INDIAN MATHEMATICAL SOCIETY

INDIAN MATHEMATICAL SOCIETY

(Founded in 1907; Reg. No. S-550, Delhi)
Registered Office: Department of Mathematics,
Savitribai Phule Pune University, Pune-411007

http://www.indianmathsociety.org.in

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NEWSLETTER

NO. 37

March/April – 2017

Facsimile of the Commemorative Postage Stamp on the 'Indian Mathematical Society' issued by the Department of Posts (Philately Division, Government of India, to mark the completion of hundred years of the Society. Released on the Inaugural day of the Platinum Jubilee 75th Annual Conference of the Society on 27th December 2009.

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IMPORTANT EVENTS

(1) The ensuing 83^{rd} Annual Conference of the Society will be held under the auspices of Sri Venkateswara University, Tirupati (A. P.) during December 12-15, 2017. Prof. S. Sreenadh, Department of Mathematics, Sri Venkateswara University will be the Local Organizing Secretary. His email id is
$profsreenadh@gmail.com$.

(2) Prof. Manjul Gupta, Department of Mathematics, IIT, Kanpur has been elected as the President of the Indian Mathematical Society for a period of one year with effect from April 1, 2017.

(3) Prof.G. P. Singh, (VNIT, Nagpur); Prof. S. S. Khare, (North Eastern Hill University, Shillong); and Prof. Rajasekhar Reddy, (Sri Venkteswara University, Tirupati, A. P.) have been elected as members of the Council for a period of three years with effect from April 1, 2017.

(4) Prof. A. K. Agarwal Award for 2015 has been awarded to Dr. Abhishek Banerjee, Department of Mathematics, Indian Institute of Science, Bengaluru for his paper "Action de Hopf sur les operateurs de Hecke modulaires tordus" published in the Journal of Noncommutative Geometry, Vol. 9, No. 4 (2015), 1155 1173.

(5) A. Narasinga Rao Memorial Prize for the year 2014 has been awardrd to Dr. K. B. Mangang, Department of Mathematics and Computer Science, Mizoram University, Tanhril, Aizwal, 796004 for his paper entitled "Equicontinuity of the limit function of a sequence of equicontinuous functions" published in the Journal of the Indian Math Society, Vol 81 (2014), 115-121.

(6) P. L. Bhatnagar Memorial Prize for 2016 has been awarded to Mr. Kapil Pause (Goa) for being the top scorer for the Indian Team at the 57th International Mathematics Olympiad (IMO) held during July 6-16, 2016 at Hong Kong.

(7) The Volumes 83(3-4) (2016) and 84(1-2) (2017) of JIMS have been published online on the website of the Informatics publishing Limited, Bangalore.

These volumes have been uploaded on the Informatics India's I-scholar platform.

(8) The last date for submitting papers for Prof. A. K. Agarwal Award, Prof. A. M. Mathai Award and Prof. Satish Bhatnagar Award for the year 2016 is June 30, 2017. The details are available on the website of the Society (www.indianmathsociety.org.in).

HIGHLIGHTS OF THE 82^{nd} ANNUAL CONFERENCE OF THE IMS

The 82^{nd} Annual Conference of the Indian Mathematical Society was held at the Department of Mathematics, University of Kalyani, Kalyani, Nadia, West Bengal during December 27-30, 2016 under the president-ship of Prof. D. V. Pai. The Conference was attended by more than 200 delegates. Two presidential addresses (General and Technical), one plenary lecture, by Prof. Hrushikesh Mhaskar (Claremont Graduate University, Claremont, USA), four Memorial Award lectures and ten invited lectures were delivered in the conference. Also, six Symposia were organized during the conference and thirty four invited speakers gave talks in the Symposia. Moreover, in all 113 research papers were accepted for presentation at the Conference including 10 research papers for the paper presentation competition for various prizes.

The Conference was inaugurated by Prof. Sankar Kumar Ghosh, Vice Chancellor, University of Kalyani. The function was presided over by Prof. D. V. Pai. Prof. Sanjib Kumar Datta, Department of Mathematics and the Local Organizing Secretary of the Conference, welcomed the delegates. The General Secretary of IMS, Prof. N. K. Thakare spoke about the Indian Mathematical Society and on behalf of the Society expressed his sincere and profuse thanks to the host for organizing the Conference. Prof. Peeyush Chandra, Academic Secretary of IMS, reported the academic programmes of the Conference.

Prof. D. V. Pai delivered his Presidential address (General) on the topics "Road to Mathematical Sciences in India - a Relook ". The function ended with a vote of thanks by , Prof. Abhijit Banerjee, the Head, Department of Mathematics, University of Kalyani and Convener of the conference.

Prof. D. V. Pai gave Presidential address (Technical) on "Some highlights of our research contributions "which was presided over by Prof. N. K. Thakare, General Secretary of the Indian Mathematical Society.

Prof. Hrushikesh Mhaskar, Claremont Graduate University, Claremont, USA delivered a **Plenary Lecture** on "Fourier series: myths, facts, and applications".

The 30^{th} **P. L. Bhatnagar Memorial Award Lecture** was delivered by Prof. G. P. Raja Sekhar IIT, Kharagpur on "Tumor growth-chemo-mechanical modelling and existence theory".

The 27^{th} **V. Ramaswami Aiyar Memorial Award Lecture** was delivered by Prof. C. S. Aravinda, TIFR CAM, Bangalore on "Geodesic conjugacies of surfaces".

The 27^{th} **Srinivasa Ramanujan Memorial Award Lecture** was delivered by Prof. Eknath Ghate, TIFR, Mumbai on "The Tau of Ramanujan".

The 27^{th} Hansraj Gupta Memorial Award Lecture was delivered by Prof. Neena Gupta, ISI, Kolkata on "Some problems on polynomial rings".

A. Narasinga Rao Memorial Prize for the year 2014 has been awardrd to Dr. K. B. Mangang, Department of Mathematics and Computer Science, Mizoram University, Tanhril, Aizwal, 796004 for his paper entitled "Equicontinuity of the limit function of a sequence of equicontinuous functions" published in the Journal of the Indian Math Society, Vol 81 (2014), 115-121.

P. L. Bhatnagar Memorial Prize for 2017 has been awarded to Mr. Kapil Pause (Goa) for being the top scorer for the Indian Team at the 57^{th} International Mathematics Olympiad (IMO) held at Hong Kong during July 6-16, 2017.

Various prizes for the Paper Presentation Competition:
For the IMS prizes 10 papers were received : four in Group 1, one in Group 2, three in Group 4, one each for AMU Prize and V M Shah Prize. No paper was received for Group 3, 5 and 6.

Prof. Peeyush Chandra (Chairperson), Prof. Manjul Gupta, Prof. J. R. Patadia and Prof. M. M. Shikare were the judges.

Following was the result for the award of these prizes.

IMS Prize - Group-1: There were 3 presentations and the prize was awarded to Somnath Paul, Tezpur University, Assam.

IMS Prize - Group-2: There was one presentations and the prize was awarded to Mukta Garg, University of Delhi, Delhi.

IMS Prize - Group-3: No presentation.

IMS Prize - Group-4: Only one paper was received and presented. However, it was not recommended for the prize.

IMS Prize - Group-5: No paper was received in this group.

IMS Prize - Group-6: No paper was received in this group.

AMU Prize: Only one paper was received and presented. However, it was not recommended for the prize.

V M Shah Prize: Only one paper was received and presented. However, it was not recommended for the prize.

Invited Lectures delivered
Invited Speakers:
One hour Talk

1. Prof. Sanjeev Dhuradhar, IUCAA, Pune.

Half Hour Talks

2. Prof. G. P. Singh,V N I T, Nagpur.
3. Prof. S. Sundar IIT Madras.
4. Prof. R. Thangadurai, H. R. I. Allahabad.
5. Prof. Sudeshna Banerjea, Jadavpur University, Jadavpur.
6. Prof. D. K. Ganguly, Calcutta University, Kolkata.
7. Prof. Kapil K. Sharma, SAU, New Delhi.
8. Prof. Uma Basu, Calcutta university, Kolkata.

As per convention the winners of A. Narsinga Rao Memorial Prize for 2014 and Prof. A. K. Agarwal Award for 2015 were also invited to give half an hour talk. The speakers are as follows:

1. A. Narsinga Rao Memorial Prize for 2014 - Dr K. B. Mangang, Mizoram University.

2. Prof. A. K. Agarwal Award for 2015 - Dr Abhishek Banerjee, IISc., Bangalore.

Symposia organized
Six symposia along with their convenors were finalised and convenors were requested

to invite the speakers for their symposium. Following are the details:

1. Integral Inequalities and Applications: Dr. S. D. Kendre, S. P. Pune Univ. (convener). Speakers: Professors S. D. Kendre, Saroj Panigrahi, H. L. Tidke, K. Balchandran, Kishor D. Kucche.

2. Advances in Complex Analysis: Prof. Indrajit Lahiri, Kalyani Univ. (Convener). Speakers: Professors A. P. Singh, Santosh B. Joshi, Abhijjit Banerjee, V. Allu, Tarakant Nayak.

3. Advances in Theoretical Fluid Mechanics: Prof. Manoranjan Misra, IIT Ropar (convener). Speakers: Professors T. Sahoo, S. N. Bora, R Usha, K. C. Sahu, B. S. Padmavathi.

4. Homology Theory of Transformation Groups: Prof. J. K. Maitra, R. D. Univ. Jabalpur. (Convener). Speakers: Professors Satya Deo, Amiya Mukherjee, H. K. Mukherjee, H. K. Singh, S. S. Khare.

5. Nonlinear Analysis, Optimization and Applications: Prof. P. Veeramani, IIT Madras (convener). Speakers: Professors V. Vetrivel, D. R. Sahu, C. S. Lalitha, Joydeep Datta, Q. H. Ansari.

6. Commutative Algebra: Prof. Jugal Verma, IIT Bombay (convener). Speakers: Professors J. K. Verma, D. P. Patil, H. Ananthnarayan, Indranath Sengupta, Neena Gupta, R. Gujjar, Mousumi Mandal.

MINUTES OF THE 82^{nd} ANNUAL GENERAL BODY MEETING OF THE INDIAN MATHEMATICAL SOCIETY

The Annual General Body Meeting of the Indian Mathematical Society was held on Friday, the 30^{th} December 2016 at 12 noon in the Lecture Hall of the University of Kalyani, Kalyani, West Bengal under the presidentship of Prof. D. V. Pai.

The following business was transacted.

Item No. 1. To confirm the Minutes of the General Body meeting held on Wednesday, December 30, 2015 at 12 noon in the Auditorium of Visvesvaraya National Institute of Technology (VNIT), Nagpur.

The Minutes of the General Body meeting held on December 30, 2015 at 12 noon at VNIT, Nagpur were confirmed.

Item No. 2 : To receive the report of the General secretary for the year 2016

Report of the General Secretary for the year 2016.

1. Prof. D. V. Pai, IIT, Gandhinagar was informed of his election to the post of President of the IMS. Elected council members were informed accordingly.

2. The IMS News Letters - No. 35 in March 2016 and No. 36 in August 2016 - were published. These are also displayed on the website of the Indian Mathematical Society. The soft copies of these News Letters have been sent by e-mails to all the members of the Society.

3. The meeting of the Academic Planning Committee for the IMS Conference 2016 was held on Sunday, the 3rd July 2016 from 11.00 am in the conference room of the Guest House of the Savitribai Phule Pune University, Pune. The meeting was presided over by Prof. D. V. Pai. The names for four memorial award lectures, plenary talks, invited talks, list of symposia and their conveners were finalized in the meeting.

4. A. Narasinga Rao Memorial Prize for the year 2014 has been awardrd to Dr. K.

B. Mangang, Department of Mathematics and Computer Science, Mizoram University, Tanhril, Aizwal, 796004 for his paper entitled "Equicontinuity of the limit function of a sequence of equicontinuous functions" published in the Journal of the Indian Math Society, Vol 81 (2014), 115-121.

5. The Prof. A. K. Agarwal Award for 2015 has been awarded to Abhishek Banerjee, Department of Mathematics, Indian Institute of Science, Bengaluru for his paper "Action de Hopf sur les operateurs de Hecke modulaires tordus" published in the Journal of Noncommutative Geometry, Vol. 9, No. 4 (2015) , 1155-1173.

6. No paper was found up to the mark for the award of Prof. A. M. Mathai Award for the year 2015.

7. P. L. Bhatnagar Memorial Prize for 2016 has been awarded to Mr. Kapil Pause (Goa) for being the top scorer for the Indian Team at the 57th International Mathematics Olympiad (IMO) held during July 616, 2016 at Hong Kong.

8. A meeting concerning digitization of the old issues of the Journal of the Indian Mathematical Society (JIMS) was held on Monday, the 20^{th} June 2016, at 11.00 am in the Department of Mathematics, Savitribai Phule Pune University, Pune. The meeting was attended by Prof. N. K. Thakare (General Secretary, IMS), Mr. Somshekhar Thalange (Informatics Publishing Ltd.), Prof. R. M. Kumbhar (Librarian, S. P. Pune University) and Prof. M. M. Shikare (Admn. Secretary, IMS). In the meeting the practical aspects of the digitization of the back volumes were discussed. It was decided that Prof. Kumbhar will provide to IMS the detailed inventory of available back volumes of the JIMS in the Library of S. P. Pune University. The Volumes will be issued on the name of Prof. Shikare who will then handover them to Informatics Publishing Limited (IPL), Bangalore for digitization.

9. Prof. Kumbhar provided the inventory of 43 back volumes of JIMS published from the year 1932 to the year 1976 which are available in the Library of S. P. Pune University. These volumes have been handed over to Informatics Publishing Limited (IPL), Bangalore. The digitization is expected to be completed by the end of December 2016. The staff of the Library of S. P. Pune University, Pune extended its full cooperation in the process.

10. During the year of the report 160 new life members and 14 annual members of IMS were enrolled. 46 persons became session members of the IMS for 2016 conference.

11. A timely guidance and the help has been provided to Prof. Sanjib Kumar Datta, Local organizing secretary of the 82^{nd} Annual Conference of IMS pertaining to raising of funds, local arrangements and inaugural function of the conference.

12. Each Life Member of the Society is now allotted a Permanent Membership Number. The complete list of Life Members of the Society is now available on the IMS website.

13. The complete catalogue of the back volumes of the periodicals published by the Society as well as those received in exchange by the Society and available in the IMS Library, Chennai is now available on the IMS website.

14. The General Secretary thanks Prof. J. R. Patadia for maintaining and updating the website of the IMS.

15. The General Secretary thanks Prof. M. M. Shikare and Prof. S. K. Nimbhorkar for extending substantial help in performing the duties of the general secretary.

Item No. 3 : To receive the Report of the Academic Secretary 2016.
Report of the Academic Secretary for the year 2016.

Based on the deliberations during the APC meeting held on July 3, 2016 at the S. P. Pune University, Pune, following speakers/ programmes were finalized and letters of invitation were sent to:

Plenary Speaker:
1. Prof. H. Mhaskar, Claremont Graduate University, Claremont, USA.

Speakers for IMS Memorial Award Lectures:

(i) 30^{th} P. L .Bhatnagar Memorial Award Lecture - Prof. G. P. Rajasekhar, IIT Kharagpur.
(ii) 27^{th} Hansraj Gupta Memorial Award Lecture - Dr Neena Gupta, ISI Kolkata.
(iii) 27^{th} Srinivasa Ramanujan Memorial Award Lecture - Prof. Eknath Ghate, TIFR Mumbai.
(iv) 27^{th} V. Ramaswamy Iyer Memorial Award Lecture - Prof. C. S. Aravinda, TIFR - CAM, Bangalore.

Invited Speakers:

One hour Talk

1. Prof. Sanjeev Dhuradhar, IUCAA, Pune.

Half Hour Talks
2. Prof. G. P. Singh,V. N. I. T., Nagpur.
3. Prof. S. Sundar, IIT Madras.
4. Prof. R. Thangadurai, H. R. I. Allahabad.
5. Prof. Sudeshna Banerjea, Jadavpur University, Jadavpur.
6. Prof. D. K. Ganguly, Calcutta University, Kolkata.
7. Prof. Kapil K. Sharma, SAU, New Delhi.
8. Prof. Uma Basu, Calcutta university, Kolkata.

As per convention the winners of A. Narsinga Rao Memorial Prize for 2014 and Prof. A. K. Agarwal Award for 2015 were also invited to give half an hour talk. The speakers are as follows:
1. A. Narsinga Rao Memorial Prize for 2014 - Dr K. B. Mangang, Mizoram University.
2. Prof. A. K. Agarwal Award for 2015 - Dr Abhishek Banerjee, Indian Institute of Science, Bangalore.

Six symposia along with their conveners were finalised and conveners were requested to invite the speakers for their symposium. Following are the details:

1. Integral Inequalities and Applications: Prof. S. D. Kendre, S. P. Pune Univ. (convener). Speakers: Professors S. D. Kender, Saroj Panigrahi, H. L. Tidke, K Balchandran, Kishor D. Kucche.

2. Advances in Complex Analysis: Prof. Indrajit Lahiri, Kalyani Univ (Convener). Speakers: Professors A. P. Singh, Santosh B. Joshi, Abhijjit Banerjee, V. Allu, Tarakant Nayak.

3. Advances in Theoretical Fluid Mechanics: Prof. Manoranjan Misra, IIT Ropar

(convener). Speakers: Professors T Sahoo, S. N. Bora, R. Usha, K. C. Sahu, B. S. Padmavathi.

4. Homology Theory of Transformation Groups: Prof. J. K. Maitra, R. D. Univ Jabalpur (Convener). Speakers: Professors Satya Deo, Amiya Mukherjee, H. K. Mukherjee, H. K. Singh, S. S. Khare.

5 Nonlinear Analysis, Optimization and Applications: Prof. P. Veeramani, IIT Madras (convener). Speakers: Professors V. Vetrivel, D. R. Sahu, C. S. Lalitha, Joydeep Datta, Q. H. Ansari.

6. Commutative Algebra: Prof. Jugal Verma, IIT Bombay (convener). Speakers: J. K. Verma, D. P. Patil, H. Ananthnarayan, Indranath Sengupta, Neena Gupta, R. Gujjar, Mousumi Mandal.

For the IMS prizes 10 papers were received : four in Group 1, one in Group 2, three in Group 4, one each for AMU Prize and V M Shah Prize. No paper war received for Group 3, 5 and 6.

113 contributory papers were received for presentation - 11 in Section A, 11 in Section B, 32 in Section C, 17 in Section D, 5 in Section F, 6 in Section G, 1 in Section H, 3 in Section I, 9 in Section J, 10 in Section K, 2 in Section L, 1 in Section M, 5 in Section N.

Acknowledgement : I wish to place on record my sincere thanks to all the members of APC. In particular Prof. N K Thakare and Prof. Satya Deo provided valuable guidance at various stages.

Item No. 4: To receive the report of the Administrative Secretary for the year 2016.

Report of the Administrative Secretary for the year 2016

1. E-mails of thanks and appreciations were sent to the speakers of the Memorial Award lectures, Invited talks and conveners of the symposia, local organizing secretary of the 81st Annual Conference of IMS held at National Institute of Technology (NIT), Nagpur in Dec. 2015. The Minutes of the Council Meeting and the General Body meeting held at NIT, Nagpur have been prepared.

2. An arrangement was made on 20th June 2016 at the Department of Mathematics, Savitribai Phule Pune University (SSPU) for holding the meeting (concerning the digitization of old volumes of JIMS) of the office bearers of IMS, the representatives of the India Publishing Limited (IPL), Bangalore and the Librarian of the S. P. Pune University, Pune.

3. Arrangements were made for holding the meeting of the Academic Planning Committee on Sunday, the 3rd July 2016 from 11.00 am in the conference room of the Guest House of the Savitribai Phule Pune University, Pune.

