and analytic functions with fixed second and third Taylor coefficients. Coefficient condition, starlikeness and convexity, extreme points, growth and distortion properties for this class are investigated.

Index Terms – Univalent function

I. INTRODUCTION

Let S be the class of functions of the form $f(z) = z + \sum_{n=2}^{\infty} a_n z^n$ that are analytic and univalent in the unit disk $U = \{z \in \mathbb{C} : |z| < 1\}$. Let T be the subclass of functions of S which are of the form

$$f(z) = z - \sum_{n=2}^{\infty} a_n z^n, \quad a_n \geq 0, \quad n = 2, 3, \dots \quad (1)$$

in U and C be the subclass of functions of T which are convex in U . We have $f \in C$ if and only if $zf' \in T$.

Now we introduce a subclass $T(b, c, B_n) \subseteq T$ by fixing a_2 and a_3 , for $0 \leq b \leq \frac{1}{4}$, $0 \leq c \leq \frac{1}{12}$ and $B_n \geq n(n+1)$ for $n \geq 2$,

$$T(b, c, B_n) = \{f(z) \in T : f(z) = z - bz^2 - cz^3 - \sum_{n=4}^{\infty} a_n z^n, \sum_{n=3}^{\infty} B_n a_{n+1} \leq 2b - cB_2\}.$$

Let $C(b, c, B_n)$ be a subclass of functions of $T(b, c, B_n)$ which is convex in U .

This paper consists of two sections. In section 1, we find the coefficient conditions for starlikeness and convexity of the class $T(b, c, B_n)$. In section 2 we find extreme points, growth and distortion properties for the class $T(b, c, B_n)$.

SECTION 1

We need the following definitions from [1].

Definition 1: [1] A function $f(z) \in S$ is said to be starlike of order α ($0 \leq \alpha < 1$) in U , if it satisfies the inequality $\operatorname{Re} \left[\frac{zf'(z)}{f(z)} \right] > \alpha$ for $z \in U$. The class of starlike functions of order α is denoted by $S^*(\alpha)$.

Definition 2: [1] A function $f(z) \in S$ is said to be convex of order α ($0 \leq \alpha < 1$) in U , if it satisfies the inequality $\operatorname{Re} \left[1 + \frac{zf''(z)}{f'(z)} \right] > \alpha$ for $z \in U$. The class of convex functions of order α is denoted by $C^*(\alpha)$.

We have $f \in C^*(\alpha)$ if and only if $zf' \in S^*(\alpha)$.

We start with a coefficient characterization for the functions of T to be in the class $T(b, c, B_n)$.

Theorem-1

The function $f(z) = z - bz^2 - cz^3 - \sum_{n=4}^{\infty} a_n z^n$, $z \in U$ is in the class $T(b, c, B_n)$ if and only if $\sum_{n=3}^{\infty} n(n+1) a_{n+1} \leq 2b - 6c$. The result is sharp.

Proof: If $f(z) = z - bz^2 - cz^3 - \sum_{n=4}^{\infty} a_n z^n$, $z \in U$ belongs to the class $T(b, c, B_n)$,

Then by the definition, we have $\sum_{n=3}^{\infty} B_n a_{n+1} \leq 2b - cB_2$

This gives $\sum_{n=3}^{\infty} n(n+1) a_{n+1} \leq 2b - cB_2$
 or $\sum_{n=3}^{\infty} n(n+1) a_{n+1} \leq 2b - c \cdot 2.3$

this shows $\sum_{n=3}^{\infty} n(n+1) a_{n+1} \leq 2b - 6c$ (2)

Now, suppose that $\sum_{n=3}^{\infty} n(n+1) a_{n+1} \leq 2b - 6c$

Then $\sum_{n=2}^{\infty} n a_n \leq 1$.

Therefore $f(z) \in T$ by [3].

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Crystallization and Dielectric Properties of PbTiO_3 based Glass Ceramics

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Abstract. Glass samples with composition $(50 - X) \text{PbO} - (25 + X) \text{TiO}_2 - 25 \text{B}_2\text{O}_3$ (where $X = 0, 5, 10$ and 12.5 mol %) were prepared using conventional quenching technique. These glass samples were converted to glass ceramics by following two stage heat treatment schedule. The XRD results in the glass ceramics revealed the formation of tetragonal lead titanate as a major crystalline phase. The SEM results show rounded crystallite of lead titanate. The ferroelectric nature of all the glass ceramic samples is confirmed by P - E hysteresis measurements. The extended heat treatment of glass ceramic samples at 593K for 10 h exhibited saturated hysteresis loops with higher values of remnant polarization.

1. INTRODUCTION

Glass ceramics are polycrystalline solids prepared by controlled crystallization of glasses. Crystallization is accomplished by subjecting suitable glasses to a carefully regulated heat treatment schedule which results in nucleation and growth of crystal phases within the glasses. This method of making a ceramic material represents a radical departure from conventional ceramic preparation processes and it offers a number of important advantages. Since molten glass can be obtained in a homogeneous condition, uniformity of chemical composition can easily be achieved for glass ceramics. The homogeneity of the parent glass together with the controlled manner in which the crystals are developed results in glass ceramic (gc) materials having a very fine grained uniform structure free from porosity. The other unique characteristics, such as no ageing or depoling problems and good stability at high temperature, high-pressure and in harsh environments, make glass ceramics attractive for use in variety of applications. Realizing the advantages of the glass ceramic process, several attempts have been made to produce glass ceramics having high permittivity, low dielectric loss, high electrical resistance and high dielectric breakdown strength by precipitating various ferroelectric phases were crystallized. Prominently these phases are BaTiO_3 , LiTaO_3 , NaNbO_3 , $\text{Pb}_3\text{GeO}_{11}$, LiNbO_3 , SrTiO_3 , KNbO_3 , KNN , PZT and PbTiO_3 . The main emphasis in these investigations was on the study of dielectric and electro optic properties as a function of composition, heat treatment and grain size.

However, the systematic study of crystallization and dielectric properties of PbTiO_3 based glass ceramics has not been reported so far. Hence, in the present work the content of TiO_2 was increased by decreasing PbO content and the glass former (B_2O_3) content was kept fixed with an idea to restrict the volume fraction of residual glass phase and to improve crystallization, dielectric and ferroelectric properties of PbTiO_3 based glass ceramics.

2. EXPERIMENTAL

Glasses with composition $(50-X) \text{PbO} - (25+X) \text{TiO}_2 - 25 \text{B}_2\text{O}_3$ (where $X = 0, 5, 10$ and 15 mol %) were prepared from the high purity ingredients heated in an alumina crucibles at 1373 K-1523 K for 1h. The melt was homogenized by stirring it before quenching into aluminium mould at room temperature. The resultant glass

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Structural, Magnetic and Magnetoreactance Studies In $\text{NiFe}_{2-x}\text{R}_x\text{O}_4$ ($x = 0, 0.05$; $\text{R} = \text{Y, Yb and Lu}$)

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Abstract. Structural, magnetic and magnetoreactance (*mr*) properties of $\text{NiFe}_{2-x}\text{R}_x\text{O}_4$ ($x = 0, 0.05$; $\text{R} = \text{Y, Yb and Lu}$) compounds were investigated and the results are discussed and presented in this paper. Rietveld refined X-ray diffraction (XRD) patterns and Raman spectroscopy revealed the cubic inverse spinel phase for all the compounds investigated. The former also identified small amounts of RFeO_3 as the secondary phase. Lattice constant values were increased upon partial substitution of Fe^{3+} by R^{3+} ($\text{R} = \text{Y, Yb and Lu}$). Magnetization measurements revealed that the magnetic moment of R^{3+} ($\text{R} = \text{Y, Yb and Lu}$) substituted compounds decreased compared with NiFe_2O_4 . *mr* was measured at 3 kHz and 3 MHz both longitudinal (*LT*) and transverse (*TR*) configuration. A maximum *mr* of 54 % was observed in Y^{3+} substituted NiFe_2O_4 in *TR* mode.

