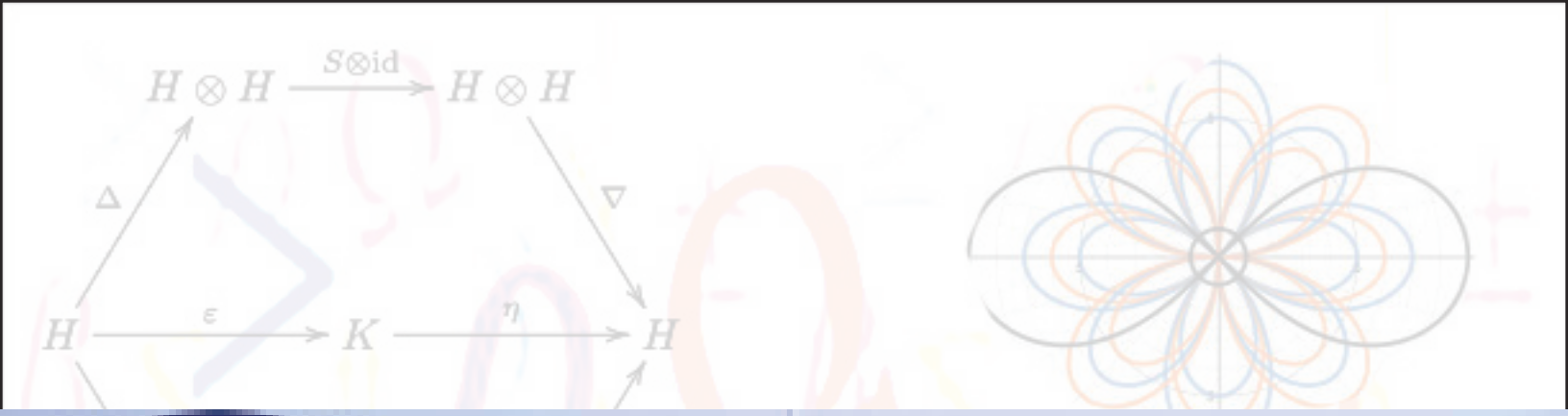
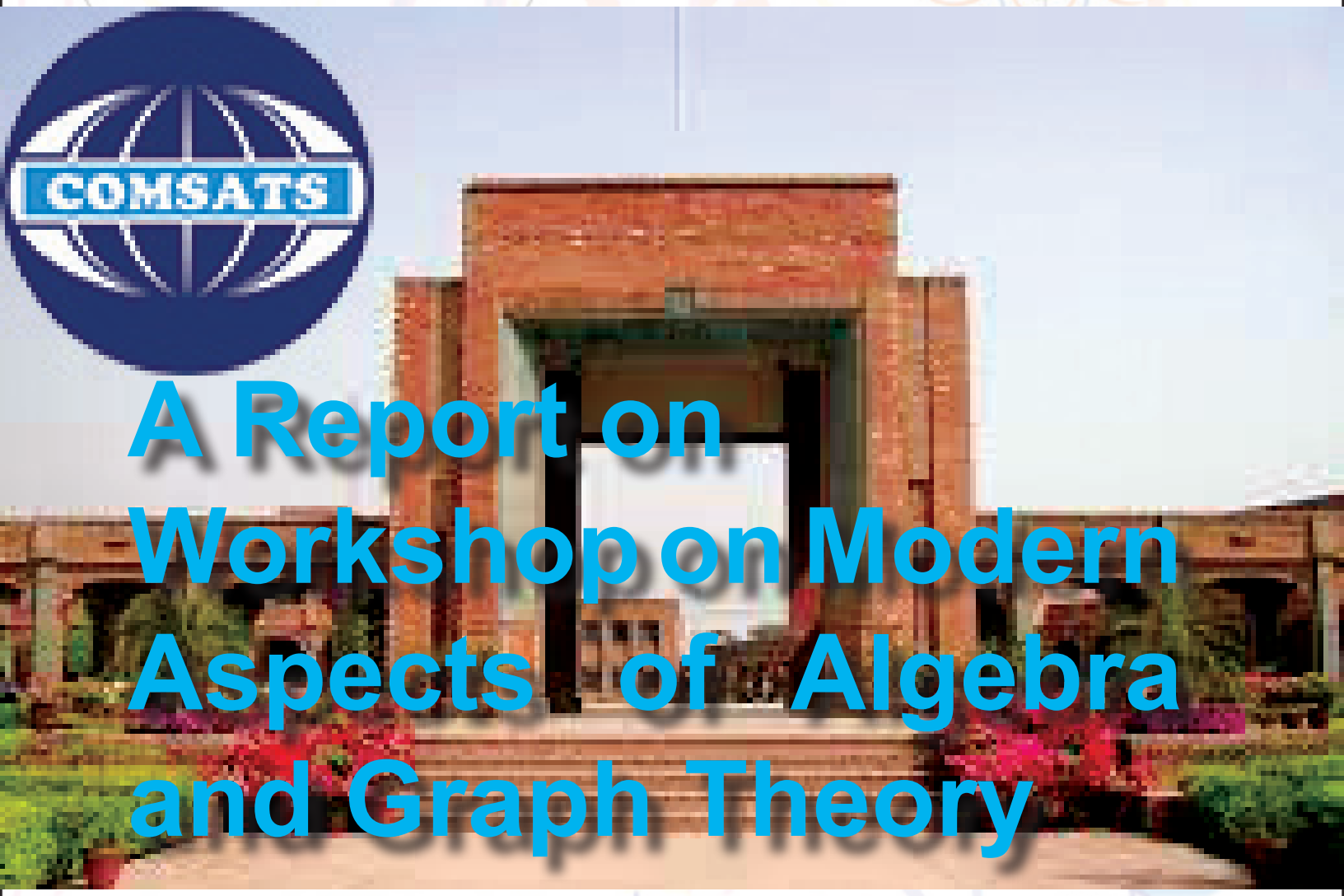