4. The print copies of JIMS Volume 83, nos. 1-2 (January June 2016) and JIMS Volume 83, nos. 3-4 (July Dec. 2016) were received from Parashuram Process, Pune and preserved in the Library of the Mathematics Department, S. P. Pune University, Pune. The camera ready copies of The Math. Student, Vol. 85 (1-2), 2016, and The Math. Student, Vol. 85 (3-4), 2016, were forwarded to the Parshuram Process for the purpose of printing. The printed copies have been received from the press and preserved in the Library of Math. Dept., SPPU.

5. The copies of JIMS Vol. 83 (Nos. 1-2) (2016), Vol. 83 (Nos. 3-4)(2016) and The Mathematics Student Vol. 85 (Nos. 1-2) (2016) have been sent to the subscribing

institutes and Universities by registered post. The account of corresponding expenses has been maintained.

6. The 43 copies of the back volumes of the JIMS published during 1932 and 1976 were taken into custody from the Library, S. P. Pune university, Pune. The volumes were then handed over to Mr. Somshekhar Thalange, Informatics Publishing Ltd. (IPL) on 1 / 11 / 2016 for the purpose of digitization. The digitization is in progress.

7. Substantial help was rendered to the General Secretary Prof. N. K. Thakare in the finalization of Newsletter Nos. 33 and 34. The Newsletters were prepared and sent by e-mails to the Life members of the IMS (with the help of the assistant).

8. The invitation was sent to Mr. Kapil Pause, Goa for attending the Inaugural function of IMS conference and receiving the P. L. Bhatnagar memorial prize awarded to him for the year 2016. The records / documents such as minutes of the council meeting, minutes of the general body meeting, copies of the News Letters, copies of agenda for council meeting, General body meeting etc. have been maintained.

Item No. 5: To consider the Audited Statement of Accounts for the year 2015 2016 and budget for the year 2017 2018.

The Audited Statement of Accounts for the year 2015 2016 and budget for the year 2017 2018 presented by the Treasurer, Prof. S. K. Nimbhorkar were approved.

Item No. 6. To receive the report of the Editor, The Journal of the Indian Mathematical Society for 2016.
Report of the Editor, Journal of the Indian Mathematical Society (2016).

Manuscript Status:

(a) Number of papers pending with the referee or under process at the end of 2015:	03
(b) Number of manuscripts received during the year 2016:	70
Total:	73

(i) Number of Manuscript accepted during 2016:	16
(ii) Number of manuscript rejected during 2016:	40
(iii) Number of manuscript with the referees during 2016:	17
Total:	73

Publication Status (print):

Volume 83(1 - 2) 2016 of the Journal of the Indian Mathematical Society was released during the Inaugural function of the Society in Dec 2015 and sent to the subscribers in Jan 2016.
Volume 83 (3 - 4) 2016 of the Journal of the Indian Mathematical Society was released in September 2016 and sent to the subscribers. Volume 84 (1-2) 2017 is under preparation for release in Jan/Feb 2017.

Publication status (online): The Informatics India LTD people are ready to publish online JIMS Vol. 84 (1-2) 2017 on Jan. 1, 2017. I have supplied them the complete set to be put online. The back volumes are yet to be put online.

Acknowledgements: The Chief Editor, JIMS puts on record his grateful thanks to the members of the Editorial Board of JIMS, referees of research papers from India and abroad for their assistance and support to JIMS. The editor also expresses his sincere thanks to the Treasurer of IMS, Prof. S. K. Nimbhorkar and the Administrative Secretary Prof. M. M. Shikare for providing valuable assistance in

the overall publications and dispatch of JIMS.

Item No. 7: To receive the report of the Editor, Mathematics Student for 2016.

Report of the Editor of The Mathematics Student for 2016.

Publication Status: The soft copy of the Vol. 85, Nos. 1- 2, January-June (2016) of The Mathematics Student was sent on line in June 2016 and that of the Vol. 85, Nos. 3- 4, July-December (2016) of The Mathematics Student was sent on line during November 27-December 3, 2016 to all the Life Members (who have registered their E-mail id on line on imsgoesgreen@gmail.com or jamanadaspat@gmail.com or sknimbhorkar@gmail.com) at their registered E-mail addresses. Both these soft copies are available on the Societys website as well.

There is no backlog as regards to the publication of the Mathematics Student.

Manuscript Status: 66 manuscripts are received during the period from December 24, 2015 to December 23, 2016 and 11 manuscripts were reported as pending with the referees in the last report. Of these total 77 manuscripts, 14 are accepted, 51 are not accepted and 12 are pending with the referees.

Acknowledgements: We take this opportunity to put on record our sincere thanks and profuse gratefulness to Members of the Editorial Board and the learned referees for their continuous support and assistance in our sustained efforts for timely publication of the Mathematics Student. The Society looks forward to the active assistance in the constructive reviewing work as well as quality contributions from the large pool of mathematicians from India and abroad.

We also expresses our sincere thanks to the Administrative Secretary Prof. M. M. Shikare and the Pune Press for their assistance in getting the Vol. 85, Nos. 1-2, January-June (2016) as well as the Vol. 85, Nos. 3-4, July-December (2016) of the Mathematics Student printed, and thus in its timely publication.

Call for contributions: Contributions are welcome and are assured of all the sincere efforts for prompt processing.

Item No. 8: To consider the venue of the 83rd Annual Session of the society to be held in 2017.

The IMS accepted the firm invitation from the Registrar, Sri Venkateswara University, Tirupati (A. P.) for organizing the 83rd Annual Conference of the Indian Mathematical Society. Prof. S. Sreenadh, Department of Mathematics, Sri Venkateswara University will be the Local Organizing Secretary.

Item No. 9: Announcements of the results of the following elections:

(i) President for the year 2017-2018;

(iii) Three members of the Council for a period of three years w. e. f. April 01, 2017.

The returning officer Prof. M. M. Shikare reported that the following members are declared elected.

President for 2017-18 : Prof. Manjul Gupta, IIT, Kanpur is elected as the President of IMS for a period of one year with effect from April 01, 2017.

Members of the Council :
Dr. G. P. Singh, VNIT, Nagpur; Prof. S. S. Khare, North Eastern Hill University, Shillong; and Prof. Raj Shekhar Reddy of Tirupati University, Tirupati (A. P.)

have been elected as Members of the Council of IMS for a period of three years w. e. f. April 1, 2016.

Item No. 10: Any other item with the permission of the chair.

The Meeting ended with a vote of thanks to the President of IMS, the members present and the local organizers of the conference.

N. K. Thakare
General secretary
Indian Mathematical Society

Memorial Award Lectures

During every Annual Conference of the Society, the following Memorial Award Lectures are arranged as a part of the Academic Programme (each award lecture is of one hour duration with no other parallel session) :

(1) P. L. Bhatnagar Memorial Award Lecture (Instituted in 1987).
(2) Srinivasa Ramanujan Memorial Award Lecture (Instituted in 1990).
(3) V. Ramaswamy Aiyer Memorial Award Lecture (Instituted in 1990).
(4) Hansaraj Gupta Memorial Award Lecture (Instituted in 1990).
(5) Ganesh Prasad Memorial Award Lecture (Instituted in 1993 ; and delivered every alternate year).

Each of these Lectures carry a token honorarium of Rs. 5000/- along with a citation.

Members of the Society are requested to suggest the names of the prospective speakers, along with their brief write-up, for these awards. The suggestions may be sent to Professor N. K. Thakare, the General Secretary of the Indian Mathematical Society up to June 30, 2016. His e-mail address is nkthakare@gmail.com

IMS Sponsored Lectures

To popularize mathematics and to create awareness regarding the Society and its activities in the Country, the Society has a Scheme of **Sponsored Lectures**. It provides a token support of Rs. 1000/- to a number of Departments / Institutions for organizing popular and semi technical lectures.

Prof. Ravi Kulkarni has also donated Rs. 1,25,000/- to organize **Meenakshisundaram–Patoudi lectures**.

Members arranging such lectures are required to send the report of the arranged lectures to The Treasurer, IMS, with a copy to The Editor, `The Mathematics Student`.

Society intends to enhance this activity of organizing such lectures at more and more centers. Members desirous to organize such lectures at their centers may write to the General Secretary Prof. N. K. Thakare through their respective Head of the Department.

Periodicals published by the Society

The Society publishes two periodicals: `The Journal of the Indian Mathematical Society` (JIMS; the Journal ; ISSN 0019-5839) and `The Mathematics Student` (Math Student; the Mathematics Student; ISSN 0025-5742), both of which are quarterly. The details can be found on the website: www.indianmathsociety.org.in

Subscriptions

Annual subscription for the Journal / the Mathematics Student :
For each periodical

- Rs. 1500/- for Libraries of Educational Institutions in India - provided the subscription is direct or through an agent who gives complete name and address of the subscriber. The supply will be made directly to the subscribing library. If an agent subscribes for an educational Institution in India, the subscription is Rs. 1800
- Rs. 8000/- for others for personal use or to the agents who do not supply the name and address of the end user.
- $150/- for personal use or for Libraries outside India.

The agents are entitled to 15 % discount on their orders.

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It may please be noted that the contents of `The Mathematics Student` will continue to be available on the Society's website www.indianmathsociety.org and a physical copy of `The Mathematics Student` will continue to be available at the IMS Library (Ramanujan Institute of Advanced Study in Mathematics, Madras University, Chennai) as well as at the Registered Office of the Society (Department of Mathematics, S. P. Pune University, Pune 411 007) for reference during office hours.

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- *Membership form is available on the IMS website.*

Business Correspondence and Payments:

All business correspondence be addressed to Prof. S. K. Nimbhorkar, Treasurer, IMS; Department of Mathematics, Dr. B. A. M. University, Aurangabad 431 004 (Maharashtra), India. All payments should be sent to Prof. S. K. Nimbhorkar,

Treasurer, IMS by DD / payable at par cheque drawn in favor of **"The Indian Mathematical Society"** payable at **Aurangabad** (Maharashtra), India at the address mentioned in the above.

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IMS Library:
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Guidelines for acceptance of Donations to the Society:

There will not be any further institution of Memorial Award Lectures. (This point was discussed in the earlier meetings of the Council and such was the consensus).

The donation amount will not be less than Rupees Five Lacs. (There could be an upward revision of this amount from time to time).

The donor may be an individual or a trust or a group of individuals.

The Indian Mathematical Society will solely and independently own the amount donated to it.

A prospective donor should approach the General Secretary of the Indian Mathematical Society with a Offer. Keeping with the spirit of this Policy Guidelines and if so felt necessary, referring to the Council whether the proposal be negotiated or not, in his wisdom, the General Secretary will negotiate the terms and conditions for each donation proposal and will put it before the Council for its consideration and approval. The Council will deliberate on the proposal, and after modifications, if any, may accept the proposal through a special resolution with specific details mentioning the terms and conditions. This will be published in the IMS News Letter after the Donor agrees to the resolution of the Council.

Ordinarily during every Annual Conference of the Society there are several Invited Lectures and Symposia running in parallel sessions. One of these academic programmes may be permanently marked / identified as so and so sponsored programme in the (fond) memory of or so and so sponsored programme in the honor of as per the wish of each donor by the Council. This programme may be arranged in a parallel session during the Conference.

Each year, the Council through its Academic Planning Committee (APC) will be the final authority in this regard to finalize the name of a speaker of an invited talk or the names of the Symposia speakers for this sponsored programme. The modus operandi for identifying the speaker(s) may be decided by the Council.

The invited speaker(s) will be the guest of the host institution. In case of an honorarium, if any, to the invited speaker, the amount of the honorarium will not exceed the honorarium amount for the existing Memorial Award Lectures.

Ordinarily train travel to the extent of AC-2 Tier be reimbursed. However, in special cases the domestic air travel may be considered.

Not withstanding the above,

(A) An offer of a donation with a stipulated purpose (not as part of the corpus), may be accepted by the Council on its merit.

(B) An offer of a donation of any amount in general, without any stipulated conditions, may be accepted by the Council on its merit as a part of the General Purpose Corpus.

The Council reserves its right whether or not a particular donation be accepted.

Green initiative taken by the Society-
A fervent appeal to all members of the Society

As a part of the "Green Initiative "taken by the Society (for further details, refer Society's website www.indianmathsociety.org.in), the Council of the Society has decided to send online the soft copy of the Mathematics Student / give online access to the Mathematics Student to all the Life members instead of supplying the hard copy. For this purpose, all the members of the Society are requested to register their e-mail address online, along with Name and the **Unique Membership Number** therein, to J. R. Patadia on **imsgoesgreen@gmail.com** or **jamanadaspat@gmail.com** so that further necessary action can be taken.

Important Change:
This newsletter also includes the abstracts of accepted papers for presentation as well as abstracts of invited talks, etc. in the just ended annual conference. From this issue of the newsletter this policy will be followed every year and such abstracts shall not be included in the issues of **The Mathematics Student**.

N. K. Thakare, General Secretary, IMS
c/o Department of Mathematics,
Savitribai Phule Pune University,
Pune-411007 (M.S.)
March 25, 2016.

Abstracts received for the 82^{nd} IMS Conference held at Department of Mathematics, University of Kalyani, Kalyani, Nadia, West Bengal

Abstract of the Plenary Talk

Fourier series: myths, facts, and applications, by
Hrushikesh Mhaskar, Claremont Graduate University, Claremont, USA.
It is widely believed that in order to approximate or analyze a 2-periodic function on the real line in the uniform norm, an expansion in Fourier series has several disadvantages. The Fourier series does not necessarily converge uniformly, and the Fourier coefficients reveal no local information about the target function, such as the locations of discontinuities. Moreover, local\ bad" behavior of functions affects the convergence throughout the period. We will introduce the basic concepts, and describe our research in the direction of approximation by trigonometric polynomials and waveletlike representations using Fourier coefficients to illustrate how easy it is to perform these tasks using spectral data. We will discuss some applications, and mention some extensions of the theory.

Abstracts of the Memorial Award Lectures

(1) Tumor growth-chemo-mechanical modelling and existence theory by G. P. Raja Sekhar, IIT, Kharagpur.
There are many experimental models to understand tumor growth in a bio-reactor. It will be important and quite challenging to put these results in a theoretical framework. Mathematical modelling is one of the best tools to understand the experimental results in terms of physical and bio-chemical mechanisms. This talk introduces some of the developments to model the mechanical behaviour of tumour at the macro scale using porous media approach. Our purpose is to focus on the well-posed-ness of these mathematical models which are governed by partial differential equations. In most of the general situations it is difficult to find a classical solution. Therefore one can break the existence problem into two subparts: (i) find a weak or generalized solution (means less smooth than the required solution) (ii) and then show that this weak solution is smooth via suitable regularity techniques. We study related existence and uniqueness results for the combined hydrodynamic and nutrient transport problems inside a tumor. We support these existence results in limited cases with series solution. We explain important results on necrosis formation in a tumor. Further, in specific cases, we show correlations with clinical data.

(2) The Tau of Ramanujan, by Eknath Ghate, TIFR, Mumbai.
This talk will be a leisurely introduction to Ramanujan's tau function which takes the values

1,-24, 252, -1472, 4830, ...

These number have been the guiding force behind several themes in number theory, and continue to tantalize us till today.

(3) Geodesic conjugacies of surfaces, by C. S. Aravinda, TIFR CAM, Bangalore.
The question of whether a time-preserving geodesic conjugacy determines a closed, negatively curved Riemannian manifold up to an isometry is one of the central problems in Riemannian geometry. While an answer to the question in this generality has yet remained elusive, we give an overview of results on surfaces.

(4) Some problems on polynomial rings, by Neena Gupta, ISI, Kolkata.
Polynomial rings have been a central object of study for algebraists and geometers for more than a hundred years. In this talk we will discuss some results and examples on a cancellation problem about polynomial rings and their connections with

some of the other fundamental problems on polynomial rings.

Abstracts of the Invited Talks

(1) Syzygies in Mathematics and Astronomy: Detecting gravitational waves with space detectors, by Sanjeev Dhurandhar, IUCAA, Pune.
Cancellation of laser frequency noise in interferometers is crucial for attaining the requisite sensitivity of the triangular three spacecraft Laser Interferometric Space Antenna (LISA). Since it is impossible to maintain equal distances between spacecraft laser noise cancellation must be achieved by combining the six beams appropriately with time-delays. A systematic formalism based on computational commutative algebra will be presented. The relevant data combinations form the first module pf syzygies. The module is over a polynomial ring in three variables corresponding to the three time delays. Specifically, we list several sets of generators for the module whose linear combinations generate the entire module. This is the simplest model of LISA. However, we can generalise to the case when armlengths are time dependent. In this case we have to deal with non-commutative algebra and the problem is much more difficult. We shall indicate the directions.

(2) 100 Years of General Relativity and its role in Cosmology, by G. P. Singh,.VNIT, Nagpur.
Einsteins theory of relativity is considered as one of the best scientific achievement of the 20th century. Cosmology, based on theory of relativity, is mainly concerned with the study of the large scale structure, origin and evolution of the universe. The scope of our understanding of the universe is limited as observing instruments are limited in their ability to observe and our knowledge of the laws of physics, on which we base our explorations of the universe, is by no means complete. In this talk brief introduction of theory of relativity and its role in cosmology will be discussed. Further, Recent developments in cosmology will also be presented.

(3) Nonlinear conservation law models for production system, by S. Sundar, IIT, Madras.
In general, any production system can be viewed as a Supply Chain Network. Understanding the bottlenecks in a network flow is mathematically challenging. In this talk I will be focusing on nonlinear conservation law PDE models for such networks and thereon on some of our theoretical and numerical results.

(4) Four Exponentials Conjecture; Erdos Problem, by R. Thangadurai, HRI, Allahabad.
In 1944, Alaglou and Erdos asked the following question. Let p and q be two distinct prime numbers. Is it true that p^x and q^x are integers only if x is an integer? This question was raised in connection with their work on highly composite numbers. There is a folklore conjecture, namely, Four Exponentials Conjecture, which answers this question positively. Indeed, the conjecture states as follows. Let x_1 and x_2 be two Q-linearly independent complex numbers and y_1 and y_2 be two Q-linearly independent complex numbers. Then at least one of the numbers $e^{x_1y_1}, e^{x_1y_2}, e^{x_2y_1}, e^{x_2y_2}$ is a transcendental number. We shall talk about this conjecture and the problem of Erdos et al.

(5) Linearised Theory of Water Waves and Singular Integral Equations, by Sudeshna Banerjee, Jadavpur University, Kolkata.
Wave phenomena are encountered in almost all branches of Mathematical physics. According to Sommerfield Eversince waves were studied water waves have served a natural scientist as a model for wave theory in general. Here we shall discuss about the basic equations in the linearised theory of water waves and the application of

singular integral equations in the problem of water wave propagation in presence of obstacles.

(6) Numerical Study Singularly Perturbed Differential Difference Equations by Kapil K. Sharma, SAU, New Delhi.
Singularly perturbed differential difference equations are ubiquitous in mathematical modeling of several real life phenomena and provide a realistic simulation of the phenomena. Due to presence of differential and difference terms simultaneous, till now there is no method available to find their exact solution. Therefore, we land to the numerical approach to simulate such type of problems. In the development of numerical methods to find the approximate solution of SPDDEs, there are two major difficulties, namely, i) due to presence of singular perturbation parameter and ii) due to presence of difference terms in form delay or advance. In the present talk, there is an attempt to introduce the audience with this class of differential equation. Further, the development to find their solution and our recent work on development of robust numerical methods to find approximate solution of the singularly perturbed parabolic differential difference equations.