I. INTRODUCTION

Giant Magnetoimpedance (*GMI*) effect is the change in impedance of a ferromagnetic material with the application of a dc magnetic field and is defined as, $MI = \left[\frac{Z(H) - Z(H_{max})}{Z(H_{max})} \right] \times 100$. The *GMI* effect is observed in wires, ribbons, tubes and thin films [1]. Small and negative magnetostriction has been reported to lead to large *MI* values [1-3]. Recently *MI* has been reported in Mn-Zn ferrite at different frequencies and has a maximum value of 61.2 % at 4 MHz [4]. Many researchers have reported *MI* in perovskites [5]. Since ferrites are insulators, change in the reactive part of the impedance rather than the skin effect gives rise to the *MI* in ferrites which is nothing but magnetoreactance (*mr*), $mr = \left[\frac{X(H) - X(H_{max})}{X(H_{max})} \right] \times 100$.

In the present investigations, R^{3+} ($\text{R} = \text{Y, Yb and Lu}$) was chosen to partially substitute the lighter and smaller Fe^{3+} (ionic radius of $\text{Fe}^{3+} = 0.63 \text{ \AA}$ and that of $\text{Y}^{3+} = 0.89 \text{ \AA}$, $\text{Yb}^{3+} = 0.86 \text{ \AA}$ and $\text{Lu}^{3+} = 0.85 \text{ \AA}$). In this paper, structural, magnetic, and magnetoreactance properties of $\text{NiFe}_{2-x}\text{R}_x\text{O}_4$ ($x = 0, 0.05$; $\text{R} = \text{Y, Yb and Lu}$) compounds are reported.

II. EXPERIMENTAL DETAILS

The starting materials NiO (99.96 %), Fe_2O_3 , Y_2O_3 , Lu_2O_3 and Yb_2O_3 (99.99 %) are used to prepare polycrystalline $\text{NiFe}_{2-x}\text{R}_x\text{O}_4$ ($x = 0, 0.05$; $\text{R} = \text{Y, Yb and Lu}$) compounds, by solid state reaction method. The powders of the starting materials were taken in stoichiometric ratios and ground in an agate mortar and pestle for 3 h and were heat treated in air at 1200 °C for 12 h. The phase formation of the samples was confirmed by powder X-ray diffraction (XRD) technique using a PANalytical (X'pert PRO) X-ray diffractometer employing Cu K_α radiation. Rietveld refinement was carried out using the GSAS program with EXPUGI interface. Raman active vibrational

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Dielectric and Impedance Properties of $\text{NiFe}_{1.95}\text{R}_{0.05}\text{O}_4$ (R = Y, Yb and Lu)

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Abstract. The dielectric and impedance spectroscopic properties of $\text{NiFe}_{1.95}\text{R}_{0.05}\text{O}_4$ (R = Y, Yb and Lu) were investigated. The materials were prepared by solid state reaction and crystallized in the cubic inverse spinel phase with a very small amount additional phase of RFeO_3 (R = Y, Yb and Lu) as secondary phase. The scanning electron micrograph images clearly show grains (~2 μm) which are separated by thin grain boundaries. The presence of all elements were confirmed by the energy dispersive X-ray elemental mapping. The frequency variation of ϵ' shows the dispersion, following the Koop's phenomenological theory, which considers the dielectric structure as an inhomogeneous medium of two-layers of the Maxwell-Wagner type. Impedance spectroscopic analysis indicates the different relaxation mechanisms, which corresponds to bulk grain and grain-boundaries. Their contributions to the electrical conductivity and capacitance of these materials were discussed in detailed.

I. INTRODUCTION

Ferrite materials have wide range of applications in the fields of electronics, optoelectronics, magnetics and magnetoelectronics due to their high saturation magnetization, large permeability, low eddy current losses and high electrical resistivity. Nickel ferrite crystallizes in inverse spinel structure and is a centro-symmetric magnetic material. Substitution of rare earth ion into the spinel structure has been reported to induce structural distortion and strains in the material [1]. Y, Yb and Lu doped NiFe_2O_4 have been prepared and their structural, dielectric and impedance spectroscopic properties were investigated. The objective of the this work is to study the bulk and interface phenomena over a wide range of frequencies in order to obtain information about the relaxation times present in these materials. The results obtained on the Y, Yb and Lu substituted Ni ferrites are presented and discussed in this paper.

II. EXPERIMENTAL DETAILS

The materials were prepared using the solid state reaction method. Powders of starting materials were NiO (99.96% pure), Fe_2O_3 , Y_2O_3 , Yb_2O_3 and Lu_2O_3 (all 99.99% pure) were ground in a agate mortar and pestle for 3 h and the mixtures were heat treated in air at 1200 °C for 12 h. Surface morphology was studied using scanning electron microscope (Model: Quanta 200) attached with energy dispersive X-ray (EDAX) equipment (for elemental analysis) along with Back Scattered Electron (BSE) imaging. The powders made into pellets, then sintered at 1330°C in air for 24 h, ensuring 95% densification and used for electrical measurements. Dielectric and impedance measurements were carried out employing 'Novocontrol Alpha broad dielectric analyzer'. Highly conducting silver paste was applied on both sides of the pellet and dried before the impedance and dielectric measurements.

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Behavior of Organic Compounds with Different Functional Groups based on Surface Tension, Ramsey-Shields-EÖTVÖS Constants (k), Order of Association (x) and Trouton's Rule

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Abstract

Hydrocarbons and organic compounds having different functional groups with hetero atoms have shown a discriminative behavior toward surface tension, EÖTVÖS constants (k), order of association (x) and Trouton's rule. This was explained in terms of associative and non-associative behavior of these compounds.



Article History

Received: 20 May 2018

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Keywords:

Taft equation, Eötvös Constant, Ramsay-Shields equation, Trouton's rule, Order of Association, Hydrogen Bond Donor-Acceptor Sites (H_{ad}).

Introduction

Study on associative properties of aliphatic alcohols¹, aliphatic carboxylic acids², phenols³, and aliphatic amines⁴ based on their surface tension data, EÖTVÖS constants (k), order of association (x) and Trouton's rule is a major breakthrough from our laboratory hither to not reported earlier in literature. In the present study, various compounds like hydrocarbons, and compounds having different functional groups with different hetero atoms were

taken to see the effect of these groups on surface tension, EÖTVÖS constants (k), order of association (x) and Trouton's rule.

Experimental and Data Source

All the surface tension data used in this article is from reference². The detailed procedure for calculation of various parameters mentioned in table 1 are described in references 1-4. Thermo chemical data is from reference⁶. Taft σ^* values are from reference⁷.

