

Titles and Abstracts (Contributory Talks)

Speaker: *Anuradha Gupta, DCAC, University of Delhi*

Title: *Weyl Type Theorems for Unbounded Operators*

Abstract: In 1909, H. Weyl (*Über beschränkte quadratische Formen, deren Differenz Vollstetig ist.* Rend. Circ. Mat. Palermo 27 (1909) 373–392) examined the spectra of all compact perturbations of a self adjoint operator on a Hilbert space and found that their intersection consisted precisely of those points of the spectrum which were not isolated eigenvalues of finite multiplicity. A bounded linear operator satisfying this property is said to satisfy **Weyl's theorem**.

Various variants of Weyl's theorem, generally known as the Weyl-type theorems, have been introduced with much attention to an approximate point version called a-Weyl's theorem. This study, however, was limited to the classes of bounded operators. Study of other generalizations began in 2003 that resulted in various Weyl type theorems, viz., Browder's theorem, a-Browder's theorem, generalized Weyl's theorem, generalized a-Weyl's theorem, generalized Browder's theorem and generalized a-Browder's theorem.

We have extended this study to the classes of unbounded normal operators and unbounded hyponormal operators on an infinite dimensional complex Hilbert space H , with resolvent set $\rho(T) \neq \phi$.

Speaker: *Bhavneet Kaur, LSR College, University of Delhi*

Title: *Robe's Restricted Problem of 2+2 Bodies*

Abstract: We have generalised the Robe's Restricted Three Body Problem to 2+2 Body problem taking one of the primaries of mass m_1 as a rigid spherical shell filled with homogeneous incompressible fluid of density ρ_1 . The second primary is a mass point m_2 outside the shell. The third and the fourth bodies (of mass m_3 and m_4 respectively) are small solid spheres of density ρ_3 and ρ_4 respectively inside the shell, with the assumption that the mass and the radius of the third and the fourth body are infinitesimal. We find the equilibrium solutions of m_3 and m_4 and analyse their linear stability. We have also studied the various generalisations of the Robe's Restricted Three Body Problem incorporated into Robe's Restricted Problem of 2+2 Bodies.

Speaker: *Deepmala, Indian Statistical Institute, Kolkata*

Title: *Dynamic Programming in Multistage Decision Process*

Abstract: Dynamic programming is an important research field because of its applicability in multistage decision making process. The existence problems of solutions for various functional equations arising in dynamic programming is always challenging for the researchers. In this paper, we discuss the solvability of some real world problem through functional equations arising in dynamic programming.

Speaker: *V. Divya, TIFR Bangalore*

Title: *Regularity behaviour of solutions of hydrodynamical equations*

Abstract: An important milestone achieved over the last century in three-dimensional turbulent flows is the paradox that energy dissipation in them tends to a non-zero value, even as the viscosity tends to zero. This problem is connected to profound issues of regularity for both the

Euler and the Navier-Stokes equations, which is in fact a Millenium-Prize problem declared by the Clay Mathematics Institute.

Speaker: *Iffat Jahan, Ramjas College, University of Delhi*

Title: *The Lattice of L-ideals of a Ring is Modular*

Abstract: We extend the notion of a tip-extended pair of fuzzy subgroups to L-ideals of a ring. We prove that the sum of two tip-extended L-ideals of an arbitrary pair of L-ideals of a ring is the least L-ideal containing the union of the given L-ideals. Using this construction of join of L-ideals, we prove that the lattice of all L-ideals of a given ring is modular.

Speaker: *Isha Dhiman, IIT Ropar, Punjab*

Title: *Introduction to stochastic transport with applications in biology*

Abstract: The study of stochastic transport in complex systems is of primitive interest due to its diverse applications in cell biology, computer science and traffic flow. Such systems form an important class of non equilibrium driven diffusive systems, which can be studied using appropriate mathematical models.

Speaker: *Jyoti Darbari, LSR College, University of Delhi*

Title: *A fuzzy optimisation model for decision making in a recovery network*

Abstract: The paper presents a mixed integer linear programming model under fuzzy environment which aims at optimizing the transportation flow of a recovery network of an electronics manufacturing company. Analytical network process (ANP) is applied to evaluate criteria preferences of the decision makers to select optimal location of the recovery facility.

Speaker: *Monika Singh, LSR College, University of Delhi*

Title: *Weighted Hardy inequalities on Grand Lebesgue spaces for monotone functions*

Abstract: We consider the Hardy averaging operator $Hf(x) := \frac{1}{x} \int_0^x f(t)dt$ and discuss its boundedness on weighted Lebesgue and weighted grand Lebesgue spaces for quasi monotone functions. Moreover, some reverse inequalities have also been discussed.

Speaker: *Nisha Gupta, Laxmi Bai College, University of Delhi*

Title: *Frame System in Banach spaces*

Abstract: Banach frame systems in Banach spaces have been defined and studied. A sufficient condition under which a Banach space, having a Banach frame, has a Banach frame system has been given. Also studied the uniqueness of Banach Frame system.

Speaker: *Neha Gupta, Shiv Nadar University*

Title: *Crossed systems and 2-dimensional HQFTs*

Abstract: Inspired by the work done by Vladmir Turaev on Homotopy Quantum Field Theory (HQFTs), we define for a given group G , an object which we call Turaev G -crossed system in a symmetric monoidal category. For the group G , we also define a cobordism category $X - Cob_1$ where manifolds and cobordisms have been endowed with maps to the target space X , which is a pointed $K(G, 1)$ space. This category is special as it turns out to be a symmetric monoidal category. Then, circles and cylinders form a Turaev crossed system in $X - Cob_1$. Finally we show

that corresponding to a given Turaev crossed system, we can construct a $(1 + 1)$ -dimensional HQFT over a $K(G, 1)$ space.