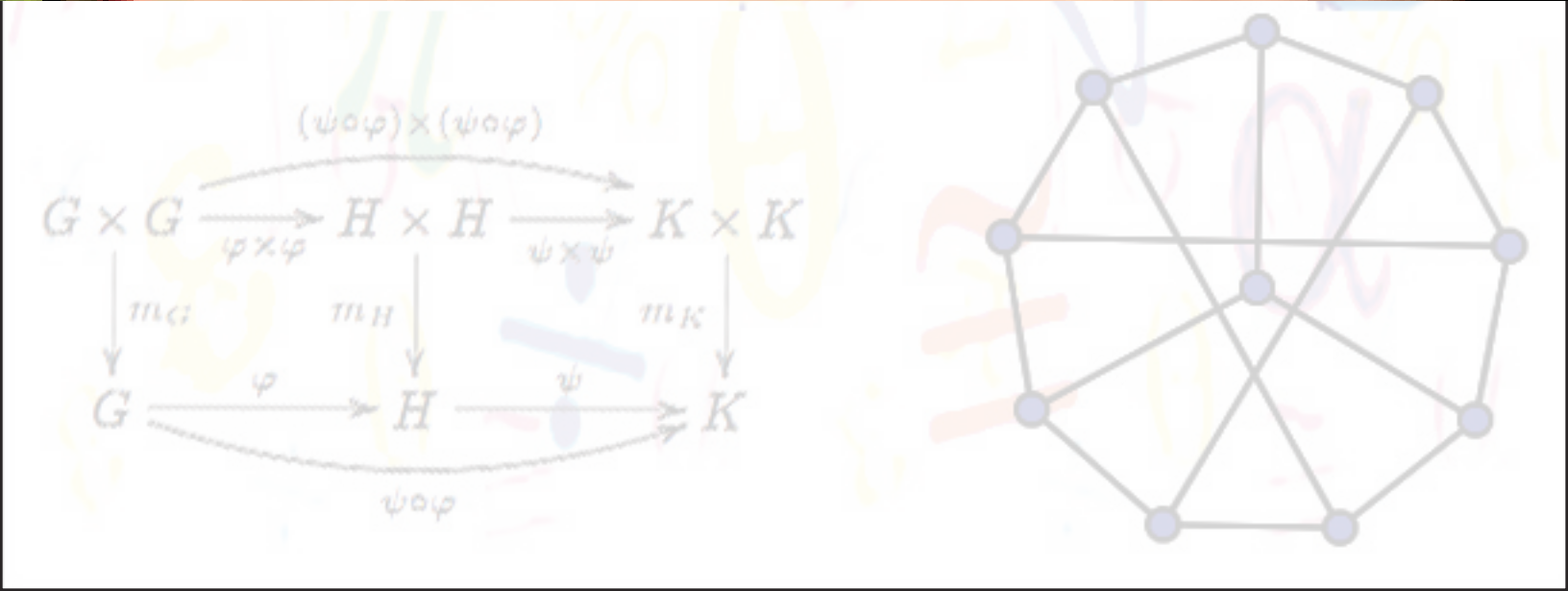