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Chemical Education

Does A Partition or Distribution Coefficient Exist For A Solute That Distributes Between Two Miscible Solvents?**R. Sanjeev¹, R. Ravi² and V. Jagannadham^{3*}**

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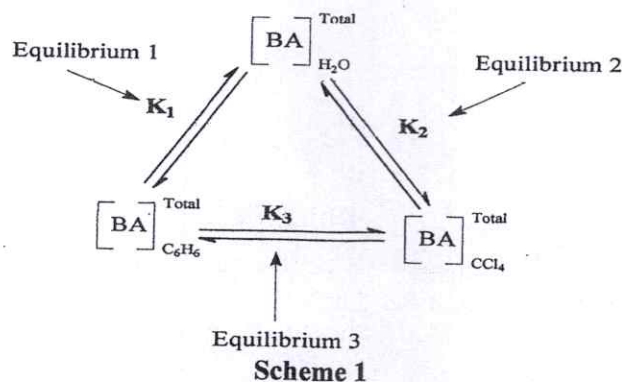
Email: jagannadham1950@yahoo.comAccepted on 8th September 2017, Published online on 27th September 2017**ABSTRACT**

It is known that for any solute, the Nernst distribution law is between two solvents which are immiscible¹. It is a well established fact that partition coefficient is meant for un-dissociated species and distribution coefficient is that for total concentration of the un-dissociated and dissociated solute². At constant temperature a solute can distribute between two immiscible solvents so that the ratio of the amounts or concentrations of the solute in two solvents is constant. For all practical purposes and to avoid any confusion we have used the total concentration of the solute in this article.

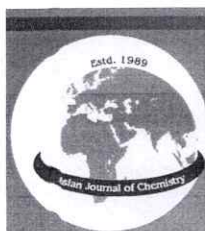
Keywords: Nernst distribution law, Distribution coefficient, Partition coefficient.

INTRODUCTION

Our concern is, is there any distribution or partition law of a solute between two solvents which are completely *miscible*? If so can it be determined? We have taken benzoic acid (BA) as an example. From the scheme 1 below

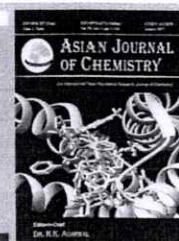


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Conventional and Microwave Assisted Synthesis of Quinoxaline Carboxamide Derivatives

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AJC-18572

The synthesis of carboxamide derivatives containing quinoxaline scaffold is described. They were prepared from 3-hydroxy quinoxaline-2-carbohydrazide in a series of steps using conventional as well as microwave assisted methods.

Keywords: Carboxamide derivatives, Quinoxaline, Microwave assisted synthesis.

INTRODUCTION

The versatility of the quinoxalines, in addition to its chemical simplicity and accessibility, makes them the most promising sources of bioactive heterocycles. The quinoxaline skeleton is used as an intermediate in designing novel quinoxaline derivatives with potential as anticancer [1-3], antiviral [4], antimicrobial (or antifungal) [3], anticandida [5,6], anti-thrombotic [7], anxiolytic agents and other activities. Moreover, quinoxaline based drugs have shown to be photochemical DNA cleaving agents making them highly promising scaffolds for anticancer therapeutics.

Especially tetracyclic quinoxaline carboxamides showed cytotoxic activity which is helpful in treating cancers. Cisplatin is a platinum containing anticancer drug, used to treat various types of cancers, including sarcomas, some carcinomas, bladder cancer, lymphomas and cervical cancer. The synthesis of new platinum compounds using quinoxaline-2-carboxamide as a ligand would reveal the significance of quinoxaline derivatives [8]. They show cytotoxic activity, though displaying poor activity, compared to cisplatin [9]. Quinoxaline 2-carboxamides are efficient 5-HT₃ receptor antagonists, which reduce the side effects of cancer treatment like nausea and vomiting [10].

High blood pressure is the main cause of sudden cardiac arrest. Some of the quinoxaline derivatives are antagonists of bradykinin, which is a peptide responsible for the dilatation of blood vessels, thus leading to the lowering of blood pressure [11].

It is found that microwave enhances the rate of chemical reaction, thereby reducing reaction time, improving yields, purity and suppressing the formation of side products. Considering

the significance of microwave assisted synthesis, we planned to synthesize some of the quinoxaline compounds through microwave.

EXPERIMENTAL

Chemicals and solvents used were purchased either from Fluka or Merck. All the reagents were of analytical grade. Microwave assisted synthesis was carried out in BP090 Laboratory grade microwave oven. Thin-layer chromatography (TLC) was performed on E. Merck AL silica gel 60 F254 plates and visualized under UV light. IR spectra were recorded as KBr pellet with a Perkin-Elmer spectrum gx FTIR instrument and only diagnostic and/or intense peaks are reported. ¹H NMR spectra were recorded in DMSO-*d*₆ with a Varian Mercury plus 400 MHz instrument. All the chemical shifts were reported in δ (ppm) where TMS is used as an internal standard. The ¹H NMR chemical shifts and coupling constants were determined assuming first-order behaviour. Mass spectra were recorded with a PE Sciex model API 3000 instrument. All the reactions were carried out under argon atmosphere.

RESULTS AND DISCUSSION

All the quinoxaline derivatives were synthesized by both conventional and microwave-assisted synthetic methods. Synthesis of N-[3-chloro-2-(aryl)-4-oxoazetidin-1-yl]-3-hydroxy-quinoxaline-2-carboxamides were carried out according to **Scheme-I**. The condensation of 3-hydroxyquinoxaline-2-carbohydrazide (**2**) and aldehyde in ethanol was carried out under reflux conditions for 1 h. The yields ranging from 55 to 65 % when synthesized by conventional method. The yield

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Peristaltic Transport of a Micropolar Fluid with Nanoparticles in an Inclined Tube with Permeable Walls

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Abstract: The paper deals with the theoretical investigation of peristaltic transport of a micropolar fluid in an inclined tube with permeable walls. The closed form expressions for velocity, pressure drop, time averaged flux, frictional force and mechanical efficiency have been investigated under the assumptions of low Reynold's number and long wave length. Effects of different physical parameters like micropolar parameter, coupling number, inclination, Brownian motion parameter, thermophoresis parameter, local temperature Grashof number, local nano particle Grashof number, slip parameter on pressure rise, frictional force, mechanical efficiency, temperature profile, nano particle phenomena, heat transfer coefficient, mass transfer coefficient and streamline patterns have been studied. The computational results are presented in graphical form. The present study puts forward an important note that peristaltic transport of a micropolar fluid with nano particles can be considerably controlled by suitably adjusting the parameters of micropolar fluid like micropolar parameter, coupling number, and also the parameters of nano particle like Brownian motion parameter, thermophoresis parameter. The peristaltic transport can also be controlled by slip parameter and inclination.

Keywords: Peristalsis, Micropolar fluid, Nano particles, Brownian motion parameter, Thermophoresis parameter, Mechanical efficiency, Slip Effect.

I. INTRODUCTION


Peristalsis is a mechanism which is involved in transportation of fluids from one place to another due to contraction or expansion of a tube containing fluid. Peristalsis appears to be the major mechanism in many physiological systems and mechanical situations.

Several researchers have investigated peristalsis in both physiological and mechanical situations. [Fung & Yih, (1968), Shapiro et al., (1969), Devi & Devanathan, (1975), Meijing et al., (1993), Maruthi Prasad & Radhakrishnamacharya, (2009), Pincombe et al., (1999), Maruthi Prasad et al., (2015), Santhosh et al., (2015)].

Nicoll et al., (1946) suggested that peristalsis plays a vital role in circulation of blood. The effects of an endoscope on peristaltic flow of micropolar fluid was investigated by Hayat et al., (2008). The effect of peripheral layer on the peristaltic transport of a micropolar fluid was studied by Maruthi Prasad et al., (2009).

Nano fluid is a fluid containing nano meter sized particles known as nano particles. The nano particles in nano fluids are typically made of metals, carbides, or carbon nano tubes. Nano fluids possess special properties that make them potentially useful in several applications in heat transfer, including microelectronics, pharmaceutical processes, fuel cells and hybrid powered engines.