Speaker: *Pratima Rai, University of Delhi*

Title: *Fitted operator finite difference scheme for a class of singularly perturbed differential-difference turning point problems exhibiting interior layers*

Abstract: In this paper we consider singularly perturbed differential-difference turning point problems exhibiting interior layers. In this work we consider both the cases, i.e., when delay/advance arguments are small as well as when they are big. We derive certain a priori estimates on the solution and its derivatives which are used in proving the parameter uniform convergence of the proposed scheme. Fitted operator finite difference scheme is constructed for the numerical approximation of the solution of the considered problem. Numerical results compliment the theoretical results and also demonstrate the effect of the shifts on the interior layers

Speaker: *Priyambada Tripathi, S.B.S.C., University of Delhi*

Title: *Qualitative and Quantitative study of a New Hyper Chaotic System*

Abstract: In this presentation, a function projective synchronization (FPS) of two identical new hyper chaotic systems is defined and scheme of FPS is developed by using Open-Plus-Closed-Looping (OPCL) coupling method. A new hyper chaotic system has been constructed and then response system with parameters perturbation and without perturbation. Numerical simulations verify the effectiveness of this scheme, which has been performed by Mathematica.

Speaker: *Priyanka Grover, IIT Delhi*

Title: *Orthogonality to matrix subspaces*

Abstract: Let $M(n)$ be the space of $n \times n$ complex matrices. The problem of finding best approximations to a matrix A from a given subspace W of $M(n)$ has intrigued many authors in the past few years. One specific question here is when is the zero matrix a best approximation to A from this subspace? In other words, under what conditions do we have $\|A + X\| \geq \|A\|$ for all $X \in W$. A matrix A is said to be Birkhoff-James orthogonal to W if the above condition holds. We give a necessary and sufficient condition for A to be orthogonal to W . These results can be used to obtain some interesting distance formulas, which we shall discuss.

Speaker: *Kumari Saloni, IIT Guwahati, Assam*

Title: *Bounding the first Hilbert coefficients of modules relative to m -primary ideals*

Abstract: Let (A, \mathfrak{m}) be a Noetherian local ring of dimension $d > 0$, M be a finitely generated maximal modules and $I, K \subset A$ be \mathfrak{m} -primary ideals. The Hilbert polynomial of M relative to I can be written as

$$H_M^I(X) = \sum_{i=0}^d (-1)^i e_i(I, M) \binom{X + d - i}{d - i}.$$

We present significant bounds on the first Hilbert coefficient $e_1(I, M)$ and interesting inequalities relating $e_1(I, K)$, $e_1(I, A)$, $e_1(K, A)$, $e_1(IK, A)$, etc. We also present a characterization of the

finiteness of the set of $e_1(I, M)$ in a number of cases.

Speaker: *Shuchi Agrawal, Maharaja Agrasen College, University of Delhi*

Title: *Uniform Microwave Heating of a Thin Ceramic Slab*

Abstract: Two-dimensional reaction diffusion equations, which contain a functional and inhomogeneous source term, are good models for describing microwave heating of thin ceramic slabs in a multi-mode, highly resonant cavity. A thin ceramic slab situated in a TE_{N03} rectangular cavity modeled in the small Biot number limit is studied to gain insight into the dynamics of the heating process. The evolution of temperature is governed by a two-dimensional reaction diffusion equation and a spatially non-homogeneous reaction term. Numerical methods are applied to accurately approximate the steady state leading order temperature of this equation and to determine the stability of solutions for Neumann boundary conditions.

Speaker: *Sudeshna Basu, George Washington University, U.S.A.*

Title: *Small combination of Slices in Banach Spaces*

Abstract: In this work, we study certain stability results for Ball Separation Properties in Banach Spaces leading to a discussion in the context of operator spaces. In this work, we study certain stability results for Small Combination of Slices Property (SCSP) leading to a discussion on SCSP in the context of operator spaces. SCS points were first introduced in [GGMS] as a slice generalisation of the PC (i.e. point of continuity points for which the identity mapping from weak topology to norm topology is continuous.) It was proved in [GGMS] that X is strongly regular (respectively X^* is w^* -strongly regular) if and only if every non empty bounded convex set K in X (respectively K in X^*) is contained in the norm closure (respectively w^* -closure) of $SCS(K)$ (respectively w^* - $SCS(K)$) i.e. the SCS points (w^* -SCS points) of K . Later, it was proved in [S] that a Banach space has Radon Nikodym Property (RNP) if and only if it is strongly regular and it has the Krien Milamn Property(KMP). Subsequently, the concepts of SCS points was used in [R] to investigate the structure of non dentable closed bounded convex sets in Banach spaces. The point version of the result in [S] (i.e. characterisation of RNP), was also shown to be true in [HL] which extends the results in [LLT].

Speaker: *Vandana Rajpal, Shivaji College, University of Delhi*

Title: *Grothendieck's tensor norms*

Abstract: We discuss some of the basic concepts regarding Banach spaces, C^* - algebras and their tensor products. We also outline some facts and features of operator spaces and the three most important tensor norms in this category, namely, the operator space projective, the operator space injective and the Haagerup tensor norms along with the Grothendieck inequality. Recently, we introduce a new tensor norm and called it as Schur tensor norm. In this talk, we develop a systematic study of the Schur tensor product both in the category of operator spaces and in that of C^* -algebras, which will play a vital role in the theory of operator spaces. Some open questions related to this norm will be stated.