(7) Some remarks on Projection of Big Planar Sets by D. K. Ganguly, Calcutta University, Kolkata.
In 1920, H. Steinhaus [3] proved that the distance set $D(A) = \{|x - y| \colon x, y \in A\}$ of a nonempty set A in $\mathbb{R}$ contains an interval of the form $[0, \alpha)$ $(\alpha > 0)$ if A is a set of positive Lebesgue measure and the same conclusion holds for the difference set $\Delta(A) = \{x - y \colon x, y \in A\}$ provided the subset A of $\mathbb{R}$ is of positive measure. The category analogue of the result of Steinhaus was established by S. Piccard [2]. She proved that if A is a set of second category in $\mathbb{R}$ having the property of Baire then $\Delta(A)$ contains an interval of the form $[0, \alpha)$. J. Ceder and D. K. Ganguly [1] introduced the concept of different types of projections on planar sets in sense of measure and category to provide an alternative way for interpreting the results of Steinhaus and Piccard. In this paper attempt is made to study some descriptive properties of such projections and strengthen the results of Steinhaus and Piccard. The main object of this paper is to give an affirmative answer to a question raised by Ceder and Ganguly by using Martins Axioms.

(8) Use of wavelets in the numerical solution of differential equations by Uma Basu, Calcutta University, Kolkata.
The development of a numerical scheme to obtain the solution of advection diffusion equation in the orthonormal wavelet bases of Haar family with a finite interval in $\mathbb{R}$ is discussed. Haar operational method is simple as it converts the problem into a system of algebraic equations. The Haar function is an odd rectangular pulse pair, is the simplest and oldest orthonormal wavelet with compact support. Here the Haar basis for the highest order of differential is taken and then the series is integrated to obtain lower order differentials. Tedious calculations are avoided with the aid of collocation techniques. These reduce the aforesaid advection-diffusion transport equation to a system of nonhomogeneous first order coupled ordinary differential equations. A number of examples are given for numerical illustration where this scheme has been employed. It is found that the scheme is efficient and user-friendly.

(9) Some Dynamical Properties of the Limit Function of a Sequence of Functions by K. B. Mangang, Mizoram University, Tanhril, Aizwal.
The dynamical properties such as equicontinuity, G-equicontinuity and minimality of the limit function f of a sequence (f_n, X) of dynamical systems have been

studied. It has been found that the orbital limit function of a sequence of equicontinuous function is equicontinuous. An example has been given to support this fact. Likewise it has been found that the orbital limit function of a sequence of G-equicontinuous function is G-equicontinuous. We have given a sufficient condition so that the uniform limit of a sequence of minimal dynamical systems is minimal.

(10) Hopf actions on twisted modular Hecke operators by Abhishek Banerjee, Assistant Professor, Indian Institute of Science, Bengaluru.
We consider modular Hecke operators twisted by an elementof $SL_2(\mathbb{Z})$. The collection of twisted operators carries a naturalaction of the modular Hecke algebra of Connes and Moscovici. We also define Rankin-Cohen brackets on twisted modular Hecke operators by means of a Hopf algebra action. Finally,we consider a tower of modular Hecke operators twisted tovarious degrees and describe operations between the levelsof the tower in terms of Hopf algebra actions.

Abstracts of the lectures delivered in symposia

(1) Symposium on Symposium on Integral Inequalities and Applications
Convener: Dr. S. D. Kendre, S.P. Pune University, Pune.
Email: sdkendre@yahoo.com

(i) Some Nonlinear Integral Inequalities of Pachpatte Type, by S. D. Kendre, Department of Mathematics, Savitribai Phule Pune University, Pune 411007, Email-Id: sdkendre@yahoo.com
Inequalities have played a dominant role in the development of all branches of mathematics. Differential and integral inequalities are major tools in the analysis of differential and integral equations that occur in nature. It has been observed that these inequalities provide explicit known bounds on function(s) appearing in differential, integral and other equations. Thus they have found widespread acceptance in a variety of applications. Because of this, it is not surprising that numerous studies of new types of inequalities have been proved in order to achieve many new developments in various branches of mathematical science. In 1919, Gronwall first established the integral inequality while investigating the dependence of a system of differential equations with respective parameter. Also in 1943, Bellman presented the integral inequality, which is an important tool to obtain various estimates in theory of ordinary and stochastic differential equations. The year 1973 marked a new beginning in the theory of inequalities due to the discovery of the remarkable inequality by B. G. Pachpatte. Based on Pachpatte's work we have established nonlinear integral inequalities in one and two variables of more general type. These inequalities are key tool in obtaining bounds on solutions of ordinary and partial differential equations.

(ii) Distribution of Zeros of Solutions of Differential Equations by Saroj Panigrahi, School of Mathematics & Statistics, University of Hyderabad, Central University Campus, PO, Gachibowli, Hyderabad-500 046.
Email: panigrahi2008@gmail.com
The lower bounds of the spacing $b-a$ or $a'-a$ of two consecutive zeros or three consecutive zeros of third order differential equations of the form

$$y'' + q(t)y' + p(t)y = 0 \tag{1}$$

are derived under very general assumptions on p and q. These results are then used to show that $t_{n+1} - t_n \to 0$ or $t_{n+2} - t_n \to 0$ as $n \to \infty$ under suitable assumption p and q, where $< t_n >$ is a sequence of zeros of an oscillatory solution of (1). The nature of the distance between consecutive two zeros or three zeros

has been studied with the help of the Lyapunov-type integral inequality. An estimate for the number of zeros of an oscillatory solution of 1 with $q = 0$ has been obtained on a compact interval. The Opial-type integral inequalities are used to derive lower bounds of the spacing $d - a$ or $b - d$ for a solution $y(t)$ of (1) with $y(a) = 0 = y'(a)$, $y'(c) = 0$ and $y''(d) = 0$ where $d \in (a, c)$ or $y'(c) = 0, y(b) = y'(b)$ and $y''(d) = 0$ where $d \in (c, b)$.

(iii) B. G. Pachpatte's Wisdom by H. L. Tidke, Department of Mathematics, School of Mathematical Sciences, North Maharashtra University, Jalgaon (India). Email: tharibhau@gmail.com
The aim of the present talk is to present brief biography of B. G. Pachpatte and to provide an overview of some of his basic discoveries over the past four decades. In particular, we focus our attention to his fundamental research findings related to integral and finite difference inequalities and their applications. We hope that it will further broaden the developments and the scope of their applications. Let us explore wisdom of B. G. Pachpatte.

(iv) Controllability of Nonlinear Fractional Dynamical Systems by K. Balchandran, Department of Mathematics, Bharathiar University Coimbatore.
Email: kbkb1956@yahoo.com
In this talk we shall discuss about the fractional differentiation and integration with historical notes. Properties of fractional derivatives and important results are stated. Fractional differential equations are introduced and the existence problem is discussed. Controllability problem for linear and nonlinear fractional dynamical systems through Mittag-Leffler functions is studied. Examples are provided to illustrate the theory.

(v) Role of Integral Inequalities in the study of Differential and Integro-differential equations by Kishor D. Kucche, Department of Mathematics, Shivaji University Kolhapur-416 004, Maharashtra, India. Email-Id: kdkucche@gmail.com
Integral inequalities appear as important tools in the study of various classes of differential and integro-differential equations. Many instances can be found in the development of the theory differential equations and integral equations are due to only the availability of the suitable integral inequalities. The aim of this talk is to is illustrate the applications of Pachpatte's integral inequalities and other similar types integral inequalities in the investigation of qualitative properties of solutions such as existence, uniqueness, continuous dependence uniqueness, different types of stabilities and the behavior of solutions for various classes of differential and integro-differential equations.

(vi) Some Dynamical Inequalities on time scales by Deepak B. Pachpatte, Department of Mathematics, Dr. Babasaheb Ambedekar Marathwada University, Aurangabad-431004(MS) India. Email-Id: pachpatte@gmail.com
The main objective of this presentation is to present some results on fundamental dynamical inequalities. In this we give some explicit estimates of certain integral inequalities on time scales, these estimates gives bounds on unknown functions which can be used in studying qualitative aspects of certain dynamic equations. We present some applications of the result also.

(2) Symposium on Advances in Theoretical Fluid Mechanics
Convener: Manoranjan Mishra, IIT Ropar, Email: manoranjan@iitrpr.ac.in

(i) Topological change and path instability in rising air bubble by Kirti Chandra Sahu, Department of Chemical Engineering, IIT Hyderabad. Email: ksahu@iith.ac.in

The dynamics of a rising air bubble in a liquid (Newtonian/non-Newtonian fluid) will be discussed. A few fundamental questions, such as (i) are the dynamics of bubbles and drops similar if we invert the gravity, (ii) what is the largest size of bubble one can create without breaking (iii) when can we assume azimuthal symmetric, will be addressed. The bubble dynamics in different regimes in the Gallilei and Eotvos numbers plane will be discussed in terms of shapes, topological changes and trajectories followed by the bubble. Both numerical and experimental results will be presented in the symposium.

(ii) Film Flows down Inclined Substrates: Models, Dynamics and Stability by R. Usha, Department of Mathematics, IIT Madras. Email: ushar@iitm.ac.in Different models for evolution of film flows down inclined substrates will be presented in this talk and these are based on the classical long wavelength analysis, energy integral methods and weighted integral methods. The agreement of the model results on the thickness of the film and the flow rate, with the theoretical asymptotic properties close to instability threshold, and with experimental predictions beyond threshold will be shown. The dynamics and stability of the base flow will be analyzed in detail through dynamical systems approach for the model derived using energy integral method.

(iii) Stokes Flow Past Non-Spherical Porous Bodies by B. Sri Padmavati, School of Mathematics and Statistics, University of Hyderabad.
Email: bs.padmavathi@gmail.com
The study of Stokes flow past porous particles is an important one owing to numerical applications in science and engineering. There has been an extensive study by researchers of problems where the porous bodies are spherical in shape. We now discuss a new and simple method to discuss the problem of Stokes flow past a porous body of non-spherical shape and give the solution in some illustrative examples.

(iv) Damping of water waves by vertical porous structures at uniform and varying depths by S. N. Bora, Department of Mathematics, IIT Guwahati, Email: swaroop@iitg.ernet.in Breakwaters and wave absorbers are structures constructed in the coastal areas to protect harbours, inlets and beaches by attenuating incoming wave energy. We mainly study oblique water wave scattering by a vertical porous structure placed on an elevated horizontal bottom and on a multi-step bottom in the presence of a rigid vertical wall. A linearized friction factor is calculated to damp the motion for the horizontal bottom whereas the friction factor is taken as fixed for the multi-step bottom. It is observed that the propagating mode controls the reflection phenomenon up to a certain wave number beyond which the evanescent modes start affecting reflection. The value of the reflection coefficient decreases with an increase in the height of bottom elevation as well as in the values of porosity. Again, a multi-step bottom under the vertical porous structure is considered where the structure is divided into multiple regions according to the number of steps. With an increase in the number of steps, oscillation in the reflection coefficient is observed. This problem is also extended first by placing the rigid wall at a distance from the porous structure; and later by removing the rigid wall and considering the water region to the rear side of the porous structure to be unbounded. Corresponding studies are analyzed. Minimum admissible width of the porous structure in order to be an effective wave absorber is justified from the steep portion of the graph of the reflection coefficient

(v) Mathematical challenges in hydroelasticity in the context of ocean

engineering by T. Sahoo, Department of Ocean Engineering & Naval Architecture, IIT Kharagpur. Email: tsahoo@naval.iitkgp.ernet.in
Hydroelasticity is concerned with the mutual interaction among the hydrodynamic and elastic forces. In particular, the mutual interaction of water waves with ocean structures such as ships, breakwaters, very large floating structures (VLFS) and mobile offshore base play a significant role in applied mathematics. Another interesting branch is the interaction of water waves with floating ice sheet which is of importance in polar engineering. The associated mathematical models lead to a class of boundary value problems associated with Laplace/Helmholtz equation satisfying higher order boundary conditions on the structural boundaries. This class of boundary value problems are non-Sturm Liouville type in nature and the corresponding eigenvalues are not orthogonal in the usual sense. In the recent decades, there is a significant progress in the mathematical analysis of a large class of problems of hydroelasticity arising in Ocean Engineering and other branches of mathematical physics and engineering. In the present talk, various problems of hydroelasticity arsing on Ocean Engineering and cold region science and technology will be briefly discussed followed by a discussion on various mathematical challenges for dealing with such problems. A review of various expansion formulae for the velocity potentials and characteristics of the corresponding eigen-systems will be presented in both the cases of water of finite and infinite depths. Further, some of the recent works on the convergence of the expansion formulae for wave-structure interaction problems arising in hydroelasticity will be demonstrated. Moreover, the recent developments on blocking of flexural gravity waves in the presence of current and compressive force will be highlighted.

(3) Symposium on Advances in Complex Analysis
(Dedicated to the memory of Late Prof. B. K. Lahiri)
Convener: Indrajit Lahiri, University of Kalyani, West Bengal.
Email: ilahiri@hotmail.com

(i) Escaping Sets of Transcendental Entire Functions by Anand Prakash Singh, The Central University of Rajasthan, Kishangarh, Rajasthan.
Email: singhanandp@rediffmail.com; apsingh@curaj.ac.in
For a transcendental entire function f, let f^n denote the n^{th} iterate of f. The set $I(f) = \{z \in \mathbb{C}\colon f^n(z) \to \infty \text{ as } n \to \infty\}$ is called the escaping set of f. Eremenko (1989) proved that (i) $I(f) \neq \emptyset$ $(ii) J(f) = \partial J(f)$ where $J(f)$ is the Julia set of f, $(iii) I(f) \cap J(f) \neq \emptyset$ and (iv) the closer $\overline{I(f)}$ has no bounded component. He further conjectured that $I(f)$ has no bounded components. This has lead to a rich development of the theory. In this talk we plan to mention some of the recent developments on this topic and some of the results that we have obtained.

(ii) Geometric function theory and its applications to Fractional Calculus operator by Santosh B Joshi, Walchand College of Engineering Sangli, Maharashtra. Email: santosh.joshi@walchandsangli.ac.in
In this lecture our main objective is to provide systematic account of basic definitions, historical background in Geometric functions theory. Further we present connection between fractional calculus operators and Geometric function theory using various subclasses defined in unit disc U. The results presented here involve; coefficient estimates, radii of starlikness, convexity and distortion theorem.

(iii) Some investigations on different uniqueness and strong uniqueness polynomials and their generating unique range sets by Abhijit Banerjee, Department of Mathematics, University of Kalyani, Nadia, West Bengal 741235, India. Email: abanerjeekal@gmail.com

The study of unique range sets has been creating an increasing interest among the researchers in the uniqueness literature. Gradually this investigations have been shifted to-wards the characterizations of the polynomial backbone of concerned sets. Consequently the notion of uniqueness and strong uniqueness polynomial have appeared in the literature. In 2000, H. Fujimoto [H. Fujimoto, On uniqueness of meromorphic functions sharing finite sets, Amer. J. Math., 122 (2000), 1175-1203.] first invented a special property of a polynomial, which he called the property (H) which plays a vital role in the research of uniqueness and strong uniqueness polynomial. We wish to elaborately characterize the existing uniqueness as well as strong uniqueness polynomials in the literature and try to bring all the existing variants under a single umbrella. We also wish to discuss the scope for future research and intend to present our humble contribution in this aspect.

(iv) Logarithmic coefficients for close-to-convex functions by Vasudevarao Allu, IIT Kharagpur, West Bengal. Email: alluvasudevarao@gmail.com
Let S denote the class of analytic and univalent functions f in the unit disk $D := \{z \in \mathbb{C}\colon |z| < 1\}$ with the normalization $f(0) = 0$ and $f'(0) = 1$. For $f \in S$ the logarithmic coefficients γ_n are defined by

$$\log \frac{f(z)}{z} = 2\sum_{n=1}^{\infty} \gamma_n z^n$$

In this talk, we discuss the sharp upper bound of $|\gamma_3|$ for functions f in the family of close-to-convex functions.

(v) Dynamical Aspects of Baker omitted value by Tarakanta Nayak, IIT Bhubaneswar, Orissa. Email: tnayak@iitbbs.ac.in
Motivated by earlier work of I.N. Baker on iteration of transcendental entire functions, we define Baker omitted value for meromorphic functions (including entire). Sufficient conditions ensuring the existence of this value are obtained. Some of its dynamical implications are investigated. It is proved that functions with Baker omitted value have at most one completely invariant Fatou component. Some questions are suggested for further investaigation.

(4) Symposium on Homology Theory of Transformation Groups
Convener: J.K. Maitra, R.D. University, Jabalpur, Email-Id: jkmrdvv@rediffmail.com

(i) The localization theorem in equivariant K-theory, by Amiya Mukherjee, ISI Kolkata, Kolkata. Email: mukherjee.amiya@gmail.com
We describe a general localization theorem in equivariant K-theory, which is an analogue of the localization theorem in the equivariant cohomology. This localization theorem is the main ingredient for the local equivariant index theorem. This theorem asserts that for a compact Lie group G the analytic G-index of an elliptic G-operator P at an element g of G is equal to the topological G-index of P at g, and is known as the Atiyah-Segal-Singer fixed point theorem.

(ii) Revisiting the structure of fixed point sets under compact group actions, by Satya Deo, Harish Chandra Research Institute (HRI), Allahabad.
Email: sdeo94@gmail.com
In this talk I propose to review the cohomological structure of the fixed point sets on various cohomology finitistic spaces using the methods of Paul Smith and Armond Borel. The latest position and the importance of those results will be discussed so that the gap between the theorems and the known counterexamples can be closed as much as possible. The topic has reached a sort of saturation point, but even then a number of interesting questions, such as their dimensions, still remain to be answered.

(iii) On Adams operations in K-theory, by H. K. Mukherjee, North Eastern Hill University (NEHU), Shillong. Email: himadri@nehu.ac.in
In the proof of two famous theorems by J.F. Adams, one on vector field on spheres and the other on the Hopf invariant 1 problem, the Adams's operations in K-theory have played key roles. The purpose of this talk will be to give an overview of these.

(iv) Finite Group Actions on Spaces of Cohomology Type $S^n \times S^{2n}$ and $S^n \vee S^{2n} \vee S^{3n}$, by Hemant Kumar Singh, Department of Mathematics, University of Delhi, Delhi. Email: hksinghdu@gmail.com
Let G be a finite group acting freely on a finitistic space X having cohomology type the product of spheres $S^n \times S^{2n}$ and the one-point union $S^n \vee S^{2n} \vee S^{3n}$. Heller proved that a finite group G which contains $Z_p + Z_p + Z_p$, p a prime, cannot act freely on $S^n \times S^{2n}$. We improve the result due to A. Heller and show that if a finite group G acts freely on a space of cohomology type $S^n \times S^{2n}$, where n is odd, then G cannot contain $Z_p + Z_p$, p an odd prime and $2p \neq n + 1$. For the spaces of cohomology type $S^n \vee S^{2n} \vee S^{3n}$, we prove that every p-subgroup of G is either cyclic or a generalized quaternion group. We also observe that for these spaces and n is even, Z_2 is the only group which can act freely on X. This is parallel to the result proved by P. A. Smith that every abelian subgroup of a finite group G, which acts freely on a sphere, is cyclic and the only group which can act freely on even dimensional sphere is Z_2

(v) Smooth $(Z(2))^k$ action and fixed point set, by Prof. S. S. Khare, FNASc. Former Pro Vice Chancellor, NEHU, Shillong, (521, Meerapur, Allahabad, UP.) Email-Id: kharess1947@gmail.com
While studying the connection between bordism and transformation groups, Conner and Floyd in 1964 raised the following question. Question: Given a compact Lie group G, which bordism classes admit a representative upon which G acts smoothly without any fixed point? They confined their studies to $(Z(2))^k$ and $(Z(p))^k$, for prime p1992, Pergher studied the following question. In Question: Which bordism classes admit a representative M^n upon which $(Z(2))^k$ acts smoothly with fixed point set of dim. $(n-r)$, for some r between 0 and n. For this he defined $(J(n,k))^r$ as the set of all bordism classes which represent smooth manifold M^n admitting $(Z(2))^k$ action with fixed point set F of dimension $n-r$. $(J(n,k))^r$ is a subgroup of unoriented bordism group $MO(n)$. If $(J(\#,k))^r$ is the sum of $(J(n,k))^r$ as $n \geq r$, then $(J(\#,k))^r$ is a graded ring. Pergher computed $(J(\#,k))^r$ for $r = 1$ and 2. In 1994, Shaker got the most breakthrough in computing $(J(\#,k))^r$. He computed $(J(\#,k))^r$ for important $r < 2^k$ and later for $r = 2^k$. In 1999,Wang, Wu and Ding gave a crucial contribution for determining $(J(\#,k))^r$ for $r > 2^k$ by showing that for every $r > 2^k$, there exists a number $g(r) > r$ such that for every $n \geq g(r)$, $(J(n,k))^r$ is explicitly computable. This reduces the computation of $(J(n,k))^r$ for $r > 2^k$ to finite and explicit list of values of n i.e. n lying between r and $g(r)$. Late $r^k + 8$ by 2010. Finally in 2012, Meng and Wang computed $(J(\#,k))^r$ for $r = 2^k + t$, 2 for odd t. Investigation is on for $r = 2^k + even$.