Choi, (1995), was the pioneer of study of nano fluid technology. Sohail Nadeem et al., (2014) studied Mathematical model for the peristaltic flow of nanofluid through eccentric tubes comprising porous medium. Peristaltic transport of a nano fluid in an inclined tube was studied by Maruthi Prasad et al., (2015). Maruthi Prasad et al., (2015) also studied the peristaltic transport of nanoparticles of micropolar fluid in an inclined tube with heat and mass transfer effect.


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Role of Taft Equation in Selecting the Site of Attack in the Reactions of Aliphatic Amines and TI(III)

Volume 33, Number 5

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ABSTRACT:

In our earlier article [1], we had shown the application of Hammett equation of finding the site of attack. The application is based on the relative position of substituent on the aromatic ring from the center of the reaction. We had shown why we have to use σ_m value for ρ_p and σ_p value for σ_m value, when we use Hammett's plot. In the present article we have demonstrated the use of the Taft equation for finding the site of attack. Here too, similar necessity arises. Often occasion arises in research, related to oxidation of aliphatic amines, where there is more than one site of attack, and we have to find the right one. One of the sites may be the N-H bond of the functional group; others being the α -C-H bond and the lone pair of electrons of the nitrogen atom. In such a circumstance, the Taft equation plays a deciding role in location of the site of attack. This equation is apparently simple but requires judicious application. It is in the fitness of this aspect, an attempt is made to make the application more understandable and student friendly. Also we feel that it should be essential part of Physical Organic Chemistry Graduate Curriculum.

KEYWORDS:

Amines; Oxidation; One Electron Oxidant and Two Electron Oxidant

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Introduction

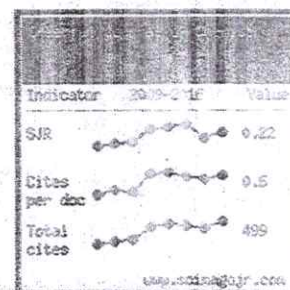
The Hammett equation, which is based on the linear free energy relation, does not apply to the reactions of aliphatic compounds and ortho substituted benzene derivatives. This is because of interference of substituent by the reaction center. Also Hammett's σ values concern groups attached to an aromatic system engaged in resonance.

For aliphatic compounds, the Taft equation in simple form is described as $\log k = \log k_0 + \sigma^* \rho^*$ where k = rate constant for a particular member of a reaction series, k_0 = rate constant for the parent compound, ρ^* = polar reaction constant and σ^* is the polar substituent constant which is the measure of the electron attracting ability of the substituent. It is a purely inductive effect and transmits itself through the aliphatic



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Taft Equation - A Convenient Tool to Decide the Position of Attack in the Reactions of Aliphatic Amines and Thallium(iii)

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ABSTRACT

In our earlier article¹, we had shown the application of Hammett equation of finding the site of attack. The application is based on the relative position of substituent on the aromatic ring from the center of the reaction. We had shown why we have to use σ_m value for σ_p and σ_p value for σ_m value, when we use Hammett's plot. In the present article we have demonstrated the use of the Taft equation for finding the site of attack. Here too, similar necessity arises. Often occasion arises in research, related to oxidation of aliphatic amines, where there is more than one site of attack, and we have to find the right one. One of the sites may be the N-H bond of the functional group; others being the α -C-H bond and the lone pair of electrons of the nitrogen atom. In such a circumstance, the Taft equation plays a deciding role in location of the site of attack. This equation is apparently simple but requires judicious application. It is in the fitness of this aspect, an attempt is made to make the application more understandable and student friendly. Also we feel that it should be essential part of Physical Organic Chemistry Graduate Curriculum.

Keywords: Amines, Oxidation, One Electron Oxidant and Two Electron Oxidant.

INTRODUCTION

The Hammett equation, which is based on the linear free energy relation, does not apply to the reactions of aliphatic compounds and ortho substituted benzene derivatives. This is because of interference of substituent by the reaction center.

Also Hammett's σ values concern groups attached to an aromatic system engaged in resonance.

For aliphatic compounds, the Taft equation in simple form is described as $\log k = \log k_0 + \sigma^* \rho^*$ where k = rate constant for a particular member of a reaction series, k_0 = rate constant for the parent

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RESEARCH ARTICLE

Estimation of Taft ρ^* of Dissociation Equilibriums of Methanium Ions RCH_4^+ the Hydrocarbon Super Acids: A Chemical Education Practice in Physical-Organic Chemistry Class-Room

1718

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ARTICLE HISTORY

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Abstract: In continuation of our efforts on the study of 'attenuation effect' in aromatic and aliphatic systems prompted us to give another attempt to estimate the Taft ρ^* value of the dissociation equilibriums ($RCH_4^+ \rightleftharpoons RCH_3 + H^+$) of the methanium ion (CH_5^+) and substituted methanium ions (RCH_4^+) based on the attenuation effect on the dissociation equilibriums of alkyl ammonium ions ($RNH_3^+ \rightleftharpoons RNH_2 + H^+$) with one, two, three, four, five and six atoms between the ionizable proton and the first carbon atom of the substituent.

Keywords: Taft reaction constant (ρ^*), attenuation effect, methanium ions, super acids.

INTRODUCTION

A super acid is defined as an acid with acidity greater than that of the acidity of 100% pure sulfuric acid, where acidity is in modern definition is defined as the chemical potential of the proton in a given medium is higher than that in pure sulfuric acid [1]. The first super acid where perchloric acid could protonate aldehydes and ketones in non-aqueous solvent like acetic acid that was known is nearly a century ago [2]. Later, many super acids were prepared in the Olah laboratory [3] at the University of Southern California by protonating hydrocarbons using a magic acid, a mixture of antimony pentafluoride (SbF_5) and fluorosulfonic acid (FSO_3H) was found by one of Olah students R. H. Schlosberg who dissolved a paraffin candle in the above mentioned magic acid. Examination of this solution by ¹H-NMR showed the presence of the t-butyl cation [4] that had been formed by protonation and subsequent isomerization of the original paraffin hydrocarbon. Concluding that this magic acid could protonate alkanes, it was found that methane can also be protonated at 140°C and at 1 atm.

pressure to form the CH_5^+ ion as an intermediate [3]. As the ammonium ion is derived from ammonia by protonation, in the same analogy the CH_5^+ cation is called methanium ion as it was produced by protonation of methane. According to Hammett acidity function the H_0 of CH_5^+ would be less than that of the magic acid because the magic acid was used to produce CH_5^+ by protonation of methane (CH_4) by a magic acid which must be a stronger acid than CH_4 . H_0 for some concentrated acids are [5]: Fluoroantimonic acid: -31.3, Magic acid: -19.2, Carborane superacid: -18.0, Fluorosulfuric acid: -15.1, Triflic acid: -14.1, Chlorosulfuric Acid: -12.78, Sulfuric acid: -12.0. Therefore, it is not unreasonable to propose a H_0 value for CH_5^+ as little less than the value of magic acid i.e. - 19.2. One can put an upper limit of - 19.0. Formulating an equation similar to Taft Polar Linear Free Energy (TPLFER) relationship [6-9]:

$$\frac{H_0^R}{H_0^H} = \rho^* \sigma^* \quad (1)$$

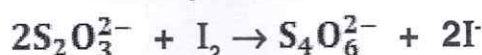
where H_0^R and H_0^H are the Hammett acidity functions of the substituted and un-substituted methanium ions. To obtain H_0^R values of substituted methanium ions one needs the value of Taft ρ^* as required in equation 1. In continuation of our efforts on the study of

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Silver Bullet For The Computation Of Equivalent Weight Of Sodium Thiosulphate In The Reaction



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ABSTRACT

When we standardize sodium thiosulphate solution either by iodometry or by a iodimetry, we base our understanding on $2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$. While addressing the freshmen students, especially during the pre-experimental lectures, we teach them the computation of equivalent weight of sodium thiosulfate (hypo); this necessitates the knowledge of the difference in oxidation state of sulphur atoms in the product (2.5) and the reactant side (2.0); the difference in oxidation state of sulphur atoms is 0.5. The overtly observable query which occurs to the students is, "Is the equivalent weight and molecular weight of sodium thiosulphate same or different?" If yes, then the change in the oxidation state apparently does not conform to the difference, 0.5. This article deals with this apparently simple but extremely perplexing question

Key word: Oxidation States, Molecular Weight, Sodium Thiosulphate.

INTRODUCTION

If one attempts to calculate the equivalent weight of hypo in the title reaction i.e. the reaction between sodium thiosulphate and iodine molecule, the conventional method involves the evaluation of the oxidation state of sulphur in the reactant and product sides; this in essence gives the change in the number of electron(s) in the reaction. Then

finally, we divide the molecular weight of sodium thiosulphate by the change in the number of electrons.

DISCUSSION

Let us apply the conventional method for the computation of equivalent weight of sodium thiosulphate to the title reaction. The first step

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17-18 (1)

Effect of Frustrated Exchange Interactions and Spin-half Impurity on the Electronic Structure of Strongly Correlated NiFe₂O₄

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Spin-polarized density functional calculations, magnetization, and neutron diffraction measurements are carried out to investigate the magnetic exchange interactions and strong correlation effects in Yb substituted inverse spinel nickel ferrite. In the pristine form, the compound is found to be a mixed insulator under the Zaanen-Sawatzsky-Allen classification scheme as it features both charge transfer and Mott insulator mechanism. Estimation of magnetic exchange couplings reveals that both octahedral-octahedral and octahedral-tetrahedral spin-spin interactions are antiferromagnetic which is typical of a spin-frustrated triangular lattice. However, the latter is dominant compared to the former leading to a forced parallel alignment of the spins at the octahedral site which is in agreement with the results of neutron diffraction measurements. The substituent Yb is found to be settled in +3 charge state, as confirmed from the XPS measurements, to behave like a spin-half impurity carried by the localized $f_{z(x^2-y^2)}$ orbital. The impurity f spin significantly weakens the antiferromagnetic coupling with the spins at the tetrahedral site, which explains the experimental observation of fall in Curie temperature with Yb substitution.

I. INTRODUCTION

The cubic inverse spinel NiFe₂O₄ (NFO) has been extensively investigated in the context of nanomagnetism [1], spin-filtering [2, 3], spintronics [4] and multiferroics [5]. In addition, it exhibits unusual electronic and magnetic properties when Fe³⁺/Ni²⁺ ions are partially substituted by other transition metal (M) ions, rare earth (R) ions or ions of non-transition elements [6–11]. Collinear Néel type ferrimagnetic structure of NiFe₂O₄ yields to triangular Yafet-Kittel structure upon substantial Cr substitution at the Fe sites [6]. The octahedra containing Fe³⁺ ions in NFO, when partially substituted by rare-earth (R³⁺), become non-centrosymmetric to make the compound ferroelectric. Experimentally it has been shown that, substituents like Sm³⁺ and Ho³⁺ induce magnetoelectric effect in NFO [8].

Significant changes in the electronic, magnetic and structural behavior of Ni-Zn ferrite upon diluting with several rare earth ions have been observed [9–11]. With substitution of 2% of Fe by R (= Yb, Er, Dy, Tb, Gd, Sm and Ce) in Ni_{0.7}Zn_{0.3}Fe₂O₄, while lattice has been reported to expand and resistivity has increased, both magnetization and Curie temperature have decreased [9–11]. Larger ionic radii of R³⁺ ions cause lattice expansion and the 4f electrons are more localized than the itinerant 3d electrons and hence, the resistivity increases [9–11]. The reported value of Curie temperature (T_C) of NiFe₂O₄ is 853 K [7, 12]. A decrease in T_C upon the partial substitution of R³⁺ for Fe³⁺ in NiFe₂O₄ has

been reported from our lab [7, 8]. In Ni₂Fe_{1.925}R_{0.075}O₄ compounds, the T_C decreases to 775 K, 812 K and 839 K respectively for Dy [7], Ho³⁺ and Sm³⁺ substitutions [8]. However there are no concrete mechanisms and evidence to explain the decrease in magnetization and Curie temperature, even though qualitatively it has been attributed to weaker R-Fe exchange coupling replacing the stronger Fe-Fe exchange coupling [12, 13].

In this paper, results from DFT calculations and experimental studies are presented and analyzed to explain the electronic and magnetic structures of Yb substituted NFO viz. NiFe_{2-x}Yb_xO₄ (x = 0, 0.05, 0.075). The reasons for choosing Yb were manifold: (a) Structural distortion is expected to be weak or negligible, since the radius of Yb³⁺ ion (0.86 Å) is smaller compared to those of the other rare earth ions. (b) Yb ion can stabilize in +2 and +3 charge states. (c) Yb³⁺ is magnetic and has lower spin moment compared to the other R³⁺ (R = Gd, Tb, Dy, Ho, Er, Tb) ions [12] and hence, large reduction in magnetization as well as Curie temperature. (d) Yb³⁺ is expected to provide a spin-half f impurity state. Therefore, it serves as a model system to study host (d spin)-impurity (f spin) magnetic interactions.

Experimentally, X-ray photoelectron spectroscopy (XPS), Raman spectroscopy and neutron diffraction (ND) measurements are performed and theoretically, spin-polarized band structure is calculated to explain the electronic structure of NiFe_{2-x}Yb_xO₄. In addition, various magnetic exchange couplings are estimated from the total energies of several possible magnetic configurations so that the spin-spin interactions in this compound can be better understood. Emphasis is given on the magnetic coupling of Yb and Fe spins and its

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ABSTRACT:

Decimal arithmetic is convenient for financial calculations and other database manipulations as compared to binary arithmetic. Research is still going on to have specialized decimal arithmetic hardware processing units to make these tasks more efficient in terms speed, power and hardware to supports these applications. In this paper, we propose a new approach to decimal addition that is simple in concept, appealing and efficient in terms of speed and hardware. The proposed decimal adder uses a signed 2's complement vinculum representation of the decimal numbers. The design although generates a dual carry, i.e. a positive and a negative carry, analysis of the adder has revealed a much lower probability of carry generation as compared to the conventional decimal adder allowing the possibility of parallel decimal addition. The proposed VBCD adder is tested up to 16-digit on vertex 6 FPGA platform and also on 180 nm Cadence digital Encounter Tools

Keywords: BCD Adder, BCD Subtractor, Two's complement number system, Vinculum numbers

1. INTRODUCTION:

Decimal Arithmetic plays a very vital role in many financial, business and commercial applications for which binary arithmetic is not suitable. Thus in such systems the decimal hardware eliminates the need of internal binary conversions. From the last decade lot of research is going on decimal arithmetic [18] [14]. The literature available mostly concentrates on conversion of Decimal to Binary and from Binary to Decimal Numbers with Encoding and Decoding schemes like commonly available weighted and un-weighted codes, ASCII and EBIDIC codes [7] [17]. In recent literature there is a growing interest for computing Decimal arithmetic using Vedic mathematics [2] [19]. Our studies show that Vedic mathematics is a promising and emerging field for decimal arithmetic. Survey shows that faster and efficient arithmetic circuits can be designed using Vedic mathematics [8].

In this paper we have proposed a new method for decimal addition and subtraction using two's complement number system and Vedic vinculum number representation. Our simulation results indicate that this approach is viable and efficient. The synthesis results show a good amount improvement in speed.