(5) Symposium on Nonlinear Analysis, Optimization and Approximation
Convener: P. Veeramani, IIT Madras, Email-Id:pvmani@iitm.ac.in

(i) Existence of solutions to quasi-variational inequality problems by V.Vetrivel, IIT Madras , Chennai 600036 Email-Id: vetri@iitm.ac.in

A quasi-variational inequality is defined by a set-valued operator and a set-valued constraint map. In most of the results on the existence of solutions for a quasi-variational inequality in the literature, the constraint map is assumed to be a self-map.We will discuss the quasi-variational inequalities with non-self constraint map

alongwith the new concept of solution for quasi-variational inequalities with non-self-constraint map and study the existence of such solutions. Some applications will also be discussed.

(ii) Convergence analysis of inexact iterative techniques and applications, by D. R. Sahu, Institute of Science, Banaras Hindu University Varanasi-221005, India Email-Id: drsahudr@gmail.com During the last two decades, different modifications of fixed point, proximal point and forward-backward splitting iterative techniques were introduced for solving various nonlinear problems in Hilbert and Banach spaces. The purpose of this talk is to analyze the convergence of inexact techniques. These techniques are applied to solve fixed point problems and inclusion problems.

(iii) Certain Aspects of Well-Posedness in Optimization by C.S. Lalitha, University of Delhi South Campus New Delhi-110021 Email-Id: cslalitha1@gmail.com A well-known concept closely related to stability notion is the notion of well-posedness. A minimization problem is said to be well-posed in the classical sense if it has a unique solution which is stable in some sense. The stability condition in the sense of Tykhonov involves the convergence of every minimizing sequence to the unique optimal point. This idea of convergence of every minimizing sequence to the optimal point plays a crucial role in numerical approximation of solutions and convergence analysis of many algorithms. The main focus of the talk would be to present the notions of Tykhonov and generalized Tykhonov well-posedness for a classical minimization problem and to discuss these notions in the setting of vector problems as well.

(iv) On a practical notion of proper Pareto optimal solutions in multiobjective optimization by Joydeep, Dutta IIT Kanpur. Email-Id: jdutta@iitk.ac.in Geoffrion proper Pareto optimality is a central notion in the study of multuobjective optimization problem. It picks up those Pareto solutions which have bounded trade-offs. However as algorithms for multiobjective optimization produces only approximate solutions and thus we study here the properties of approximate Geoffrion proper efficient solutions. However these may converge to solutions which have unbounded trade-off and that is not useful from a practical point of view. However by viewing the notion of Geoffrion proper Pareto solutions in a reverse way we define a new type of proper Pareto solution and its approximate version which alleviates this issue of converging to solutions with unbounded trade-offs. Thus this new notion of proper solution turns out to be more relevant from the practical view point. In this talk we discuss various properties of this solution and showcase its importance from the practical point of view.

(v) Generalized Nonsmooth Convex Functions by Qamrul Hasan Ansari, Aligarh Muslim University, Aligarh 202 002 Email-Id: ghansari@gmail.com It is well known that differentiable convex functions and generalized convex functions can be characterized by means of the gradient function. However, when the function fails to be differentiable, the convexity may be given in terms of a generalized derivative (if it exists). For instance, if $f : R^n \to R$ is directionally differentiable then f is convex if and only if $f'(x; y - x) \leq f(y) - f(x)$, for all $x, y \in R^n$. Most of the generalized derivatives like the directional derivative, the Dini derivatives, the Clarke derivative etc., share a very important property, namely, positive homogeneity as a function of the direction. Motivated by this fact an attempt was made to unify the generalized derivatives by considering a bifunction $h(x; d)$ with values in $R \cup \{\pm infty\}$, where x refers to a point in the domain of the function and d is a direction in R^n. We discuss the generalized convexity in terms of the bifunction

$h(x;d)$. This definition encompassed most of the existing definitions involving the generalized derivatives. Several characterizations of generalized nonsmooth convex functions will be discussed. Some applications to optimization will also be discussed.

(6) Symposium on Homological Aspects of Commutative Algebra
Convener: Jugal Verma, IIT, Bombay, Email-Id: verma.jugal@gmail.com

(i) Connectedness of the Spectrum of a Burnside Algebra by Dilip P. Patil, Indian Institute of Science, Bangalore - 560 012, Karnataka, India. Email-Id: patil@math.iisc.ernet.in
In this talk starting with some history of Burnside algebras of a finite group. I will talk about defining equations of these algebras and prove that the prime spectrum of the Burnside Algebra of a finite abelian group is connected.

(ii) Ideals of Joint reduction number zero by J K Verma, IIT Bombay, Email-Id: verma.jugal@gmail.com
We Introduce Ideals of Joint reduction number zero In a Noetherian ring. Complete ideals in two dimensional rational singularities, zero dimensional monomial Ideals in polynomial rings are examples of such Ideals. We show how one can compute the Hilbert polynomial of such Ideals and how they produce cohen-Maceulay Rees algebras. We also point out their connection with an unsolved conjecture of Itoh about the normal reduction number of an m-primary ideal In a three dimensional Gorenstein local ring.

(iii) Associated Graded Rings and Connected Sums by Hariharan Ananthnarayan, I.I.T. Bombay, Powai, Mumbai - 400 076. Email-Id: ananth@math.iitb.ac.in
In 2012. Ananthnarayan, Avramov and Moore give a new construction of Gorenstein rings from two Gorenstein local rings, called their connected sum. In this talk, we give a characterization for a Gorenstein Artin local ring to be a connected sum. Furthermore, we use this characterization to investigate conditions on the associated graded ring of a Gorenstein Artin ring which force II to be a connected sum. As a consequence, we obtain results about its Poincare series and minimal number of generators of its defining ideal. This Is Joint work with E. Celikbas, Jai Laxmi and Z. Yang.

(iv) Ideals of the form $I_1(XY)$ by Indranath Sengupta, IIT Gandhinagar. Email-Id: indranathsg@iitgn.ac.in
We will discuss some results on Gr"obner bases for the ideal $I_1(XY)$, generated by the 1×1 minors of the matrix XY, where X is a matrix whose entries are either indeterminates x_{ij} or 0 and Y is a generic column matrix with entires y_j. The x indeterminates are different from the y indeterminates. We will consider the cases when X is square generic, symmetric and generic $(n+1) \times n$ matrix of indeterminates. At the end we will discuss some applications.

(v) Kernel of a locally nilpotent derivation on a polynomial ring by Neena Gupta, ISI, Kolkata, Email-Id: rnanina@gmail.com
It is an important problem in algebra to study the structure and properties of the ring of invariants of an algebraic group action on an affine space. A locally nilpotent derivation on a polynomial ring over a field and its kernel are in one to one correspondence with the action of the algebraic group G_a on an affine space over a field and its ring of invariants.

(vi) Locally nilpotent derivations on 3-dimensional affine domains by Rajendra Gurjar, IIT Bombay. Email-Id: gurjar@tifrvax.tifr.res.in
After briefly reviewing the general theory of locally nilpotent derivations on affine

domains, and Its equivalence with $(\mathbf{C}, +)$ actions on corresponding affine varieties, we will state some recent results about locally nilpotent derivations on 3-dimensional affine domains. These are joint results with M. Koras, K. Masuda, M. Miyanishi, P. Russell and A. Sathaye.

(vii) Number of generators of the tangent cone in codimension 2 by Mousumi Mandal, IIT Kharagpur Email: mousumi.mandal@gmail.com
Let I f S = k[—x, y—] be a zero dimensional ideal and HF S/I denote the Hilbert function of the local Artinian ring S/I: Iarrobino and Bertella in [cf A. A. Iarrobino: Punctual Hilbert schemes, Mem. Amer. Math. Soc. 188 (1977),1429-1442 & V. Bertella: Hilbert function of local Artinian level rings in codimension 2 Journal of Algebra, 321 (2009), 1429-1442.] proved lower and upper bounds on the minimal number of generators of I in terms of first difference of the Hilbert function and all the values can be attained. Very few results are known about the structure of the tangent cone G = k[x, y]/I * , except the case when I is a complete intersection. In general the Hilbert function * does not determine the numerical invariants of a graded minimal free resolution of I , even if we fix the minimal number of generators of I: We prove sharp bounds on the minimal number of generators of I in terms of second difference of the Hilbert function and we determine the graded Betti numbers when the minimal value is attained. If I is a complete intersection, then we show that the Hilbert function completely determines the numerical invariants of a graded minimal free resolution of * I . We give simple proofs of some results from [cf S. Goto: W. Heinzer and M. Kim The leading ideal of a complete intersection of height two , Journal of Algebra, 298 (2006), 238-247; S. Goto: W. Heinzer and M. Kim The leading ideal of a complete intersection of height two, Part II , Journal of Algebra, 312 (2007), 709-732 & S. Goto, W. Heinzer and M. Kim: The leading ideal of a complete intersection of height two in a 2-dimensional regular local ring, Communications in Algebra, 36 (2008), 1901-1910.] using the techniques of zero and negative cancellations mentioned in [cf M. E. Rossi and L. Sharifan: Consecutive cancellations in Betti numbers of local rings , Proc. Amer. Math. Soc. 138(1) (2010), 61-73.].

IMS Prizes

Group-1: Discrete Mathematics (Combinotorics, Graph Theory and related areas):

(i) Conjugate Laplacian eigenvalues of co-neighbour graphs by Somnath Paul, Tezpur University, Assam, India Email-Id: som@tezu.ernet.in
Let G be a simple graph of order n. A vertex subset is called independent if its elements are pairwise non-adjacent. Two vertices in G are co-neighbour vertices if they share the same neighbours. Clearly, if S is a set of pairwise co-neighbour vertices of a graph G; then S is an independent set of G. Let $c = a + bm$ and $c = abm$; where a and b are two nonzero integers and m is a positive integer such that m is not a perfect square. In [Lepović M. On conjugate adjacency matrices of a graph, Discrete Mathematics, 307, 730738, 2007], the author defined the matrix $A^c(G) = [c_{ij}]_n$ to be the conjugate adjacency matrix of G; if $c_{ij} = c$ for any two adjacent vertices i and j; $c_{ij} = c$ for any two nonadjacent vertices i and j; and $c_{ij} = 0$ if $i = j$. In this article, we define conjugate Laplacian matrix of graphs. Using the variational characteristics of eigenvalues of Hermitian matrices, we obtain certain properties of the eigen values of conjugate Laplacian matrices of graphs. Moreover, we give a lower bound for the second smallest conjugate Laplacian eigenvalue and discuss the eect of edge grafting on the conjugate Laplacian spectral radius (the largest conjugate Laplacian eigenvalue). As an application, we determine certain

properties of the eigenvalues and the eigenvectors of a graph with co-neighbour vertices.

(ii) The Q1-Matrix Completion Problem by Kalyan Sinha, Panjipukur S.T.D.S Vidyapith, Chinsurah, India Email-Id: kalyansinha90@gmail.com
A matrix is a Q1-matrix if it is a Q-matrix with positive diagonal entries. A digraph D is said to have Q1-completion if every partial Q1-matrix specifying D can be completed to a Q1-matrix. In this paper, necessary conditions for a digraph to have Q1-completion are obtained and sufficient conditions for a digraph to have Q1-completion are provided. Later on the relationship among the completion problem of Q1-matrix and some other class of matrices are discussed. Finally, the digraphs of order at most four that include all loops and have Q1-completion are characterized.

(iii) Colouring index of a set and Characterization of 2-chromatic bounded posets, by Wadile Amit Sitaram, S.S.V.P.S.'s L. K. Dr. P. R. Ghogrey Science College, Dhule-424005, India, Email: aswadile@gmail.com
In this paper we introduced the concept colouring index of a set and characterize2-chromatic bounded poset. A new concept of partial sum of two posets is introduced. Relations between chromatic numbers of two posets and their partial sum, linear sum, 1- sum of posets are obtained by using the concept of colouring index of sets. Some applications of structure theorem for dismantlable lattices are reported.

(iv) Lattice Operations On Generalized Projections, by A. S. Khairnar, Department of Mathematics, A. G. College, Karve Road, Pune-411004.
Email: anil_maths2004@yahoo.com
In this paper, we introduce a concept of a generalized projection in a -ring. We also introduce a partial order on the set of generalized projections which is a generalization of the partial order on the set of projections. We prove that, the set of generalized projections $GP(R)$ of a Rickart -ring R forms a lattice. A sufficient condition for a Rickart -ring R is given so that the lattice of $GP(R)$ is complemented. We characterize generalized comparability of generalized projections in terms of their orthogonal decomposition.

Group-2: Algebraic Geometry, Geometry, Topology, Algebraic Topology and related areas:

(i) Exploring the almost average shadowing property in one parameter flows, by Mukta Garg, Department of Mathematics, University of Delhi.
Pseudo-orbits are important tools for investigating properties of dynamical systems, for instance, they can detect mixing and recurrent behaviours of the system which may not be evident by studying actual orbits. One useful application of pseudo-orbits is obtained in neuroscience. In mathematics, a well known application of pseudo-orbits is the shadowing property. In this article, the notion of almost average shadowing property (ALASP) for one-parameter ows is introduced and some of its interesting properties are studied. The relationship of the ALASP with various known dynamical properties, for instance, topological transitivity, weak mixing, strong ergodicity, proximality, equicontinuity, sensitivity, distality and Takens and Ruelle chaos is investigated.

Group-3: Measure Theory, Probability Theory, Stochastic Processes,and related areas.

No abstract was received.

Group-4: Differential/Integral/Functional equations and inequalities, Special Functions, Numerical Analysis and related areas.

(i) Parameter Uniform Higher Order Numerical Approximation on Equidistributed Meshes for Parabolic Initial Boundary Value Problems with Boundary Layers, by Pratibhamoy Das, Assistant Professor, Department of Mathematics, IIT Patna.
This research proposes a higher order numerical method for singularly perturbed parabolic convection-diffusion problems whose solution exhibits boundary layers. The existence of boundary layer requires adaptive mesh generation as the numerical solution on uniform meshes does not converge irrespective of singular perturbation parameter. In the present work, the mesh equidistribution based on an a priori defined monitor function is proposed for the adaptive mesh generation. This method equally distributes the error inside the boundary layers. We use a numerical scheme that comprises the Implicit Euler method in time direction on a uniform mesh and an upwind scheme in the space direction on the equidistributed nonuniform mesh. This scheme leads to first order optimal accuracy independent of perturbation parameter. Our next goal is to achieve higher order accurate solution. The higher order convergence with respect to space and time is obtained by using the post-processing Richardson extrapolation approach on the adaptive nonuniform mesh. The present analysis follows the parameter uniform convergent solution in space and time. The comparison results show that the proposed method is highly effective over the existed meshes and enhances the accuracy from first order uniform convergence to second order uniform convergence in space as well as in time.

(ii) Controllability of Nonlinear Stochastic Fractional Integrodifferential Systems , by R. Mabel Lizzy, Department of Mathematics, Ph.D Research Scholar, Bharathiar University, Coimbatore-641046. Email: mabel.math.bu@gmail.com
In this paper we obtain the sufficient conditions for the controllability of nonlinear stochastic fractional integrodifferential systems and nonlinear systems with implicit fractional derivative driven by Lvy noise. Here we use the Lvy-It decomposition of an arbitrary Lvy process into Brownian and Poisson parts. The nonlinear system is shown controllable under the assumption that the corresponding linear system is controllable and using the Banach contraction principle.

(iii) Bilinear Optimal Control for Stochastic Wave Equations, by Ramdas B. Sonawane, Ness Wadia College of Commerce Prin. V. K. Joag Path, Bund Garden Road, Pune - 411001. Email: sonawaneramdas@gmail.com
In this paper, we consider the bilinear optimal control problem for wave equation with multiplicative control and random noise. Optimal control problems for infinite dimensional stochastic equations had been studied by many researchers. Most of the researchers had considered the Hamilton-Jacobi-Bellman (HJB) approach and obtained the optimal feedback laws using associated HJB equation on a Hilbert space. In present work, we do not use HJB approach. Also, Riccati equation framework is not suitable for this problem due to nature introduced by multiplicative controls. We first prove the existence of weak solution of wave equation with random noise. Then, we prove the existence of optimal control and give the characterization in the form of optimality system.

Group-5: Solid Mechanics, Fluid Mechanics, Electro-magnetic Theory, MagnetoHydrodynamics, Astronomy, Astrophysics, Relativity and related areas.

No abstract was received.

Group-6: Operations Research, Optimization, Computational Mathematics, Information Technology, Biomathematics, History of Mathematics and related areas.

No abstract was received.

AMU Prize: Algebra, Number Theory, Lattice Theory, Set Theory, Logic and related areas.

Continuous Duality Of Groups: A Functional Analytic Viewpoint, by Pranav Sharma, Lovely Professional University, Punjab.
Email-Id: pranav15851@gmail.com
After describing the influence of functional analysis on the development of Pontryagin duality theory of topological abelian groups we investigate the role of convergence space theory in the extension of Pontryagin reflexive groups to a class of convergence groups. Due to the lack of the notation of convexity similar to that of vector spaces and the absence of the theorem like Hahn-Banach theorem for the general convergence groups the duality theory for convergence groups cannot be deduced trivially from the theory of topological vector spaces. For the purpose of analysis we endow the continuous character group of the convergence group with a continuous convergence structure and hence, we investigate the local duality properties in these classes.

V M Shah Prize: Real Analysis, Complex Analysis, Functional Analysis, Harmonic Analysis, Approximation Theory, Special functions and related areas.

On the Growth Measurement of Composite Entire Functions in the Light of their Generalized Relative Orders, by Chinmay Ghosh, Guru Nanak Institute of Technology, Sodepur, Kolkata-700114. Email: chinmayarp@gmail.com
A single valued function of one complex variable which is analytic in the finite complex plane is called an entire function. In this paper I would like to establish some results on the growth measurement of composite entire functions of one complex variable from the view point of their generalized relative orders (generalized relative lower orders).

Abstract of Papers received for presentation

Section A: Combinatorics, Graph Theory and Discrete, Mathematics:

1. Balance Index Set of Some Cycle Related Graphs by Pradeep G. Bhat and Devadas Nayak C, Department of Mathematics Manipal Institute of Technology Manipal-576 104, Karnataka. Email: devadasnayakc@yahoo.com
Let G be a graph with vertex set $V(G)$ and edge set $E(G)$. Consider the set $A = \{0, 1\}$. A labeling $f : V(G) \to A$ induces a partial edge labeling $f^* : E(G) \to A$ defined by $f^*(xy) = f(x)$, if and only if $f(x) = f(y)$, for each edge $xy \in E(G)$. For $i \in A$, let $v_f(i) = |\{v \in V(G)\colon f(v) = i\}|$ and $e_f^*(i) = |\{e \in E(G)\colon f^*(e) = i\}|$. A labeling f of a $v_f(i) = |\{v \in V(G)\colon f(v) = i\}|$ and $e_f^*(i) = |\{e \in E(G)\colon f^*(e) = i\}|$. A labeling f of a graph G is said to be friendly if $|v_f(0) - v_f(1)| \leq 1$. The balance index set of the graph G, denoted by $BI(G)$ is defined as $\{|e_f^*(0) - e_f^*(1)|\colon$ where f^* runs over all friendly labeling$f$ of $G\}$. In this paper, we obtain the balance index set of cyclic snake graphs, alternate cyclic snake graphs and generalized friendship graphs.

2. Some graph theoretic aspects of Nil Graph of a commutative ring by Shazida Begum*, Kuntala Patra and Sanjoy Kalita, Department of Mathematics Guhati University, Guwahati; Assam, India 781014.
E-mail: shazida:begum17@gmail:com, sanjoykalita1@gmail.com
Let R be a commutative ring and $N(R)$ be the set of all nil-elements of R of index two i.e., $N(R) = \{x \in R | x^2 = 0\}$. A kind of graph structure $\Gamma_n(R)$, can be defined,

on the ring , with the vertex set $\Gamma_n(R)^* = \{x \in R^* | N(R)$ for some y in $R^* = R \setminus \{0\}\}$ where any two distinct vertices x and y are adjacent if and only if $xyxy \in N(R)$. We call this graph as nil graph of R . In this paper we study the graph structure of nil graphs associated to finite commutative ring m n. Some graph theoretic properties such as chromatic number, diameter and the domination number of the said graph are also studied in this paper.

3. An Inverse System of Nonempty Objects with Empty Limit by Satya Deo, HRI, Allahabad and Veerendra Vikram Awasthi, VNIT Nagpur.
Email: vvawasthi@gmail.com
In this article we give an explicit example of an inverse system with nonempty sets and onto bonding maps such that its inverse limit is empty.

4. Matrix algebra for complete graphs and complete biprtite graphs by Suwarnlatha. N. Banasode , V. S. Shigehalli and Y. M. Umathar. Email: suwarnnam@yahoo.com, shigehallivs@yahoo.co.in, yogeeshwar@bvb.edu
In this paper the concept of adjacency matrix and Incidence Matrix has been extended for the discussion of Complete Graphs and Complete Bipartite Graphs. This paper helps us understand the nature of these two types of graphs through matrices. And properties of these graphs are stated with Matrices. Given the matrices, the corresponding graphs can be obtained.

5. On covering Energy and spectra of Posets by Vandana P. Bhamare, Shri. Gulabrao Deokar College of Engg., Jalgaon (M.S.) 425002 India and M. M. Pawar, S.S.V.P.S's L. K. Dr. P. R. Ghogrey Science College, Deopur, Dhule. Email: patilvandanapatil915@yahoo.com
In this paper the concept of energy of a poset is introduced. The bounds for energy of posets are established. Energies of some well known posets are computed. Relation between the characteristics polynomial of two bounded posets and their linear sum is obtained.

6. In characterizations of prime and minimal prime ideals of hyperlattices by D. Lokhande, Aryani B. Gangadhara* and Jameel A. Ansari, Yashwantrao Chavan Warana Mahavidyalaya , Warana nagar, Kolhapur JSPM's Rajarshi Shahu College of Engineering, Pune , India. Email: aryani.santosh@gmail.com
We prove that, every lattice is a hyperlattice but converse is not true .In the first section, we Define an ideal of hyperlattice and we obtain a result on an ideal of lattice in the sense of hyperlattice. In second section we define Prime ideals of hyperlattices and prove theorems on Prime ideals of hyperlattices. Mainly we prove the Prime ideal theorem for hyperlattices. Also we extend the classical result of Nachbin for hyperlattices. In last section, we furnish some characterizations of minimal prime ideal of hyperlattices.

7. On the distance spectrum of distance regular graphs by Fouzul Atik* and Pratima Panigrahi, Department of Mathematics Indian Institute of Technology Kharagpur, India Email: fouzulatik@gmail.com, pratima@maths.iitkgp.ernet.in
The distance matrix of a simple graph G is $D(G) = (dij)$, where dij is the distance between ith and jth vertices of G. The spectrum of the distance matrix is known as the distance spectrum or D-spectrum of G. A simple connected graph G is called distance regular if it is regular, and if for any two vertices $x, y \in G$ at distance i, there are constant number of neighbors ci and bi of y at distance $i-1$ and $i+1$ from x respectively. In this paper we prove that distance regular graphs with diameter d have at most $d+1$ distinct D-eigenvalues and we find an equitableartition and the corresponding quotient matrix of the distance regular graph which gives the distinct D-eigenvalues. We also proved that distance regular graphs satisfying

$bi = cd-1$ have at the most $[d/2]+2$ distinct D-eigenvalues. Applying these results we have found the distance spectrum of some distance regular graphs including the well known Johnson graphs.

8. Random processes under group action by T. Venkatesh, S. N. Banasode, Praveen kumar S. Araballi and Rajani Kamble, Department of Mathematics, School of Mathematics and Computing Sciences, Rani Channamma University, Belagavi, India. Email: praveenkumararaballi@gmail.com
In a probability measure space. A random variable is a random observation on state space associated with the measure space let $(\Omega, \mathscr{F}, P)$ be the probability measure space. A random process $\{X($ is a family of a random veriables resulting into observables through a map $X : (\Omega, \mathscr{F}) \to (E, \mathscr{B})$ with observation in E made at the instance. Here, E is the state space (event) and is the subset of sample space Ω. We give a nice characterization of $\{X_t(\omega) : \omega \in \Omega\}$, for each $t \in \mathbb{R}$.

9. Colouring index of a set and Characterization of 2-chromatic bounded posets by Amit Sitaram Wadile, S.S.V.P.S.'s L. K. Dr. P. R. Ghogrey Science College, Dhule-424005, India. Email: aswadile@gmail.com
In this paper we introduced the concept colouring index of a set and characterize 2- chromatic bounded poset. A new concept of partial sum of two posets is introduced. Relations between chromatic numbers of two posets and their partial sum, linear sum, 1-sum of posets are obtained by using the concept of colouring index of sets. Some applications of structure theorem for dismantlable lattices are reported.

10. The Q1-Matrix Completion Problem by Kalyan Sinha, Panjipukur S.T.D.S Vidyapith, Chinsurah, India. Email: kalyansinha90@gmail.com
A matrix is a Q1-matrix if it is a Q-matrix with positive diagonal entries. A digraph D is said to have Q1-completion if every partial Q1-matrix specifying D can be completed to a Q1-matrix. In this paper, necessary conditions for a digraph to have Q1- completion are obtained and sufficient conditions for a digraph to have Q1- completion are provided. Later on the relationship among the completion problem of Q1-matrix and some other class of matrices are discussed. Finally, the digraphs of order at most four that include all loops and have Q1-completion are characterized.

11. Conjugate Laplacian eigenvalues of co-neighbour graphs by Somnath Paul, Tezpur University, Assam, India. Email: som@tezu.ernet.in
Let G be a simple graph of order n. A vertex subset is called independent if its elements are pairwise non-adjacent. Two vertices in G are co-neighbour vertices if they share the same neighbours. Clearly, if S is a set of pairwise co-neighbour vertices of a graph G; then S is an independent set of G. Let $c = a + bm$ and $c = abm$; where a and b are two nonzero integers and m is a positive integer such that m is not a perfect square. In [Lepović M. On conjugate adjacency matrices of a graph, Discrete Mathematics, 307, 730738, 2007], the author defined the matrix $A^c(G) = [c_{ij}]_n$ to be the conjugate adjacency matrix of G; if $c_{ij} = c$ for any two adjacent vertices i and j; $c_{ij} = c$ for any two nonadjacent vertices i and j; and $c_{ij} = 0$ if $i = j$. In this article, we define conjugate Laplacian matrix of graphs. Using the variational characteristics of eigenvalues of Hermitian matrices, we obtain certain properties of the eigen values of conjugate Laplacian matrices of graphs. Moreover, we give a lower bound for the second smallest conjugate Laplacian eigenvalue and discuss the effect of edge grafting on the conjugate Laplacian spectral radius (the largest conjugate Laplacian eigenvalue). As an application, we determine certain properties of the eigenvalues and the eigenvectors of a graph with co-neighbour vertices.

Section B: Algebra, Number Theory and Lattice Theory:

1. Some Results on Strong Reducibility of Near-Rings by M. K. Manoranjan, T. P. College, Madhepura - 852113 (Bihar).
Email-Id: manojmanoranjan.kumar@gmail.com
In this paper we shall introduce some properties of strongly reduced near-rings. Strong reducibility of near-rings implies reducibility of near-ring but converse is not true. We have generalized some characterizations of strong reducibility of near-rings and investigate some relations between strongly reduced near-rings and left strongly regular near-rings. A near-ring is said to be left regular if for each $a \in R$, there exists $x \in R$ such that $a = xa^2$. A near-ring is called strongly left regular if R is left regular and regular, similarly we define right regular. A strongly left and strongly right regular near ring is called strongly regular near-ring. We find that the concept of left, strongly left, strongly right and strong regularities are all equivalent. A near-ring R is reduced if R has no non-zero nilpotent elements. That is, for each a in R, $a^n = 0$ for some positive integer n implies $a = 0$. A near-ring is strongly reduced, if for each $a \in R$, $a^2 \in R_c$ that is $a0 = a^2$ implies $a0 = a$. We find that a strongly regular near-ring is reduced and every strongly reduced near-ring is reduced.

2. A note on non-splitting Z-bent functions by Sugata Gangopadhyay, Enes Pasalic, Pantelimon Stanica and Saral Datta. Brahmananda Keshab Chandra College Email: saraldutta@gmail.com
In this note, we find constructions of non-splitting Z-bent functions, thus solving an open problem of Dobbertin and Leander [H. Dobbertin, G. Leander, Bent functions embedded into the recursive framework of Z-bent functions, Des. Codes Cryptogr. 49 (2008), no. 1-3, 3-22; MR2438437]. Under some technical conditions, we also construct Z-bent functions of level $r+1$ that are not splitting into Z-bent functions of level $r \geq 0$.

3. Semi 2-absorbing ideals in the semiring $\mathbb{Z}^+$ by J. N. Chaudhari, M. J. College, Jalgaon, Maharashtra. Email : jnchaudhari@rediffmail.com
In this paper, we obtain a characterization of principal semi 2-absorbing ideals in the semiring . Also some particular types of non-principal ideals in the semiring Z+ are investigated.

4. ξ- Torsion Injective Modules and their Generalizations by Himashree Kalita, Azizul Hoque and Helen K. Saikia, Department of Mathematics Gauhati University, Guwahati-781014, India. Email: himashree.kalita28@gmail.com
We introduce some generalizations of injective modules with respect to a class of ideals of the underlying ring. More precisely we introduce ξ-torsion injectivity, pseudo ξ-torsion injectivity and quasi-pseudo ξ-torsion injectivity. We investigate some properties of these injectivities. We characterize ξ-torsion injective modules, pseudo torsion injective modules and pseudo ξ-torsion-free injective modules using semisimple modules. We finally show that pseudo ξ-torsion injectivity implies quasi-pseudo ξ-torsion injectivity.

5. On the divisibility of the class numbers of certain real quadratic fields by Azizul Hoque, HRI, Allahabad-211019, India. Email: azizulhoque@hri.res.in
We construct a family of real quadratic fields whose class numbers are divisible by 3. The main tool used is a parameterization of Kishi and Miyake of a family of quadratic fields whose class numbers are divisible by 3. We finally obtain a lower bound on the number of real quadratic fields whose discriminant is bounded by a large real number and whose class number is divisible by 3.

6. Quasi-Coretractable Modules by A. K. Singh and A. K. Mahato, Indian Institute of Technology (Indian School of Mines), Dhanbad-826004, India. Email: singh.ak.am@ismdhanbad.ac.in, kumaramritmaths@gmail.com
In this paper, we will discuss and study the structure of quasi- coretractable modules. Some characterization theorems of quasi-coretractable modules in terms of Kasch rings, CS modules, mono-coretractable modules, projective modules, epi-retractable modules and retractable modules will be given. Some equivalent conditions related with the quasi-coretractable and the mono-coretractable module will also be considered and investigated.

7. Characterization Of Some Congruences On Quasi Completely Regular Semirings by Sunil Kumar Maity and Rituparna Ghosh, Department of Pure Mathematics, University of Calcutta. Email: skmpm@caluniv.ac.in
The main object of this paper is to study quasi completely regular semirings through congruence structures. We study the least completely regular semiring congruence on quasi completely regular semirings. We characterize the congruences not only on quasi completely regular semirings but also on quasi-orthodox quasi completely regular semirings.

8. On $(m;n)$ Closed ideals of Commutative Semirings by M. D. Suryawanshi, S.S.V.P.S.'s L. K. Dr. P. R. Ghogrey Science College, Dhule-425005, India and J. N. Chaudhari, M. J. College, Jalgaon-425002, India. Email: manoharsuryawanshi65@gmail.com
Let R be a commutative semiring with $1 \neq 0$. Recently, D. F. Anderson and Ayman Badawi have introduced the concept of semi-n-absorbing ideals and $(m;n)$ closed ideals in commutative rings with $1 \neq 0$ which are generalizations of n-absorbing ideals. In this paper we introduce these concepts in commutative semirings with $1 \neq 0$ and extend some results of Anderson and Badawi to semirings.

9. Generalized -nonexpansive mappings in Banach spaces by Rajendra Pant, 1 Department of Mathematics, VNIT, Nagpur 440010, Maharashtra, India and Shukla, Rahul Shukla and Manuel De la Sen University of the Basque Country, Spain. Email: pant.rajendra@gmail.com
We introduce a new type of monotone nonexpansive mappings in ordered Banach spaces. This new class of nonlinear mapping properly contains nonexpansive, firmly- nonexpansive, -nonexpansive and Suzuki type generalized nonexpansive mappings. We obtain some existence and convergence theorems for this new class of mappings. Useful examples are presented to illustrate facts

10. The total graph of a commutative semiring with respect to multiplicative-prime subset by Nabanita Goswami and Helen K. Saikia, Department of Mathematics, Gauhati University, Guwahati-781014, India.
Email: nabanita01goswami@gmail.com
We introduce the concept of the total graph of a commutative semiring with respect to a multiplicative-prime subset. Let S be a commutative semiring. We call a non-empty proper subset M of S is a multiplicative-prime subset of S if $ms \in M$ for all $m \in M; s \in S$, and further $ab \in M$ implies either $a \in M$ or $b \in M$. We define the total graph of S with respect to M to be the graph with all elements of S as vertices and any two distinct vertices x and y are adjacent if and only if $x + y \in M$. We discuss the characteristics of this total graph. We also find some important properties of certain induced subgraphs of this total graph.

11. A new result on Fibonacci shift operation by Bandhu Prasad, Department of Mathematics Kandi Raj College, Kandi-742137, India.
Email: bandhu_iit@rediffmail.com

Fibonacci codes of different orders are variable length. They are used for encoding of numbers and its applications are in information and coding theory. The Fibonacci binary encoding and computation of its values are used in Fibonacci shift operations. Walder et al. established a relation for k-th Fibonacci left shift for Fibonacci numbers of order $m = 2$; 3. In this paper, we established a relation for $k-$th Fibonacci left shift for Fibonacci numbers of order $m = 4$ and we generalized a formula for k-th Fibonacci left shift for the Fibonacci numbers of all orders.

Section C: Real and Complex Analysis (Including Special Function, Summability and Transforms)

1. Uniqueness of a power of a Meromorphic function sharing a set with its derivative by Abhijit Banerjee and Bikash Chakraborty, University of Kalyani, Kalyani, West Bengal-741235. Email-Id: bikashchakrabortyy@gmail.com.
The most fascinating result in Value distribution Theory is the Nevanlinna's Five Value Theorem (Zur Theorie der meromorphen Funktionen, Acta Math., 46(1-2) (1925), 1-99). In 1926, R. Nevanlinna proved that if f and g are non-constant Meromorphic functions sharing five values in extended complex plane in ignoring multiplicities, then $f = g$.

2. Growth of Composite Entire And Meromorphic Functions With Finite Iterated Order by Nityagopal Biswas and Samten Tamang, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235. Email-Id: nityamaths@gmail.com
In this paper, we have investigated the growth properties of composite entire and meromorphic functions with finite iterated order and established some new results which are the improvement and extension of the earlier results.

3. Generalized Ritt Type and Generalized Ritt Weak Type Connected Growth Properties Of Composite Entire Functions Represented By Vector Valued Dirichlet Series by Jinarul Haque Shaikh, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235. Email-Id: jnrlhqshkh188@gmail.com
In this paper, we introduce the idea of generalized Ritt type and generalized Ritt weak type of entire functions represented by a vector valued Dirichlet series. Hence, we study some growth properties of composite of two entire functions represented by a vector valued Dirichlet series on the basis of generalized Ritt type and generalized Ritt weak type.

4. Location of recurrent critical points in Complex plane by Gorachand Chakraborty, Govt. General Degree College at Manbazar II(W.B) and Tarakanta Nayak, IIT Bhubaneswar, India. Email: gorachand11@gmail.com
In this paper, we studied the Location of recurrent critical point of a transcendental meromorphic function f. We show that if a is a recurrent point of a transcendental meromorphic function f then either a is in Julia set of f or a is in one of the rotational domains (Herman ring or Siegel Disc). Moreover if a is a recurrent critical point of f then a is in Julia set of f.

5. Some Further Studies on the Uniqueness of Meromorphic Functions Sharing Two Sets with Least Possible Cardinalities by Arindam Sarkar Kandi Raj College, West Bengal-742137. Email-Id: arindamsarkarmath@gmail.com
Let f and g be two nonconstant meromorphic functions sharing two finite sets, namely $S \subseteq \mathbb{C}$ and $\{\infty\}$. We prove two uniqueness theorems under weaker conditions on ramification indices, reducing the cardinality of the shared set S and

weakening the nature of sharing of the set $\{\infty\}$ which improve results of Fang-Lahiri, Lahiri, Banerjee -Majumder-Mukherjee and others.

6. Yu's Result - A further extension by Abhijit Banerjee and Molla Basir Ahamed, Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email-Id : bsrhmd117@gmail.com
In this paper we have mainly dealt with the relation between a generalized differential polynomial and a rational function $R(f)$ of a non-constant meromorphic function f sharing a small function $a \equiv a(z)(6 \not\equiv 0; \infty)$. Our results will extend some recent reults in the direction of Brck Conjecture. We have exhibited some examples which shows that the result of this paper may or may not be true for non-constant entire functions and conditions obtained in the theorems cannot be removed. Other examples have also substantiate our certain claims.

7. On the growth properties of composite functions analytic in the unit disc from the view point of their relative L^*- types and relative L^*-weak types by Pulak Sahoo, Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email: pulak.pmath19@gmail.com
In this paper we introduce the idea of relative Nevanlinna L^*- type and relative Nevanlinna L^*- weak type in the Unit disc $U = \{z\colon |z| < 1\}$. Hence we study some comparative growth properties of composition of two analytic function in the unit disc U on the basis of relative Nevanlinna L^*- type and relative Nevanlinna L^*-weak type

8. Maximum Terms, Maximum Moduli Related and Slowly Changing Functions Based Growth Measurement of Composition of Entire Functions by Md.Azizul Hoque . Sreegopal Banerjee College, West Bengal. Email: mhoque3@gmail.com
In the paper we prove some growth properties related to the maximum terms and maximum moduli of composite entire functions using generalized L^*-order and generalised L^*-lower order as compared to the growths of their corresponding left and right factors .