The outline of the paper is arranged as follows. In Section 2 Vedic Vinculum number representation is explained with suitable examples. In Section 3 existing BCD Adder/Subtractor is given. In Section 4 Proposed Single digit VBCD Adder. In Section 5 Extension of VBCD Adder to 64 bit is proposed. Synthesis results are discussed in Section 6 and Conclusion with Future scope is provided in Section 7.

2. BASIC BACKGROUND ON VEDIC VINCULUM NUMBER REPRESENTATION:

It is a well-known and accepted fact that in ancient India (Vedic era) Vedic civilizations were known for being skilled in geometry, algebra and computational mathematics [8]. Even complex mathematical concepts like irrational numbers, calculus etc. was known to exist. They were studied and compiled by a Hindu scholar and mathematician, [Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaj] during the early part of the 20th century [8] [2] [19].

In this paper we have made an attempt to use the vinculum number representation to solve the problem of BCD Addition and Subtraction.

2.1 Vinculum Representation of Numbers

Vinculum number representation allows BCD digits to take values from -5 to 5. If a higher digit, say 7 occurs it has to be converted into 13. This type of representation allows only smaller +ve and -ve digits and hence it significantly reduces the probability of carry generation as illustrated in the Section 6.

A NOVEL APPROACH TO THE LEARNING OF VINCULUM NUMBERS IN TWO'S COMPLIMENT METHOD FOR BCD ARITHMETIC OPERATIONS

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ABSTRACT: This paper proposes a new approach of representing decimal number system using Vinculum number representation. Vinculum number system consists of numerals 0,1,2,3,4,5 same as decimal number system and 6,7,8 and 9 are represented using negative numbers less than or equal to 5. Therefore Vinculum number system consists a set of numbers as {0, 1, 2, 3, 4, 5, -4, -3, -2, -1}. Hence complexity of higher order numerals like 6,7,8 and 9 are converted into less complex numbers. Vinculum is the Vedic method of representing decimal number system. Decimal numbers are representing in Binary Coded Decimal numbers for getting compatibility with Computer systems. Similarly we have used 2's complement number system for representing Vinculum numbers. This helped in representing signed Vinculum numbers. A unique set of tuples are represented in Vinculum number system which are suitable for any decimal arithmetic operation.

Keywords: Decimal numbers, BCD numbers, Vinculum numbers

Introduction:

Decimal Arithmetic plays a very vital role in many Finance, Business and Commercial Applications for which binary arithmetic is not suitable. From the last decade lot of research is going on decimal arithmetic and Decimal Floating point number systems [4][5]. The literature available mostly concentrates on conversion of Decimal to Binary and from Binary to Decimal numbers with various Encoding and Decoding schemes like weighted, non-weighted, Excess 3 code, Gray code etc. [1] [2] [4][6]. In recent literature there is a growing interest for computing Decimal arithmetic using Vedic mathematics [13]. The studies show that Vedic mathematics is a promising and emerging field for decimal arithmetic systems.

In this paper we have proposed a new method for decimal addition and subtraction using two's complement number system and Vedic vinculum method. Two's complement approach is normally used in binary addition and subtraction. To our knowledge very little literature is available on BCD Addition and Subtraction using Vedic mathematics. We have tried to investigate the use of 2's complement number system to represent vinculum numbers to solve the problem of BCD Addition and subtraction. Our Analysis shows that this

approach is viable and efficient. Theoretical analysis shows that the number of carry bits generated from one digit to other digit are very less when compare to conventional (decimal) number systems.

The outline of the paper is arranged as follows. In Section 2 Various forms of Binary number systems are presented. In Section 3 Decimal number system using vinculum method were explained and concepts of Vinculum numbers, its Algorithm with examples are discussed, in Section 4 and Conclusion with Future scope in Section 5.

2 Overview of Number systems:

All human beings are familiar with their regional languages but one number system is common which is nothing but Decimal number system. Computers does not understand the words and letters of various languages. All those are translated into numbers where computers talk and understand each other. Although we are comfortable with decimal number system a student or a mathematician must be aware of various number systems and their working principle and their conversions from one form to another in various aspects.

2.1 Digits:

Before numbers are converted from one number system to another, the digit of a number system must be understood. The first digit in any numbering system is always a zero. For example, a base 2 (binary) numbers contains 2 digits: 0 and 1, a base 8 (octal) numbers contains 8 digits: 0 through 7, a base 10 (decimal) numbers contains 10 digits 0 through 9, a base 16(Hexa means six and decimal means 10) numbers contains 16 different digits:0 through 9 and 10 to 15 in decimal is represented as A,B,C,D,E and F.

Once the digits of a number system are understood, larger numbers are constructed by using positional notation. As in decimal the position to the left of the units position was the tens position, the position to the left of the tens position was the hundreds position and so forth. Here, the units position has a weight of 10^0 , or 1; the tens position has a weight of 10^1 , or 10; and the hundreds position has a weight of 10^2 , or 100. The exponential powers of the positions are critical for



LOW POWER TEST PATTERN GENERATION USING TEST-PER-SCAN TECHNIQUE FOR BIST IMPLEMENTATION

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ABSTRACT

This paper introduces the function of test cases with minimal power for Built-In-Self-Test (BIST) implementation. This method intends Test-Per-Scan (TPS) based test cases using Multiple Single Input Change (MSIC) architecture. Multiple SIC patterns are developed by using EX-OR operation of twisted ring counter and test design algorithms like Linear Feedback Shift Register (LFSR), Bit-Swapping LFSR (BSLFSR), and Cellular Automata (CA). These patterns are used to a diminish number of transitions in the test patterns that are generated. The preferred method uses Test-Per-Scan technique for generating Multiple SIC test patterns. TPS diminished the power consumption during test mode. The seed generator used in TPS is modified LFSR's i.e., BS-LFSR, Cellular Automata (CA). BS-LFSR is composed of with an LFSR with a multiplexer. In CA, it also presents a variation on a BIST technique, which is from a one-dimensional cellular automaton; the pseudo random bit generator is generated. The proposed Hybrid Cellular Automata (HCA) using the rules 90 and 150 to generate the pseudo random designs. Moreover, the CA implementations illustrates properties of data compression like LFSRs and that they exhibit locally and with topological consistency significant attributes for a VLSI design. In this proposed method, LFSR is replaced with BS-LFSR, and HCA. Simulation and synthesis outcome with ISCAS c432 benchmark determine that Multiple SIC can reduce the power consumption.

Index Terms: BIST, MSIC, LFSR, BSLFSR, CA, HCA, circuit under test, test-per-scan, single input change, test response analyzer, pseudo random generator.

1. INTRODUCTION

Built-In-Self-Test scheme can adequately minimize the more complex VLSI analysis problems, by generating test hardware into the Circuit-Under-Test (CUT). The Linear Feedback Shift Register (LFSR) is generally exploited as Test Pattern Generators (TPGs) and Test Response Analyzers (TRAs) in traditional BIST technique. Amainsnag of these techniques is that the pseudorandom test cases produced by the LFSR causes a notably huge switching activity in the CUT, which can lead to enormous power dissipation and also blow the circuit and reduce the product yield. The LFSR generally requires very lengthy pseudorandom patterns in order to attain the required fault coverage in BIST implementation.

A. History work on BIST

There are a number of contrives that are used to generate design necessary for testing CUT. It has been founded that power consumption is more in test mode comparatively with normal mode [12]. The main idea behind low power techniques is to minimize the power consumption in test mode. Different kinds of test generation methods are required to develops table Built-In Self-Test (BIST) techniques. The utmost familiar test pattern design generation is based on pseudorandom pattern generators (PRPGs). The simple hardware on-chip test generation can be developed by pseudorandom tests patterns. Therefore, there are two major forms of PRPGs which is derived. Generally, the linear feedback shift registers and 1- Dimensional (1-D) Linear Hybrid Cellular Automata (LHCA) are major forms of PRPGs.

In spite of few coincidences, the series of states is consistently distinct between the LHCA and the LFSR, the LHCA can generates far good randomized test patterns [21]. The CA-based test generators will be an option to traditional LFSR algorithms. Further to meliorated randomization attributes, novel pseudorandom test design algorithms also have benefit in that they can be implemented for only contiguous neighbor communication and the physical length of the pattern generator. These can be elevated or diminished by only summate or deducting the cells. However, the investigation of aliasing function is a secondary controllable job for the CA than LFSR. The architecture in [7], presents Seeded Autonomous Circular Shift Register (SACSR) producing Single-Input-Change (SIC) patterns of maximum unique vectors. One of the ways to minimize power consumption is by reducing the transitions between the consequent patterns. Many techniques are introduced to minimize the transitions. The architecture in [3] presents Bit Swapping LFSR which is unlike from conventional LFSR reduces 33% of the transitions. BIST technique should generate test sequences with shallow power and area overhead and high fault coverage.

The architecture in [8] the introduced method has to decrease scan input bit transitions along operations of scan shifting. The architectures in [9], [11], [13] introduced various new techniques for reducing switching activities and also area overhead. The architecture in [2] introduces a new technique for generating the test designs with only single bit change compared with the previous patterns and generated using the XOR of the counter output with LFSR. The architecture in [5] power is

COMPRESSOR BASED 8x8 BIT VEDIC MULTIPLIER USING REVERSIBLE LOGIC

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Abstract: Reversible logic gates became very important and computing paradigm having its applications in low power CMOS technologies and Quantum computing [5]. Reversible logics are used to reduce the depth of the circuits [6]. This paper introduces a new architecture of 4:2 Compressorbased Vedic 8x8 bit Multiplier using reversible logic and is compared with conventional multipliers using Reversible logic and it was observed that the parameters like Hardware Complexity, power and Delay are improved over other Reversible multipliers. The design is simulated, synthesized and power estimation was done using TSMC 180nm technology using Cadence Digital tools.

Keywords: Reversible gates, Compressors, Vedic Multiplier, Low power

1. INTRODUCTION

Vedic Mathematics is a system of reasoning and mathematical working based on ancient Indian teachings called Veda[10]. It is fast, efficient and easy to learn and uses all arithmetic and algebraic operations which are accepted by worldwide. The origin of Vedic mathematics is from Vedas and to more specific Atharva Veda which deals with Engineering branches, Mathematics, sculpture, Medicine and all other sciences which are ruling today's world. Vedic mathematics, which simplifies arithmetic and algebraic operations, can be implemented both in decimal and binary number systems [10]. It is an ancient technique, which simplifies multiplication, division, complex numbers, squares, cubes, square roots and cube roots. Recurring decimals and auxiliary fractions can be handled by Vedic mathematics. This made possible to solve many Engineering applications, Signal processing Applications, DFT's, FFT's and many more.[12][13]. Vedic mathematics consists of 16 sutras (formulas) and 13 sub sutras. We used UrdhvaTiryagbhyam method for multiplication process.

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The paper is organized as below. In section I we discuss algorithm of vedic multiplier for an 8 bit multiplication. Section II deals with Reversible Logics, Section III deals with Compressors and its structures and Section IV deals with proposed Multiplier using Compressor and Reversible logics, Section V Results and comparisons and Section VI Conclusions in terms of its Speed and Power

1.1 Line Diagram for 8bit Vedic multiplier

Let us consider the multiplication of 2 binary numbers. Line diagram for the multiplication is shown as below:

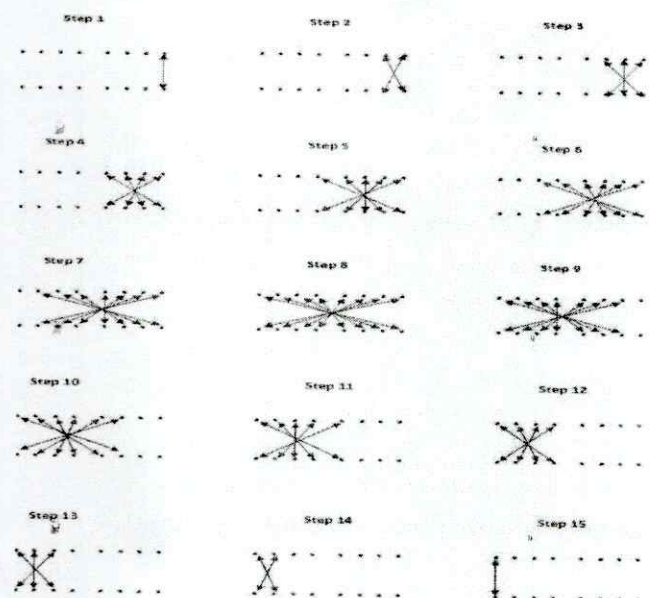
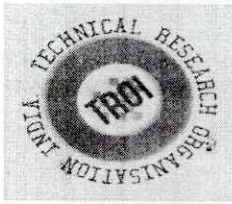


Fig 1: 8-bit Vedic Multiplier line diagram
Figure 1 explains how each bit is multiplied and final product is obtained simply by appending from step 1(LSB) to step 15(MSB).

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DESIGN OF FUZZY LOGIC CONTROLLER OF RESIDENTIAL ELECTRIC WATER HEATERS

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ABSTRACT:

With the impending deregulation of electric utility industry, customer satisfaction with utility services will be crucial. Utilities will need to place a greater emphasis on their customer's preferences and desires. This paper describes a fuzzy logic-based control strategy for shifting the average power demand of residential electric water heaters from period of high demand for electricity to off-peak periods. A minimum temperature for hot water, defined as customer comfort level, is used as a control variable. Water temperature is not allowed to fall below the minimum temperature set by the customer. Simulation result show that the proposed strategy can shift the average power demand of residential water heater to improve the load factor of residential load profile.

Key words: Fuzzy Logic control, mat lab tool box, Electric water Heater.

I. Introduction:

An Englishman Benjamin Maugham, in 1868 invented the first instant water heater called "The Geyser", a device where the water was heated as it flowed into the bath. They were known to be quite dangerous. Maughn's invention influenced the designs of a Norwegian mechanical engineer by the name of Edwin Ruud, who immigrated to Pittsburg. Ruud who invented the electric water heater (automatic storage) in 1889, founded the Ruud Manufacturing Company, which is still in operation today, and pioneered the advancement of water heaters, in both the residential and commercial market.

Population growth along with technological growth force the utility

companies to continue struggling to meet the ever-increasing need for electricity. With the majority of residents conforming to the 8 AM-5PM work schedule, the utility companies experience overwhelming demand peak associated with large amount of power being consumed at the same time. Complementing this effect are periods of low demand. Although over a period of time, the average amount of power consumed by community may be easily generated by a utility, that utility still has to provide enough generation to meet its highest power demand peak. It is in the best interest of the utility companies as well as the consumer to try to reduce these high peak demand periods and out their power demand profiles as much as possible.