9. IP^*-sets in function field and mixing properties by Pintu Debnath, Basirhat College, India. Email: pintumath1989@gmail.com
In this article we want to establish some combinatorial properties of $(F_q[x]; +)$. Further we will also apply these combinatorial properties to establish some of mixing properties of its action on measure preserving systems. We will establish that weak mixing, strong mixing and mild mixing all are equivalent under the action of $(F_q[x]; +)$.

10. On the rates of convergence of wavelet expansions by Varsha Karanjgaokar, Department of Mathematics, Govt. N. P. G. College of Science, Raipur (C.G.)-492010, India. E-mail: vardhakar@yahoo.com
In this paper we estimate the rate of convergence of wavelet expansion of functions in L^p, $1 \leq p \leq \infty$ at a point x with specific conditions on $w_f(x,t)$ for small values of t, $t \leq \partial$ where $w_f(x,t) \equiv \sup\{|f(y) - f(x)\colon |x-y| \leq t\}$. Our result generalizes the result of S. Kelly (Pointwise convergence for wavelet expansions ,Ph.D. thesis,Washington University,St. Louis, 1992).

11. Common fixed point theorems under rational contractions for a pair of mappings in complex valued metric space by Rakesh Sarkar, Gour Mahavidyalaya , Mangalbari, Malda,W.B.-732142 ,India.
Email: rakeshsarkar.malda@gmail.com .
In this paper, we prove some common fixed point theorems for a pair of mappings

satisfying certain rational contraction condition in the frame work of complex valued metric space $(X; d)$. We have also defined the max function for the partial order - in complex valued metric d.

12. Growth of meromorphic functions depending on (p, q)-th relative order by Lokenath Debnath, Sanjib Kumar Datta, Tanmay Biswas and Ananya Kar, Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email: ananyakaronline@gmail.com
In this paper for any two positive integers p and q; we wish to introduce an alternative definition of relative (p, q)-th order of a meromorphic function with respect to another entire function which improves the earlier definition of relative (p, q)-th order of meromorphic function introduced by Banerjee and Jana. Also in this paper we discuss some growth rates of composite entire and meromorphic functions on the basis of the improved definition of relative (p, q)-th order of meromorphic function.

13. Generalized relative order-dependent growths of composite entire functions by Chinmay Ghosh, Guru Nanak Institute of Technology 157/F, Nilgunj Road, Panihati, Kolkata- 700114. E-mail: chinmayarp@gmail.com
In this paper we establish some newly developed results related to the growth rates of composite entire functions on the basis of their generalized relative orders and generalized relative lower orders.

14. Some results on slowly changing function oriented relative order, relative type and relative weak type of differential monomials by Debasmita Dutta, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235 Email: debasmita.dut@gmail.com
In the paper we establish the relationship between the relative L-order (relative L-order), relative L-type (relative L-type) and relative L-weak type (relative L-weak type) of a transcendental meromorphic function f with respect to an transcendental entire function.

15. Some Results on Generalized Relative Orders of Meromorphic Functions by Pranab Das, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235 Email: pranabdas90@gmail.com
In this paper we discuss some growth rates of compositions of entire and meromorphic functions on the base of generalized relative order and generalized relative lower order of meromorphic functions with respect to entire functions.

16. Meromorphic function sharing a meromorphic function of slower growth with a linear differential polynomial by Shubhashish Das, Department of mathematics, University of Kalyani, Kalyani, West Bengal-741235 Email: dshubhashish.90@gmail.com
In this paper, we study a typical problem arisen from the famous Br ck's conjecture of the value distribution theory concerning the uniqueness of an entire function and its derivative when they share one finite complex value CM. Though R. Br ck himself resolved the conjecture for , the case for is not fully resolved. Many researchers developed and generalised this result gradually to a linear differential polynomial of an entire function instead of its derivative and a function instead of a finite complex value, etc. The main object of the paper is to prove uniqueness theorems for meromorphic function that share a function of slower growth with its linear differential polynomial under certain hypothesis.

17. Growth measures of Wronskians generated by entire and meromorphic functions depending upon their relative orders by Ahsanul Hoque,

Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email: ahoque033@gmail.com
In this paper, we have investigated the comparative growth properties of composition entire and meromorphic functions on the basis of their relative orders (relative lower orders) of Wronskians generated by entire and meromorphic functions .

18. On sequences spaces defined via Euler and matrix transformations by Sandeep Kumar Singh, Lovely Professional University, Punjab and Sanjay Mishra, Department of Mathematics, Lovely Professional University, Punjab-144411. E-mail : sanbhumath@gmail.com
We present the topological properties of some lacunary sequence spaces over n-normed space defined via Euler and matrix summability transformations. Further, some inclusion relations between these spaces are also studied.

19. Certain fixed point theorems of bi-complex valued mappings by Junesang Choi, Sanjib Kumar Datta, Tanmay Biswas and Md Nazimul Islam, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235 Email: n.islam000@gmail.com
In this paper, we introduce the concepts of the operations of bi-complex number, the concepts of convergence for bi-complex number-valued sequence and the bi-complex number valued mapping. We also introduced the metric function on the set of bi- complex numbers $C2$. Then the fixed point of bi-complex number-valued mapping is discussed and established some existent theorems of this mapping.

20. Results on uniqueness of entire functions whose difference polynomials share a polynomial by Pulak Sahoo and Himadri Karmakar, Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email: himadri394@gmail.com
A lot of research works has been devoted to uniqueness of entire and meromorphic functions whose differential polynomials share certain values or a fixed point. Recently value distribution in difference analogue has become a subject of great interest. In this paper we use the concept of weighted sharing of values, introduced by I. Lahiri, which measures how close a shared value is to being shared CM or to being IM, to investigate the uniqueness results when two difference products of entire functions share a nonzero polynomial or a small function with finite weight. We also investigate the situation when the original functions share zero counting multiplicities.

21. Measure of Relative $(p;q)$-th Order Based on a Growth of Composite Entire Functions by Stanislawa Kanas, Sanjib Kumar Datta Tanmay Biswas and Golok Kumar Mondal, Department of Mathematics, University of Kalyani, Kalyani, West Bengal-741235 Email: golok.mondal13@rediffmail.com
We deduce some growth properties of composite entire functions in the light of their relative $(p;q)$ th order by extending some results.

22. On a subclass of meromorphic univalent functions by Bappaditya Bhowmik and Firdoshi Parveen, Department of Mathematics, IIT Kharagpur, India. Email: frd.par@maths.iitkgp.ernet.in
In this article we consider a class denoted by $A(p)$ which consists of functions f that are holomorphic in the unit disc D punctured at a point $p \in (0,1)$ where f has a simple pole. We prove a sufficient condition for these functions to be univalent in D. By using this condition, we construct the family $U_p(\lambda)$ of all functions $f \in A(p)$ such that $|(z/f(z))^2 f(z) - 1| < \lambda_\mu$ where $\mu = ((1-p)/(1+p))2$ for some $0 < \lambda < 1$, $z \in D$. Therefore, functions in the class $U_p(\lambda)$ are necessarily univalent. We present some basic properties for functions in the class $U_p(\lambda)$ which

include an integral representation formula for such functions and obtain the exact region of variability of the second Taylor coefficient for functions in this class. We also obtain a sharp estimate for the Fekete-Szego functional defined on the class $U_p(\lambda)$ along with a subordination result for functions in this family. In addition, we obtain some necessary and sufficient coefficient conditions involving the coefficients b_n for functions $f \in A(p)$ of the form

$$\frac{z}{f(z)} = 1 + b_1 z + b_2 z^2 + \cdots, z \in D,$$

to be in the class $U_p(\lambda)$. We have also obtained sharp bounds for $|b_n|$, $n \geq 1$.

23. Meromorphic functions that share a small function with their linear differential polynomials by Indrajit Lahiri and Bipul Pal, Department of Mathematics, University of Kalyani, Kalyani, West Bengal. Email: palbipul86@gmail.com
We study in the paper a standard problem of uniqueness of meromorphic functions and linear differential polynomials generated by them under certain conditions. Actually this particular kind of development in value distribution theory started with the famous Bruck's conjecture regarding the uniqueness of an entire function and its derivative when they share a finite complex value with its derivative counting multiplicity. Over the years Bruck himself and other mathematicians worked on this problem and obtained a number of results to a greater extent in a more general setting. Here we take up this problem for a meromorphic function with relatively less number of poles and also the zeros of its derivatives being less, which shares a small function with a linear differential polynomial with due count of multiplicity and deduce similar conclusion.

24. Generalizations of Brück conjecture and some non-linear complex differential equations by Dilip Chandra Pramanik, Department of Mathematics, University of North Bengal, West Bengal and Manab Biswas, Barabilla High School, Uttar Dinajpur, West Bengal, India Email: dcpramanik.nbu2012@gmail.com
In this paper, we prove the following result: Let $f(z)$ and $g(z)$ be two non-constant entire functions satisfying $(\alpha) < \mu(f)$ and $\phi(z)$ be a polynomial. If f is a non-constant entire solution of the differential equation $[z] + \beta(z)\alpha(z) = (fdp - \alpha(z))e\phi(z)$, where $\beta(z)$ is an entire function satisfying $\sigma(\beta) < \mu(f)$. Then $\sigma 2(f) = deg\phi$. Our result generalizes the results due to Gundersen and Yang, Chang and Zhu and Li and Cao.

25. A study of $\overline{H}$- function by Jyoti Mishra, Gyan Ganga Institute of Technology and Sciences, Jabalpur. Email: jyoti.mishra198109@gmail.com
The subject of Fourier series of the generalized hypergeometric functions occupies an important place in the field of special functions. Certain Fourier series of the generalized hypergeometric function plays an important role in the development of the theory of special functions and certain Fourier series of the generalized hypergeometric functions enable us to obtain general solutions of some boundary value problems. The Fourier series of the generalized hypergeometric functions was given from time to time by various mathematicians with certain restrictions in parameters. An adequate list of references given here together with sources indicated in these references provides a good converge of the subject. In this paper, we have defined Fourier series for $\overline{H}$-function and also we derived integral involving sine function, exponential function, the product of Kamp de Friet functions and the $\overline{H}$-function to evaluate three Fourier series.

26. Characterization of matrices and duals involving some double sequences of fuzzy numbers by Jyotishmaan Gogoi and Hemen Dutta, Department of Mathematics, Gauhati University, Guwahati-781014, India. Email: jyotishmgogoi@gmail.com, hemen_dutta08@rediffmail.com
The main aim of the present paper is to introduce the notion of $\alpha-$, $\beta-$ and γ-duals of sets of double sequences of fuzzy numbers and compute the $\alpha-$, $\beta-$ and γ- duals of some important sets of double sequences of fuzzy numbers. The investigations of this paper will add the notion of algebraic duality for sets of double sequences in the field of fuzzy mathematics. Additionally, we give some results characterizing matrix transformations involving some classes of double sequences of fuzzy numbers.

27. Fixed point theorem in fuzzy metric space by Rajesh Kr. Singh and M. Z. Alam, College of Commerce, Arts & Science, Patna-20. Email: malam035@gmail.com
In this paper, we studied the fuzzy metric space as defined by Z. Q. Xia, and F. F. Guo. Defined in different way in the sense of fuzzy scalars instead of fuzzy numbers or real numbers are used to define fuzzy metric. It is proved that every metric space can induce a fuzzy metric space that is complete whenever, the original one is complete. We define fuzzy contraction mapping and try to established fixed point theorem in fuzzy metric space.

28. The generalized composition growth of a class of Meromorphic functions by Ratan Kumar Dutta, Department of Mathematics, Netaji Mahavidyalaya, Arambagh, Hooghly-712601, West Bengal, India. Email: ratan_3128@yahoo.com
In this article we are two show that if $f(z)$ is a transcendental meromorphic function of non- zero finite order and $g(z)$ is a transcendental entire function with $T(r,g) = O^*(e^{(\log r)^\alpha})$ Then

$$\limsup_{r\to\infty} \frac{T(r, f_{2,g})}{T(r,g)} = \lambda_f, (r \notin E)$$

where $\alpha(0 < \alpha < 1)$ is a constant, E is a set of finite logarithmic measure and $2, gf$ is generalized composition of $f(z)$ with $g(z)$.

29. Fuzziness on rough convergence by Shyamal Debnath, Department of Mathematics, Tripura University, Agartala-799022, India. E-mail: shyamalnitamath@gmail.com
In this paper we extend the notion of rough convergence in fuzzy setting which automatically extends the earlier notions of rough convergence. Also we define the set of rough limit points of a sequence of fuzzy number and rough Cauchy sequence, and prove some results associated with this set.

30. Meromorphic function sharing small functions with its derivative by Pulak Sahoo and Gurudas Biswas, Department of Mathematics, University of Kalyani West Bengal-741235, India Email: gdb.math@gmail.com
In the paper, we deal with the uniqueness problem of meromorphic function that share a set of small functions with its derivative and obtain some results which generalize the recent results due to Xu, Yi and Wang [Revista De Matematica, Teoria Y Aplicaciones, 23 (2016), 291-308].

31. On Kuznetsov sum formula by R. K. Jana, Department of Applied Mathematics & Humanities, S. V. National Institute of Technology, Surat-395 007, India. And S. Kanemitsu, Department of Information Science, Faculty of Humanity-Oriented Science and Engineering, Kinki University, Iizuka, Fukuoka, Japan. E-mail: rkjana2003@yahoo.com, kanemitu@fuk.kindai.ac.jp
The main objective of this paper is to discuss about Kuznetsov sum formula and its

interrelation with several special functions mainly G-functions and Bessel functions .

32. On the growth of composition of entire functions with respect to minimum modulus by Meghlal Mallik, Panighata U. D. M. High School, India Email: meghlal.mallik@gmail.com
In the paper we study the growth properties of composite entire and meromorphic functions using $(p;q)$th order which improve some earlier results, where p; q are positive integers and $p > q$. Some results in the form of remarks based upon minimum modulus of entire functions have also been stated in this paper.

Section D: Functional Analysis

1. Proximal normal structure by Gopal Dutta and P. Veeramani, IIT Madras, Chennai, India. Email: gopalpartha92@gmail.com
In this paper we will give a characterization for proximal normal structure. Using this characterization we will prove that if A or B is compact, then the convex pair $(A; B)$ has proximal normal structure. We will also show that in general if $(A; B)$ is a closed bounded convex proximal pair, then the compactness of A need not imply the compactness of B. But in k-strictly convex Banach spaces this is not the case. In addition we will also use our characterization to prove that if X is a Banach space and the set of all directions in which X is not uniformly convex is contained in a countable union of k-dimensional subspaces of X for some k 2 N or the set of all directions in which X is not uniformly convex is contained in a subspace of X with countable Hamel basis, then X has proximal normal structure.

2. Removable sets for weighted Orlicz-Sobolev spaces by Nijjwal Karak, IIT Indore. Email-id: nijjwal@gmail.com
In this talk, I will discuss about removable sets for Sobolev spaces, Orlicz-Sobolev spaces and some weighted version of Orlicz-Sobolev spaces. I will present the theories of removability of sets lying in a hyperplane and we will see that the removability of these sets is essentially determined by their thickness measured in terms of a concept of porosity.

3. λ_n-compact sets and λ_n-compact operators by Manjul Gupta, IIT Kanpur, India and Antara Bhar, RIE Bhubaneswar, India Email: antara.music@gmail.com
In this paper, we consider a sequence space λ equipped with the normal topology (,*) and introduce the notions of n-compact sets and n-compact operators. As $\eta(\lambda, \lambda^*)$ is a locally convex topology on λ, this study is different from our earlier work "On λ -compact operators" where λ is a Banach space. However it generalizes the work of Sinha and Karn on p-compact sets and p-compact operators. We study the properties of such sets and operators and prove the norm-ideal character of the collection of all λ_n-compact operators. We also establish the connection of λ_n-compact operators with absolutely λ-summing and λ-nuclear operators for suitably chosen sequence space .

4. Extension of Function Space in the light of Hyperspace by Sandip Jana and Jayeeta Saha, Department of Pure Mathematics, University of Calcutta Email: sjpm@caluniv.ac.in
This paper concerns the extension of the linear space of functions to a topological exponential vector space. Exponential vector space is an algebraic axiomatisation of hyperspace based on a vector space; it was proposed by S. Ganguly et al. with the name quasi-vector space. This generalisation of vector space (in some sense)

comprises a semigroup structure equipped with a compatible scalar multiplication and is designed with an order structure intrinsically with the spirit of hyperspace. Considering the exponential behaviour of its elements, we have studied this structure in the present paper with a new nomenclature exponential vector space (in short, evs). The method we have developed here can be adopted for extending any linear subspace of function spaces as well as sequence spaces to a topological evs. Following this method we have shown that any vector space can be embedded into an evs generated from some function space. Finally with the help of some invariant properties of evs we have characterised such extension of function spaces; here the invariance is judged by means of an order-isomorphism which is a morphism-like concept between two evs and is capable enough for establishing such characterisation.

5. Integration in an algebraic ordered extension of vector space by Priti Sharma and Sandip Jana, Department of Pure Mathematics, University of Calcutta. Email: mspriti23@gmail.com
In this paper we have developed an integration theory in an algebraic ordered extension of vector space which comprises a semigroup structure, a scalar multiplication and a compatible partial order. Initially the idea of this structure was given by S. Ganguly et al. with the name quasi-vector space. The axioms of this structure evolve a very rapid growth of its elements with respect to the partial order and evoke some sort of positiveness in each element. Meanwhile, a vector space is evolved within this structure and positivity of each element of the new structure is judged with respect to the elements of the vector space generated. Considering the exponential behaviour of its elements, we have studied the structure in the present paper with a new nomenclature - exponential vector space (in short, evs). We have introduced the concept of comparing function to define the line integral of a real valued function along a continuous curve in a bounded-primitive topological evs. We have discussed some basic properties of the line integral and deduced necessary and sufficient conditions for the existence of the same. We have defined primitive of a function and expressed the line integral in terms of the primitive. It has been shown that the collection of integrable functions on an evs again forms an evs over the same field and can be topologised to form a topological evs. Lastly, we have constructed an order-functional on the evs of integrable functions with the help of the line integral.

6. Weighted spaces of holomorphic functions on Banach spaces and the approximation property by Manjul Gupta and Deepika, IIT Kanpur, India, Email: dbaweja@iitk.ac.in
In this talk, we consider the linearization theorem for the weighted space $H_w(U;F)$ of holomorphic functions defined on an open subset U of a Banach space E with values in a Banach space F. After having introduced a locally convex topology T_M on the space $H_w(U;F)$, we show that $(H_w(U;F);T_M)$ is topologically isomorphic to $(L(G_w(U);F);T_c)$ where $G_w(U)$ is the predual of $H_w(U)$ consisting of linear functionals whose restrictions to the closed unit ball of $H_w(U)$ are continuous for the compact open topology T_0 . Finally, these results have been used in characterizing the approximation property for the space $H_w(U)$ and its predual for suitably restricted weight w.

7. Continuous duality of groups: a functional analytic viewpoint by Pranav Sharma, Lovely Professional University, Punjab.
Email-Id: pranav15851@gmail.com

After describing the influence of functional analysis on the development of Pontryagin duality theory of topological abelian groups we investigate the role of convergence space theory in the extension of Pontryagin reflexive groups to a class of convergence groups. Due to the lack of the notation of convexity similar to that of vector spaces and the absence of the theorem like Hahn-Banach theorem for the general convergence groups the duality theory for convergence groups cannot be deduced trivially from the theory of topological vector spaces. For the purpose of analysis we endow the continuous character group of the convergence group with a continuous convergence structure and hence, we investigate the local duality properties in these classes.

Section E: Differential Equations, Integral Equations and Functional Equations

1. Oscillation of sublinear and superlinear second order neutral differential equations by A. K. Tripathy and A. K. Sethiy, Department of Mathematics, Sambalpur University, Sambalpur-768019, INDIA. Email: aruntripathy70@rediffmail.com
In this work, we establish the necessary and sufficient conditions for oscillation of a class of functional differential equations of the form:

$$(r(t)(x(t)+p(t)x(\tau(t)))')'+q(t)G(x(\sigma(t)))+v(t)H(x(\eta(t)))=0$$

under the assumption that $\int_0^\infty \frac{dt}{r(t)}=0$ for various ranges of $p(t)$.

2. On Pólya-Szegó fractional integral inequality by Vaijanath L. Chinchane, Department of Mathematics, Deogiri Institute of Engineering and Management Studies Aurangabad-431005, India, E-mail ID: chinchane85@gmail.com
The main aim of this paper is establish some new fractional integral inequalities for Plya-Szeg integral inequality and fractional inequality related to Minkowsky inequality by using the Hadamard fractional integral operator. Also, we discuss spacial cases of these inequalities.

3. Boundary value problem of fractional order $(1,2)$ **with Riemann type fractional impulsive conditions** by Vidushi Gupta And Jaydev Dabas, Department of Applied Science and Engineering, IIT Roorkee, Saharanpur Campus, Saharanpur-247001, India. Email: rinkygupta00@gmail.com
In the present work our aim is to deal the following impulsive fractional boundary value problem with integral jump effect. These impulsive conditions (3)-(4) represent a sudden change of values of $u(t)$ and ${}^cD^qu(t)$ its derivative at impulsive points t_k depend on the area under the curves of $u(t_k)$ and ${}^cD^qu(t_k)$.

$$ {}^cD^\alpha u(t)=f(t,u(t),(\phi u)(t)),\ t\in[0,T], \tag{2}$$

$$ \Delta u(t_k)=S_k(\Sigma_{j=1}^k c_{k,j}I_t^{\beta_{k,j}}u(\overline{t_j})),\ k=1,2,\cdots,m \tag{3}$$

$$ \Delta({}^cD^qu(t_k))=J_k(\Sigma_{j=1}^k d_{k,j}I_t^{\beta_{k,j}}u(\overline{t_j})),\ 0<q<1,k=1,2,\cdots,m \tag{4}$$

$$ u(0)+\lambda{}^cD^\alpha u(0)=0, u(T)+\lambda{}^cD^qu(T)=0,\lambda\in\mathbb{R} \tag{5}$$

where ${}^cD^\alpha$ and ${}^cD^q$ represent the Caputo's derivatives of order $\alpha\in(0,1)$ and $q\in(0,1)$ respectively. This paper concern to establish the existence and uniqueness of solution for a new class of Reimann type jump impulsive fractional integro-differential equation with separated boundary conditions. The main result of the article is obtained by applying the Krasnoselkii's fixed point theorem. At last an application is given to verify our result.

4. Characterization of a class of second Order neutral impulsive systems via Pulsatile constant by A. K. Tripathy and S. S. Santra, Sambalpur University,

Sambalpur-768019, India. Email: shyam01.math@gmail.com
In this work, we study the oscillation and nonoscillation properties of a class of second order neutral impulsive differential equations with constant coefficients and constant delays by using pulsatile constant. Also, an attempt is made to extend the constant coefficient results to variable coefficient equations.

5. Group classification for isothermal drift flux model of two phase flows by T. Raja Sekhar, Purnima Satapathy, IIT Kharagpur, India. Email: purnima395@gmail.com
In this paper, a full symmetry group classification, i.e., construction of optimal systems for isothermal multiphase drift flux model is presented. Also all invariant functions are constructed for the Lie algebra, which play a vital role in construction of optimal systems. Further, with the help of one dimensional optimal classification group, invariant solutions are obtained which describe the asymptotic behavior of general solution.

6. Stability and turing instability analysis of a diffusive ratio dependent Holling type predator-prey model by Sivakumar Muthusamy, DRDO-BU-CLS, Bharathiar University, Coimbatore, India. Email: sivamaths007@gmail.com
This work is concerned with a ratio dependent Holling type predator-prey system with additive Allee effect subject to Neumann boundary condition. We analyze the local stability, existence of a Hopf bifurcation at the co-existence of the equilibrium and stability of bifurcating periodic solutions of the system in the absence of diffusion. For the model with no flux boundary conditions, Turing instability and Hopf bifurcation analysis of the system with diffusion are studied. Finally, to verify our theoretical results, some numerical simulations are also included.

7. Existence Solutions For Fractional Impulsive Integro-differential Equations In Banach Spaces by V. Oviya and M. Latha Maheswari, Department of Mathematics, PSG College of Arts & Science, Coimbatore-14, Tamilnadu, India. Email: oviyavisu@gmail.com, lathamahespsg@gmail.com
The objective of this paper is to establish the existence of solutions of first order nonlinear impulsive fractional integrodifferential equations in Banach spaces. The results are obtained by using fractional calculus and fixed point principles.

8. On the solvability of stochastic fractional integro-differential equations by P. Umamaheswari, Department of Mathematics, Bharathiar University, Coimbatore, India. Email: umamaths.tamil@gmail.com
Using the Picard-Lindelf successive approximation scheme we prove the existence and uniqueness of solution for the stochastic fractional integro-differential equations. Further the numerical scheme for approximate solutions of stochastic fractional integro-differential equations is obtained by using Galerkin method.

9. Inverse problem in an age-structured population system by Dinakar Varadharaj, Department of Mathematics, Bharathiar University, Coimbatore, India. Email: dinamat.v@gmail.com
This article concerns the inverse problem of the coupled age-structured population dynamic system with discontinuous diffusion coefficients. The internal observation with two measurements is allowed to obtain the stability result for the inverse problem consisting of simultaneously retrieving two space dependent source terms in the given parabolic system. The proof of the result relies on Carleman estimates and certain energy estimates for parabolic system.

10. Controllability of fractional delay systems using Laplace transform by Joice Nirmala Rajagopal, Department of Mathematics, Bharathiar University,

Coimbatore, India. Email: joys.maths.bu@gmail.com
This work concerns the effective ways of solving fractional delay dynamical systems. The main focus is to determine the solution of fractional delay differential equation by combining Laplace transform and method of steps. The solution is compared with the solution obtained in integer order equation. Consequently controllability criteria for both fractional linear and nonlinear delay systems have been studied using fixed point argument. Finally examples are provided with numerical stimulation to verify the results.

11. On fractional integro-differential equations in Banach spaces by T. Tamil Selvan and M.Latha Maheswari, Department of Mathematics with Computer Applications, PSG College Of Arts & Science, Coimbatore , Tamilnadu - 641014, India. Email: tamilmath94@gmail.com
In this paper we prove the existence of solutions of nonlinear fractional delay integro- differential equations with impulsive conditions. Also the existence of solutions is extended to the nonlocal case.

12. Existence and uniqueness of mild solutions of stochastic differential equations by S. Poornima and A. Anguraj, Department of Mathematics, PSG College of Arts & Science, Coimbatore, Tamilnadu-641014, India. Email: poornivnp@gmail.com, ngurajpsg@yahoo.com
In the present paper we study the existence and uniqueness of solutions for a class of Ito type stochastic differential equations by using the method of fixed point theorem with condensing operator of measure of noncompactness.

13. Regularity of solutions of pseudoparabolic fractional differential equations by A. Akilandeeswari, Department of Mathematics, Bharathiar University, Coimbatore-641046, India.
The main purpose of this paper is to study the regularity of solutions for the pseudoparabolic type fractional differential equations with integral conditions. Under suitable assumptions, the results are established by using an energy inequality method. This method is based on constructing an appropriate multiplier. From the priori estimates we are able to achieve the solvability of the problem.

14. Formation of a mathematical model of combat with range dependent attrition-rate coefficients to analyse the effectiveness of security force involved in a counter insurgency operation under decapitation warfare incorporating intelligence as a prime factor by Lambodara Sahu, Dept of Mathematics, Faculty of Civil Engineering, College of Military Engineering Pune-411031, India E-mail ID: lsahucme@gmail.com
Nowadays, using modern technology the forces so called security force and insurgents are engaged in confrontation with various decapitation strategies comprising undermining operation and ground combat. Considering the objective of the forces, the ground combat may be further subdivided to decapitation combat and regular combat. A counter insurgency operation by the security force may be considered as good as a regular combat with smaller strength involving undermining operations such as precision strike, missile attack, etc., against insurgents to nullify their various decapitation strategies like assassination or abduction of key Govt. officials, ministers and high profile politicians in addition to other undermining operation such as mining roads and bushes used by security force. Maximum effective range and reliable intelligence inputs play a vital role for a force to achieve its better effectiveness in the combat. Therefore, range-dependent attrition- rate coefficient involving maximum effective range of the force and reliability of intelligence

inputs incorporated with the decapitation effect multiplier may be the primary constituents of the model to show the efficiency of combat power transformation for causing attrition to the opposing side. A conceptual model dealing with certain key operational factors like range-dependent attrition-rate coefficients, robustness, undermining effects, reliability of intelligence inputs, break-points, can be developed using the concepts of Lanchester-type equations to project the effectiveness of security force during counter insurgency operation.

15. Notes on fractional differential equations by Suresh Kumar P, Department of Mathematics, Bharathiar University. Email: sureshkumarp.maths@gmail.com
In this paper, we study the fractional derivative with and without singular kernel. First we discuss the history of fractional calculus, definitions and properties of the Caputo fractional derivative. Second, we introduce Caputo-Fabrizio fractional derivative without singular kernel and study its definitions, properties and solution representation of fractional differential equations.

16. Lyapunov type inequality for hybrid fractional differential equation with Prabhakar derivative by Deepak B. Pachpatte, Narayan G. Abuj* and Amol D. Khandagale Department of Mathematics, Dr. Babasaheb Ambedkar Marathwada University Aurangabad - 431004, (M.S.), INDIA. E-mail : pachpatte@gmail.com, abujng@gmail.com kamoldsk@gmail.com
In this paper, we consider a hybrid fractional boundary value problem involving the Prabhakar fractional derivative. With the help of associated Green function we developed Lyapunov type inequality for it.

17. Existence results for quasilinear neutral impulsive integro-differential equations in Banach space by B. Radhakrishnan, Department of Mathematics, PSG College of Technology, Coimbatore-641004, India. Email: radhakrishnanb1985@gmail.com
In this paper, we devoted to study the existence of mild solutions for quasilinear impulsive integro-differential equation in Banach spaces. The results are established by using Hausdorff's measure of noncompactness and the fixed point theorems. Application is provided to illustrate the theory.

Section F: Geometry

1. On m-projectively flat almost pseudo Ricci symmetric manifolds by Jay Prakash Singh, Mizoram University, Aizawl-796004, Mizoram-India. Email-Id: jpsmaths@gmail.com
In the present paper we study m-projectively flat and almost pseudo Ricci symmetric manifold and prove the following theorems:

(1) In an m-projectively flat almost pseudo Ricci symmetric manifolds denoted by $A(PRS)_n$. The vectors fields and are co-directional.
(2) In an m-projectively flat , r is an Eigen value of the Ricci tensor S corresponding to the eigenvector .
(3) Every m-projectively flat is a manifold of quasi constant curvature.
(4) In an m-projectively flat with $n > 3$, the integral curves of the generator are geodesic.
(5) An Einstein m-projectively flat with non-constant negative scalar curvature tensor is a special conformally at manifold.
(6) An Einstein m-projectively flat with non-constant negative scalar curvature tensor a K-special conformally at manifold.

2. Almost Kaehlerian spaces of positive pure symmetric curvature operator by U. S. Negi, H.N.B. Garhwal (Central) University, S.R.T. Campus Badshahi-Thaul, Tehri Garhwal - 249199, (U.K.), India. Email-Id: usnengi7@gmail.com

Tachibana (1974) has studied Kaehlerian manifold of σ- positive curvature operator and theorem on Riemannian manifolds of positive curvature operator. After then, Yamaguchi (1975) has studied a theorem of Gallot- Meyer Tachibana in Riemannian manifold of positive curvature operator. Ogiue and Tachibana (1980) have studied Kaehler manifolds of positive curvature operator. In this paper, I have studied almost Kaehlerian spaces of positive pure symmetric curvature operator and several theorems have been proved.

3. Certain curves on α-para Kenmotsu manifolds by Avijit Sarkar and Amit Sil, University of Kalyani, Nadia, W.B.-741235, India. Email: amitsil666@gmail.com
The present paper is devoted to study biharmonic almost contact curves on three dimensional α-para Kenmotsu manifolds with respect to Levi-Civita connection and also with respect to semisymmetric metric connection. We study slant curves on same manifolds with respect to Levi-Civita connection as well as semisymmetric metric connection. We also consider locally ϕ -symmetric almost contact curves on same manifolds with respect Levi-Civita connection as well as semisymmetric metric connection.

4. Some curves on indefinite α- sasakian manifolds by Abhijit Sarkar and Ashis Mondal, University of Kalyani, Nadia, W.B.-741235, India. Email-id: ashism750@gmail.com
The object of the present paper is to study some classes of curves on α- Sasakian manifolds with indefinite metric. We study slant curves and C-parallel slant curves on α-Sasakian manifold with indefinite metric. Legendre curve is a particular case of slant curve. We also study biharmonic Legendre curves on such manifolds.

5. Erlangen program in the light of the group $SL(2;R)$ by Sandipan Dutta and Debapriya Biswas, IIT Kharagpur, India, Email: sandipandutta98@gmail.com
In this paper we consider the geometries formed by the transformation group $SL(2;R)$ on the two dimensional spaces generated by its subgroups. We shall introduce hypercomplex numbers to make those structures of two dimensional spaces. On this two dimensional spaces we study the invariant geometric figures under that transformation.

Section G: Topology

1. Orderability and Lexicographic relations on $\mathbb{C}_2$ by Sukhdev Singh, Department of Mathematics, Lovely Professional University, Punjab-144411 Email: singh.sukhdev01@gmail.com
Three different types of order relations have been defined on the bicomplex space. With the help of these order relations the orderability have been studied on $\mathbb{C}_2$. The topologies on $\mathbb{C}_2$ defined by Srivastava played a very important role in the study of orderability. The compatibility of the topological structures with the ordered structures on $\mathbb{C}_2$ have been studied. The methods for orderability and suborability have been explored on $\mathbb{C}_2$.

2. Generalised closed mset in multiset topological spaces by Karishma Shravan and Binod Chandra Tripathy, Institute of Advanced Study in Science and Technology (IASST), Guwahati-781035, India. Email: karishmashravan9@gmail.com
Classical set theory assumes that every mathematical objects occurs without repetition. But it was realised by many research worker that the situation in real world is not like this. Multiset was first studied by R. Dedikind in the year 1888, which is a very useful structure in many areas. K. P. Girish and J. S. John in 2011 and 2012 studied about the topological structures in multisets. In this paper we have studied generalised closed msets in context with M-topological space. Generalized

closed sets are natural generalisation of closed sets. N. Levine in 1970 introduced the notion of generalised closed sets in Point-set Topology. We also investigate separation axiom weaker than M-T1 in M-topological space.

3. Discrete switch dynamical systems by Sharan Gopal, Dept. of Mathematics, Birla Institute of Technology -Pilani, Hyderabad campus, Hyderabad, Pin 500 078 Email: sharangopal@yahoo.co.in
The theory of switch continuous dynamical systems is well studied in literature. The discrete- time switch systems are also studied as well, but their topological aspects are not considered much; only the stability is studied. In this paper, we develop a theory of discrete switch topological dynamical systems, analogous to the topological dynamics .

4. T_0 -type separations in fuzzy topological spaces in quasi-coincidence sense by Saikh Shahjahan Miah, Mithun Das and Md. Ruhul Amin, Begum Rokeya University, Rangpur. Rangpur-5404, Bangladesh. Email: skhshahjahan@gmail.com
In this paper, we introduce two notions of T 0 property in fuzzy topological spaces by using quasi-coincidence sense and we establish that all these notions satisfy good extension property. Also hereditary, productive and projective properties are satisfied by these notions. We observe that all these concepts are preserved under one-one, onto, fuzzy open and fuzzy continuous mappings.

5. Dynamical systems arising from vector fields on smooth manifolds by Suwarnlatha. N. Banasode,K. L. E. Societys Raja Lakhamagouda Science Institute, Belgaum-590001, India and Seema. B. Patil, Department of Mathematics, Rani Channamma University Belagavi. Email: suwarn-nam@yahoo.com, seemaptl21@gmail.com
In this paper, Dynamical systems arising from vector fields on smooth manifolds , we have considered a problem that looks into a possible lift for functions defined on manifolds and flows associated with the dynamically system on them. Initially we observed this problem on one dimensional manifold. Later it was generated to M when n is dimensional smooth manifold $\mathbb{R}^n$, $n > 1$.

6. Fuzzy almost continuous and weakly continuous mappings in fuzzy bitopological spaces by M. Shrivastava and Jyoti Gupta, Department of Mathematics and Computer Sciences, Rani Durgawati University, Jabalpur (M.P.), Email: guptajyoti26@gamil.com
In this paper, we introduce fuzzy (i, j)-regular open (closed) sets, fuzzy (i, j)-almost continuous and fuzzy (i, j)-weakly continuous mappings on fuzzy bitopological spaces. Also we investigate their characterizations and relationship between fuzzy (i, j)-almost continuous and fuzzy (i, j)-weakly continuous mappings.

Section H: Measure Theory, Probability Theory and Stochastic process and Information Theory 1. Large deviations for stochastic integro-differential equation by M. Suvinthra, Department of Mathematics, Bharathiar University. Email: suvinthra@gmail.com
In this work we establish a Freidlin-Wentzell type large deviation principle for stochastic integro-differential equations by using the weak convergence approach. The compactness argument is proved on the solution space of corresponding skeleton equation and the weak convergence is done for Borel measurable functions whose existence is asserted from Yamada-Watanabe theorem

Section I: Numerical Analysis, Approximation Theory and Computer Science

1. Weak continuity condition and semilocal convergence of an efficient

iterative method in Banach spaces by J. P. Jaiswal, Department of Mathematics, Maulana Azad National Institute of Technology Bhopal, M.P.-462051, India, Faculty of Science, Barkatullah University, Bhopal, M.P.-462026, India, Regional Institute of Education, Bhopal, M.P.-462013, India, Email-Id: asstprofjpmanit@gmail.com
The current paper is concerned with the study of semilocal convergence of an eighth-order method for solving nonlinear equations in Banach spaces under mild condition. The existence and uniqueness theorem has been proved followed by the error estimates. At last, the application of theoretical development has been made in nonlinear integral equation.

2. Homotopy perturbation method for unsteady squeezing flow of casson fluid between parallel plates by Nityanand P. Pai and Sampath Kumar V. S, Department of Mathematics Manipal Institute of Technology, Manipal University Manipal-576104, Karnataka, Email: sampathkmr322@gmail.com
The unsteady squeezing flow of Casson fluid between parallel plates is considered. The similarity transformation is used to reduce the governing equations into nonlinear ordinary differential equation. The homotopy perturbation method (HPM) used to solve this problem. The results obtained by HPM are compared with numerical results and also analyzed the axial and radial velocity of the fluid through HPM. The present analysis is enabled us in extending the region of validity to -10 S 10 in predicting skin friction coefficient.

3. Conforming finite element method for keller-segel chemotaxis system with cross-diffusion by Arumugam Gurusamy, DRDO-BU Center For Life Sciences Bharathiar University Campus, Coimbatore. Email: guru.poy@gmail.com
We consider the finite element approximation for a parabolic-parabolic system which describes the chemotaxis phenomenon. First we prove the existence of solutions to the discrete problem by using Schauder fixed point theorem. Next we derive the error estimates in H1 norm for the discrete solutions. The results of the numerical experiments justify the theoretical results.