One way this can be accomplished is by controlling residential electric water heaters. The Electric water heater accounts for the single largest contributor to the total power consumption of a residence. Existing electric water heater DSM (Demand-side management) strategies focus on on/off control of the water heater, where a group of heater are disabled during certain periods of time using a direct load control strategy [5]. When water heater are energized, they are either on consuming a fixed amount of power, i.e. 4.5kW, or they are off. The paper presents a fuzzy logic based variable power control strategy, where the power consumed by the water heater can be controlled based on the information available from the water heater such as water temperature, maximum and minimum water temperature allowed (or desired), and distribution level power demand. Based on the status of the above variables, the fuzzy controller will determine



NANO SCALED LIB/STATCOM FOR POWER QUALITY IMPROVEMENT IN A GRID INTERCONNECTED RES

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Abstract

The Renewable energy systems, particularly 'Wind Energy' development, showed its remarkable growth in the recent years, that can create pollution less and environment friendly atmosphere. The Nano Scaled Li-ion batteries are getting enormous attention as power sources and energy storage devices in Renewable energy system. Interconnecting the wind energy into the grid effects the power quality due to variable wind speed components. This paper shows the existence and mitigation of power quality problem due to installation of wind turbine with the grid i.e Harmonics. LIB plays critical role under clean energy system because it contribute for reduction of greenhouse gas emission. The performance of LIB is improved by developing high energy density electrode materials at Nano scale. A novel Nano Scaled LIB/STATCOM control scheme for grid connected wind Energy system has been developed using the MATLAB/SIMULINK to mitigate the power quality problems. In this the STATCOM is inputted by the Nano Scaled Li-Ion Battery Energy Storage system (LIB) it rapidly injects or absorbed reactive power to stabilize the grid system. Finally the results with LIB/ STATCOM, with STATCOM and without LIB and without LIB/STATCOM are compared and a mark reduction in total harmonic reduction is observed.

Keywords: LIB Li-ion battery energy storage; Nano Scale; PQ power quality; STATCOM;

I. INTRODUCTION

There is a current global need for clean and renewable energy sources where renewable energy sources can curb our need for fossil fuels. Fossil fuels are non-renewable and require finite resources, which are dwindling because of high cost and environmentally damaging retrieval techniques. So, the need for cheap and obtainable resources is greatly needed. The efficient and more feasible alternative option is solar, wind etc. Nano technology is the best tool for achieving breakthrough in Li-ion battery electrode material. In order to improve the performance of batteries it is desired to develop high energy density cathode materials using Nano materials. Now a day's Lead acid batteries have been used for solar electric systems but Li-ion offers higher energy density, longer cycle life, and no memory effect compared to lead acid batteries. [1]-[2]

A conventional STATCOM is a shunt-connected device which consists of a Voltage Source Inverter (VSI) and a dc capacitor. Since the dc capacitor is not a bulk energy storage device, the STATCOM does not have the ability of active power compensation. If an energy storage system, such as a Nano Scaled Li-ion battery, is connected to the dc capacitor, the power regulation ability of the STATCOM can be expanded to both reactive and active power compensation. The Active power control function can work faster than conventional synchronous generators and so, it has better performance. On the other hand, the reactive power control can enhance the power quality of



ADAPTIVE NEURO FUZZY BASED MAXIMUM TORQUE CONTROL OF THREE PHASE INDUCTION MOTOR

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Abstract

This paper manages the Maximum Torque Control of IM drives utilizing ANFIS. In modern control hypothesis, the IM is depicted by various arithmetical models, as per the engaged control technique. The proposed approaches straightforwardly direct the machine stator flux as indicated by the desirable torque, utilizing an optimal stator flux reference. In this manner, the proposed technique is appropriate for motor control conspires that depend on coordinate motion control, for example, coordinate torque control or direct torque vector control. Utilizing ANFIS, especially the neural systems, execution and operation of acceptance IM is progressed. This paper presents ANFIS based MTC of Three-phase IM. The execution of the intellectual controller has been examined through MATLAB/Simulink condition, for various operational conditions. At last, the outcomes are watched that ANFIS based controllers give preferable reactions over alternate controllers

Introduction

For any machine we expect less error, most extreme output for that we have to control the torque. In three phases IM the maximum torque control can be accomplished in various techniques. The controlling of most extreme torque should be possible in customary controllers, for example, corresponding controller, relative in addition to essential controller however these are particularly helpful in steady state and for linear systems. In any case, the P, PI controller has primary disfavor is tuning of parameters K_p, K_i, K_d, T_d, T_i (and also other problems like the high starting overshoot, sensitivity to controller gains and sluggish response due to sudden disturbance) In about the same period, there were also advances in control methods and Artificial Intelligence (AI) techniques.. Artificial Intelligent strategies mean utilization of master framework, fluffy rationale, neural systems and hereditary calculation. Experts soon understood that the control of IM drives can be improved by receiving automated interpretation based techniques like The Artificial Intelligence (AI) methods, for example, Expert System (ES), Fuzzy Logic (FL),

Novel Method for Loss Reduction and Voltage Profile Improvement with Multiple DGs

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Abstract— Distributed generation (DG) can be integrated into distribution systems to meet the increasing load demand. This paper discusses the sizing and siting issue of DG placement in radial distribution systems using novel method. The main objective of the work is to minimize the active and reactive power loss and enhance voltage profile of overall system. This paper presents a methodology for optimal distributed generation (DG) location and sizing in distribution systems. The main objective of the added DG units is minimizing the total electrical network losses with acceptable voltage profile. The effectiveness of the novel method has been successfully tested on IEEE 33 bus radial distribution system in ETAP software and the results are found to be in very good agreement.

Index Terms— Voltage profile, real power losses, reactive power losses, radial distribution system, distributed generation,

1 INTRODUCTION

The electric utility system is usually divided into three sub-systems which are generation, transmission, and distribution. The distribution system is commonly broken down into three components: distribution substation, distribution primary and secondary. At the substation level, the voltage is decreased and the power is distributed in smaller amounts to the customers. Consequently, one substation will supply many customers with power. Thus, the number of transmission lines in the distribution systems is many times that of the transmission systems. Furthermore, most customers are connected to only one of the three phases in the distribution system.

When you on the traditional power grid energy generation and distribution was relatively simple. The generator produced electricity at plant and the transmission system carried electricity from the plant to substations. At the substation, voltage was reduced and electricity continued to travel along the distribution system where transformers converted into voltage used by customer. At the customer site electricity passed through the meter which recorded usage as electricity was consumed. Energy flow was essentially one way. On a smart grid with distributed generation, energy can be generated close to the point of use and those who produce this power have the option to resell it to the utility [1],[2].

A generator is installed behind the metre to provide power. When this generator is not in operation power can be drawn from the grid. However, if there is an outage or when power prices peak, users can go off-grid and use a private generator to produce power. Solar, wind and thermal energy are renewable sources that can generate energy close to the point of use. Unlike major power stations, renewable energy resources can be installed in small increments and they have extremely low on-going costs. Though renewable energy resources are less predictable than the power generated by traditional means, hybrid systems can utilize both renewable and traditional power. With access to distributed generation re-

sources within a smart grid, utilities can configure the existing systems to meet peak power needs and diversify the range of energy resources to increase the reliability of energy flow [3],[4]. For customers distributed generation supports

- (i) Reduced energy costs
- (ii) Reduced reliance on fossil fuels and
- (iii) Increased use of renewable resources

Despite its relative unpredictability, renewable energy can fit with the load curve. For instance, in summer the sun produces high energy during the hardest part of the day when air conditioning is required, so solar energy is in affect converted into electric energy for cooling. Within the smart grid, integrated into the smart home and monitored by smart metering distributed generation is a new paradigm for energy distribution and use. For the first time energy flows to users as well as away from the users enabling utilities and their customers to work together to ensure that power is high quality, reliable, green and low cost.

Distribution systems hold a very significant position in the power system since it is the main point of link between bulk power and consumers. Effective planning of radial distribution network is required to meet the present growing domestic, industrial and commercial load day by day.

2 LOAD FLOW ANALYSIS

Consider a branch connected between buses 1 and 2 as shown in Fig.1