Section J: Operations Research

1. Deteriorating fuzzy multi-objective EOQ inventory models with shortages under partial backlogging by Sahidul Islam and Haridas Biswas, Department of Mathematics, University of Kalyani, Nadia-741235, West Bengal, India. Email: sahidul.math@gmail.com
In this paper we have formulated a multi-objective inventory problem in which time dependent deterioration and shortages are allowed. We consider demand is constant and holding cost is function of time with limitation on storage space. Next to solve multi- objective inventory model and using fuzzy programming technique. Finally, by model is expressed by numerical example.

2. Modified signomial geometric programming (msgp) and its applications by Sahidul Islam and Wasim Akram Mandal, University of Kalyani, Nadia, W.B.-741235, India Email: wasim0018@gmail.com
In this paper, we have proposed unconstrained and constrained Signomial Geometric Programming (SGP) problem with positive or negative integral degree of difficulty. Here modified form of signomial geometric programming (MSGP) has been demonstrated and some theorems have been derived. Finally, these are illustrated by proper examples and applications.

3. Multi-objective fuzzy reliability optimization model: a parametric

geometric programming approach by Tanmay Kundu and Sahidul Islam, University of Kalyani, Nadia, W.B.-741235, India Email: tanmaykundu.math@gmail.com
This paper presents a multi-objective reliability optimization model taking system reliability and cost of a series system as objective functions. Due to the vagueness of judgements of the decision maker, the objective as well as constraint goal can involve many uncertain factor and other imprecise parameters with vague in nature in a reliability optimization model. Thus the model is formulated in fuzzy environment by considering cost coefficients and the exponential factor as triangular fuzzy number. Here, the nearest interval approximation method is applied to make the fuzzy model in crisp in nature. There are two types of parametric geometric programming technique is used to solve the proposed model. The performance of these two types of solution approach is evaluated by numerical example at the end of this paper.

4. Two warehouse inventory model for deteriorating items and stock dependent demand under conditionally permissible delay in payment by Sahidul Islam, Department of Mathematics, University of Kalyani, Nadia, W.B.-741235, India and Satya Kumar Das, Government General Degree College, Gopiballavpur-II, Paschim Medinipur, India. Email: satyamath89@gmail.com
In this paper, the own warehouse has limited capacity W. After storing the W unit in OW , excess unit are storing in RW. The RW is assume to offer better preserving facilities than the OW resulting in a lower rate of deterioration and is assume to charge higher holding cost than the OW. In this model, two warehouse are considered for deteriorating items with stock dependent demand under conditionally permissible delay in payment. Numerical examples are given to demonstrate the theoretical results. Sensitivity analysis of the optimal solution with respect to major parameters of the system has been carried out the implication are discussed in detail. In the discussions, suggestions are given to minimize the total cost of the inventory system.

5. Unbalanced fuzzy transportation problem by M. Rajeshwari and P. Anukokila, Department of Mathematics, PSG College Of Arts & Science, Coimbatore -14, Tamilnadu, India. Email: rajimath1993@gmail.com, anuparaman@gmail.com
In this paper, a new methodology proposed for the solution of unbalanced transportation problem with trapezoidal generalized fuzzy numbers using centroid ranking technique. Also this technique offers effective way for handing the unbalanced fuzzy transportation problem.

6. Optimization of multi-objective unbalanced assignment problem by R. Nandhini and M. Latha Maheswari, Department of Mathematics with Computer Applications PSG College Of Arts & Science, Coimbatore -14, Tamilnadu, India. Email: nandhini.mathsca.psg@gmail.com, lathamahespsg@gmail.com
In this paper, we propose an algorithm for solving multi-objective unbalanced assignment problem (MOAP) through Hungarian Algorithm, and this approach emphasizes an optimal solution of each multi objective function by minimizing the resource. To illustrate the algorithm a numerical example is presented.

7. Cost optimal release policy based on software reliability growth model by Viresh Sharma, Department of Mathematics, N.A.S. (P.G.) College, Meerut, India, Digvijay Singh, Department of Mathematics, JPIET, Meerut, India, Lokesh Chaudhary,Department of Mathematics, GLBAJAJ ITM G.NOIDA, India and Reena Grover, Department of Mathematics, SRM University, Ghaziabad. Email: Vireshsharma1@yahoo.com; drdigvijay2008@rediffmail.com; lokeshdma@gmail.com; reenadr1980@gmail.com

The Jelinski-Moranda (JM) odal makes several assumptions, which can be criticized. It assumes that the faults are equivalent in the sense that they all contribute the same amount to the failure rate. To alleviate some of the objections to the basic Jelinski- Moranda model for software failure Moranda proposed a geometric deeutrophication model. In this model the failure rate decreases geometrically with the detection of faults. Musa Iamino, Okumoto and Farr derived expressions for the mean and intensity functions of the process N(t), which is the number of faults discovered by time t for the mgde model, which are only approximations and can be quite different for certain choices of failure rates. The process is studied as a pure birth stochastic process and its probability generating function, mean, intensity and reliability functions are derived. In this paper, the cost optimal release policy, which minimizes the total, expected software cost including penalty cost due to scheduled delivery time is discussed by using the exact mean and intensity function.

8. Quadratic fuzzy transportation problem by P. Anukokila, Department of Mathematics, PSG College of Arts and Science, Coimbatore-641014, India. E-mail: anuparaman@gmail.com
This paper presents a multi-objective quadratic transportation problem involving fuzzy random coefficients in the objective and constraints. A pair of two-level mathematical programs is formulated to calculate the upper bound and lower bound of the objective values of the interval quadratic program. A concrete numerical example is illustrated in the support of the obtained results.

9. A Problem on Soft Computing Approach Based Multiobjective Bilevel Programming in Uncertain Environment by Debjani Chakraborti, Narula Institute of Technology, 81, Nilgunj Road, Agarpara, Kolkata-700109
E-mail:debjani_333@yahoo.co.in
In this paper, a genetic algorithm (GA) based fuzzy goal programming (FGP) procedure for solving multiobjective bilevel programming problems (MOBLPPs) in large hierarchical decision problems is presented. In the model formulation of the problem, the concept of tolerance membership functions for measuring the degree of satisfaction of the decision makers (DMs) regarding achievement of their fuzzily described objective goals as well as the degree of optimality of the decision vector controlled by the upper-level DM are defined in the decision making horizon. In the solution process, the GA method is employed to solve the FGP model of the problem to make a reasonable balance of execution of decision powers of DMs in the decision making environment.

Section K: Solid Mechanics, Fluid Mechanics, Geophysics and Relativity

1. Trapped modes in a three-layer fluid by Sunanda Saha, IISC Bangalore, India and Swaroop Nandan Bora, IIT Guwahati, India. Email-Id: sunanda.s@cmrit.ac.in
Trapped waves are of considerable importance in providing examples of discrete wave frequencies in the presence of a continuous spectrum. In this work, trapped mode frequencies are computed for a submerged horizontal circular cylinder with the hydrodynamic set-up involving an infinite depth three- layer incompressible fluid with layer-wise different density. The impermeable cylinder is fully immersed in either the bottom layer or the upper layer. The trapped modes: one on the free surface corresponding to the lowest wave number and the other two on the internal interfaces corresponding to the other two wave numbers. The existence of trapped modes is shown by numerical evidence. We investigate the variation of these trapped modes by varying the depth of the middle layer as well as the submergence depth. We further analyze the limiting cases when the individual density

ratios tend to 1 separately and also when both density ratios tend to 1 simultaneously, and subsequently conclude why two-layer and single layer fluid results cannot be recovered in these limits. The existence of trapped modes show that in general a radiation condition for the waves at infinity is insufficient for the uniqueness of the scattering problem.

2. Propagation of Love waves in an inhomogeneous viscoelastic layer over an inhomogeneous isotropic half-space under the effect of point source by Anup Saha and Santimoy Kundu, Department of Applied Mathematics, Indian School of Mines, Dhanbad-826004, India. Email: sahaanup1989@gmail.com
In the present paper, study of Love waves in an inhomogeneous viscoelastic layer over an inhomogeneous isotropic half-space under the effect of point source has been taken into account. In the upper layer the in homogeneities in rigidity, internal friction and density are assumed to vary with depth whereas in the half-space the in homogeneity parameter associated to rigidity is assumed to be function of depth. The dispersion equation of Love waves has been obtained in a closed form by using Green's function technique. The dimension less phase velocity has been plotted against dimension less wave number for different values of in homogeneity parameter. It has been observed that the in homogeneity as well as initial stress affect the velocity profile of Love waves. Some other peculiarities have been observed and discussed in our study.

3. MHD free convective flow through a porous medium past a vertical plate with ramped wall temperature by Anuja Sinha* and Nazimuddin Ahmed, Department of Mathematics, Gauhati University, Guwahati-781014, Assam, India. Email: anujasinha115@gmail.com
An exact solution to the problem of the natural convective flow of an optically thin viscous incompressible electrically conducting fluid past a vertical plate in a porous medium with ramped wall temperature is obtained in presence of appreciable thermal radiation. Equations governing the flow and heat transfer are solved analytically by adopting Laplace transform technique in closed form. Expressions for the velocity field and temperature field are obtained in non-dimensional form. Effects of several parameters on the above fields are studied through graphs and tables and are physically interpreted. The application of the transverse magnetic field causes the flow to retard. It is found that velocity increases with increasing Grashof number and decreases with increasing Prandtl number. Moreover due to the increase in porosity parameter and magnetic field, the shear stress at the wall rises. The rate of heat transfer increases with increasing thermal radiation and Prandtl number.

4. MHD Visco-elastic fluid flow past a at plate with heat and mass transfer by Bibhash Deka and Rita Choudhury, Department of Mathematics, Gauhati University, Guwahati-781014, Assam, India. Email: bibhashdeka66@gmail, comrchoudhury66@yahoo.in
An analysis is carried out to study the boundary layer flow with heat and mass transfer which can be formed by an electrically conducting visco-elastic fluid past a at plate in presence of magnetic field. The problem has been solved by the application of steepest descent method used by Meksyn. Analytical expressions for the velocity, temperature, concentration, shearing stress, Nusselt number and Sherwood number have been obtained and illustrated graphically to observe the effects of visco-elastic parameter with the combination of various values of pertinent flow parameters involved in the solution.

5. Unsteady slip flow past an infinite vertical plate with ramped wall

temperature and mass diffusion in presence of thermal radiation by Harekrishna Mandal and Dilip Kumar Maiti, Department of Applied Mathematics, Vidyasagar University, Midnapore 721102, India. Email: kmathk@gmail.com
In this paper, we investigated the unsteady laminar free convection flow convection flow along an infinite vertical plate with ramped wall temperature and mass diffusion with wall slip condition and radiation. An analytical solution of the flow with heat and mass transfer have been obtained using the Laplace transform technique. The influence of various relevant pertinent parameters and their physical significance are also presented, discussed with figures and theoretically investigated.

6. Unsteady thermal radiation effects on MHD convective visco-elastic flow over a vertical porous plate by Bamdeb Dey and Rita Choudhury, Department of Mathematics, Gauhati University, Guwahati-781014, Assam, India. Email: bamdebdey88@gmail.com, rchoudhury66@yahoo.in
The influence of thermal radiation on the unsteady magneto-convention flow of an incompressible, electrically conducting visco-elastic fluid through a porous medium past a semi infinite vertical porous plate in presence of an external magnetic field with time dependent suction acting in a direction normal to the flow has been discussed. There is no external electric field imposed on the system and the magnetic Reynolds number is very small. The governing equations of the problem are solved by perturbation technique. The resulting equations are solved analytically and the approximate solutions have been derived for velocity, temperature, shear stress, rate of heat transfer have been derived. The influence of visco-elasticity on the fluid velocity, temperature and shear stress have been illustrated graphically due to wide occurrence of non-Newtonian fluid behavior in different fields.

7. Study of thermo-Diffusion effect on steady MHD mixed convective flow with induced magnetic field by D. Sarma and M. Kalita, Department of Mathematics, Gauhati University, Guwahati-781014, India.
Email: mail.anamikakalita@gmail.com
The present paper deals with the study are to investigate the effect of thermo-diffusion on steady MHD fixed convective flow with induced magnetic field. The governing non-dimensional equations relevant to the problem, containing partial differential equations are simplified first by Boussinesq's approximation and are transformed by usual similarity transformations into a system of non- linear ordinary differential equations. In the presence of induced magnetic field, the dimension less governing equations are solved by using regular perturbation technique with Eckert number Ec (¡¡ 1) as perturbation parameter. The effect of thermal diffusion is taken into account in presence of induced magnetic field. Under certain assumptions, the solution for velocity field, concentration field, temperature field and induced magnetic field to the second approximations are obtained. Detailed computations of the influence of thermal-diffusion on the variations in the fluid velocity, temperature, concentration and induced magnetic field are demonstrated graphically for various values of the physical parameters involved in the problem and the results are physically interpreted

8. Magnetorheological Dampers by H.P.Salunkhe, S. D. Thikane and Sagar Khillare, Department of Technology, Shivaji University, Kolhapur, India. Email: hpsalunkhe@gmail.com
Magnetorheological fluid (MRF) is the smart material consisting of very small magnetic particles. On account of application of magnetic field its mechanical characteristics, viscosity and flow properties get varied. It changes its rheological behavior and shear stress with respect to applied magnetic field strength. Depending upon

this property, dampers are using in various applications such as vibration and suspension in automobiles. In this paper, Types and basic components of MR damper are studied. Mathematical formulation for MR damper is given. In which response of system under loading is explained.

9. A study on inviscid fluid flow over arbitrary bottom using nonlinear theory by Srikumar Panda, Department of Mathematics, Jadavpur University, Jadavpur, Kolkata 700032, India. Email: shree.iitg.mc@gmail.com
In the present paper, a new approach has been developed using nonlinear theory to analyze the behaviour of the free surface profile for flow of an inviscid fluid over arbitrary bottom topography. The governing nonlinear boundary value problem is reduced to a Dirichlet problem (DP) after using certain transformations. The DP is solved with the help of Plemelj-Sokhotski formulae, and it is found that the solution of the DP depends on the solution of a coupled Fredholm integral equation of the second kind. These Fredholm integral equations are solved numerically by using a modified method. The free surface profile which is unknown at the outset is determined and the behaviour of the free surface profile is analyzed. In addition, influences of the bottom topography and the Froude number on the free surface profile are studied. Further, the present nonlinear result is compared with the result obtained by using linear theory.

10. Flows in out-phase slip-patterned micro-channels using boundary element methods by Chandra Shekhar Nishad, Anirban Chandra and G. P. Raja Sekhar, Department of Mathematics, IIT, Kharagpur-721302, India. Email: chandra.185@gmail.com
Flow through two-dimensional rectangular micro-channel with out-phase configuration of patterned slip under the low-Reynolds number limit (Re ¡¡ 1) is studied using boundary element method (BEM). We considered two sub-cases of out- phase patterned slip, namely large and fine depending on the characteristic length of the patterning. In order to obtain a deep insight of flow mechanics, we investigated the streamlines, velocity profiles, shear stress, and pressure gradients with varying slip-length (ls).

Section L: Electromagnetic Theory, Magneto-Hydrodynamics Astronomy and Astrophysics

1. Bi-complex quantum mechanics: Hyperbolic polynomial oscillator problem by Abhijit Banerjee, Department of Mathematics, Krishnath College, Berhampore, Murshidabad, India-742101 Email: abhijit.banerjee.81@gmail.com
We investigate the Schrodinger equation in the framework of bi-complex numbers, which are pairs of complex numbers making up a commutating ring with zero- divisors. We propose an analytical method to solve bi-complex-version of Schrodinger equation under the influence of hyperbolic valued polynomial oscillator potential function. In our approach we extend the existing mathematical formulation of quantum system searching for the exact and/or quasiexact solution for ground state energy eigenvalues and associated wave functions acting in bi-complex Hilbert space. This model is then applied to the problems of two polynomial oscillators' namely harmonic and isotonic oscillator.

2. In the atmosphere the equations developed from the motion of an axis symmetric body moving by Ashwani Kumar Sinha, Department of mathematics, M. M. Mahila College, Ara (Bihar) M. M. Bajaj, Former, Professor & Head Department of Physics and Astrophysics, University of Delhi Email: mathashwani3@gmail.com
Initially the work progressed to present a new mathematical of the motion of a

spinning axis-symmetric body in the atmosphere. The work is based on the geometrical behavior of a non-Linear differential equation arising one of the motions of an axis-symmetric projectile. Naturally, the motion equation available in the subject are first reviewed for their structures viz., reference frames, structure of forces, specification of the spinning body and finally the assumptions made to develop the model.

Section M: Bio-Mathematics:

1. A relation between metal concentration and toxicity growth by Laplace Transform by Shiv Dayal, Department of Applied Science, Premprakash Gupta Institute of Engineering, Bareilly-243122 UP, India. Email:shivonpi@gmail.com
Heavy metals are the most hazardous pollutants because they are non-degradable and get accumulate to the toxic level in both plants and animals. The role of environmental pollutants has been well established to produce various types of effect on diverse living system. Different kind of waste creates environmental problems to increasing pollution. The discharge of heavy metals into aquatic ecosystem has been a matter of concern in the world The big impact can be seen of global pollution on various terrestrial and aquatic water ecosystems between metal concentration & growth, includes two parts one is constant value (adequate region) and other is the region of decreasing value (toxic region). An environmental mathematical model describes toxicity growth and metal concentration by the help of Laplace Transformation and Gate function.

Section N: History and Teaching of Mathematics:

1. Mathematics education with special reference to pedagogic research by Aditi Biswas, University of Kalyani, Kalyani, West Bengal. Email-Id: biswasaditi.91.ab@gmail.com
In this paper we discuss some aspects of Mathematics Education in different directions.

2. The role of models in classroom when teaching Mathematics by Arup Ratan Das, Pathardanga Osmania High Madrasah (H.S.).
Email: arupratan2007@rediffmail.com
The role of Models in classroom when teaching Mathematics, In the paper we discuss the role of models in teaching Mathematics, advantages of using these models, how easily the children can understood Mathematics.

3. The use of internet and technology in teaching Mathematics Education by Sanjib Mondal, Chaltia Sreeguru Pathsala High School (H.S.) Email: sanjib_mondal_math@yahoo.in
The use of internet and technology in teaching Mathematics Education, in the paper we discuss the role of internet and technology in studying Mathematics education, some advantages and disadvantages of using these, different technique for using these technology.

4. History and teaching of Mathematics from Vedic to pre-modern age by Biswajit Ghosh, Dhantala High School, Chakdaha. Email:biswajitghsh71@gmail.com
Very little is known of the context in which ancient India's mathematical knowledge transfer. The teaching and knowledge exchange in different civilization are made by assumption. From Vedic Age to Medieval India mathematical data transfer and teaching were made in three ways (i) The Guru ,(ii) the merchants accompanied with genius person , (iii) The King with his advisors. Sources in vernacular languages could provide a few information on the context and mean of mathematical

knowledge transmission in wider circles but mathematics and astronomy little studies and very little such testimonials provided . we may sketch an uncertain image of mathematics teaching and knowledge transfer in India during historical period. We structured three historical period relevant to the history of mathematics teaching and learning in India (i) Vedic Period (2500 BCE-500 BCE) (ii) Classical and Medieval period (500 BCE- 12th century) and (iii) Pre modern age (12 th-17 th Century) in which practiced , written texts of elementary , vocational curriculum are vital.

5. Teaching Mathematics: A Philosophical view by Kuheli Biswas, Department of Philosophy, University of Kalyani, Nadia, W.B.-741235, India and Sanjib Mondal, Chaltia Sreeguru Pathsala High School, Berhampore, Murshidabad-742101, India Email: 100kuhelibiswas@gmail.com, sanjibmondal78@gmail.com
In the paper we discuss the teaching Mathematics education in philosophical approach, possibilities and limitations, modern technique used in Mathematics.

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