A Report on Workshop on Modern Aspects of Algebra and Graph Theory



Workshop on Modern Aspects of Algebra and Graph Theory

Department of Mathematics CIIT Lahore organized a two workshop on Modern Aspects of Algebra and Graph theory from March 27-28, 2015.
Algebra is one of the main pillars of mathematics and provides many applications to all sciences and disciplines. Graph Theory has proven to be one of the most versatile topics in mathematics and computer sciences due to its applicability to solve many practical problems. This Workshop proved to be very useful for the participants to get familiar with the recent research and developments in these areas. It opened the ways to find new active collaborations to develop and exchange ideas. The workshop also provided the awareness about the importance of learning and applying Algebra and Graph Theory.

Following speakers gave their valuable talks in the workshop along with problem solving sessions/discussions.

1. Prof. Dr. Muhammad Nawaz (BUITE & M, Quetta)
2. Prof. Dr. Moez-ud-din Khan (CIIT, Islamabad)
3. Prof. Dr. Tariq Shah (QAU, Islamabd)
4. Prof. Dr. F. M. Bhatti (LUMS, Lahore)
5. Prof. Ghulam Qanber Abasi (VU, Lahore)
6. Dr. Ahmad Mahmood Qureshi (FCU, Lahore)
7. Dr. Akhlaq Ahmad Bhatti (NU-FAST, Lahore)
8. Dr. Imran Javaid (BZU, Multan)
9. Dr. Muhammad Imran (NUST, Islamabad)
10. Dr. Kashif Shafique (GCU, Faisalabad)

In the opening ceremony Prof. Dr. M. Ahmad Farooqi (Director DDP, CIIT Lahore) was the chief guests. He well come the audience and explained the importance of Mathematics teaching. In the closing ceremony, Prof. Dr. G. M. HabibUllah (President Punjab Mathematical Society) was the chief guest. He explained the importance to Mathematics and distribute shields to the speakers.

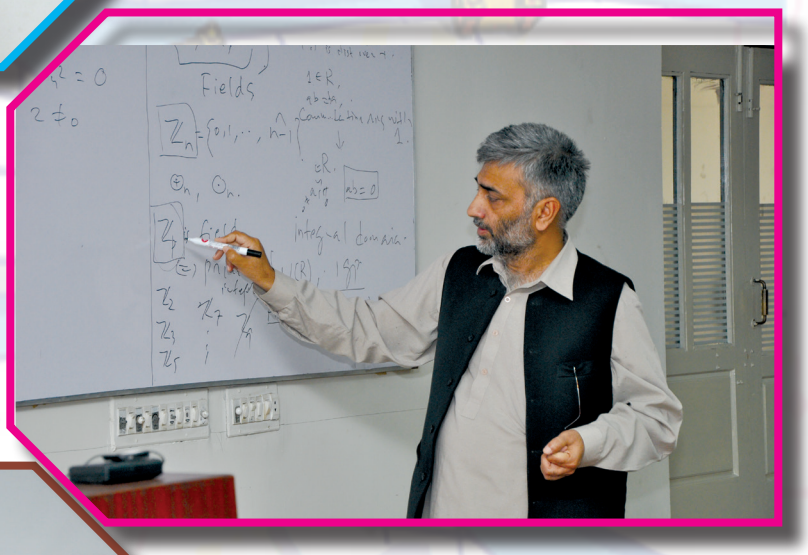
The department of Mathematics CIIT Lahore campus is thankful to the **Higher Education Commission of Pakistan** for funding this activity. We are also thankful Prof. Dr. Mahmood Ahmad Bodla(Director CIIT Lahore campus) and Prof. Dr. Tahira Haroon (Chairperson, Department of Mathematics, CIIT Islamabad) for their support to make this event a success.
The convener is very much thankful to his supporting team including Dr. Kashif Ali, Dr. Imran Anwar, Dr. Hani Shaker, Dr. Muhammad Hussain, Dr. Adeel Farooq, Dr. Sana Javed, Mr. Imran Zulfiqar Cheema, Mr. Tahir Raza Rizvi, Mr. Maqsood Ahmad, Mr. Kaleem Ullah and all students who work very hard before and during the workshop.

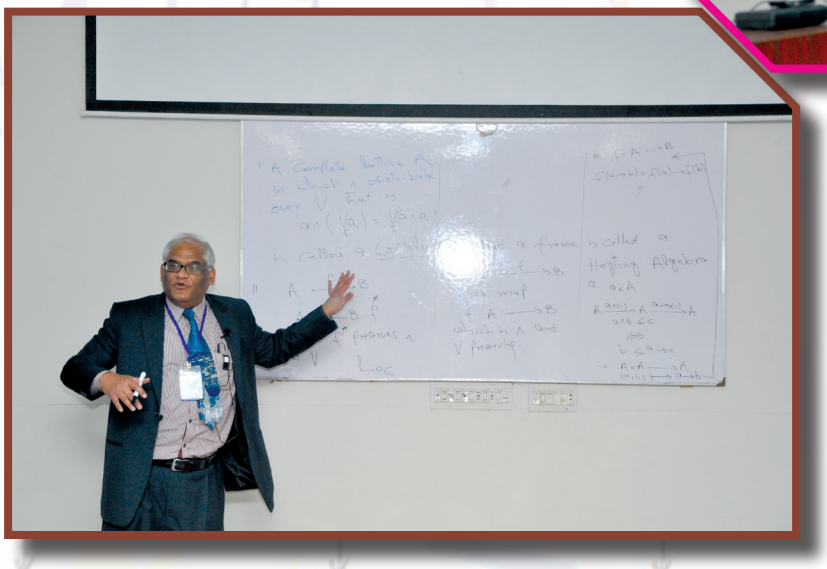
Group Photos

Speakers

Prof. Dr. Muhammad Nawaz (BUITE & M, Quetta)

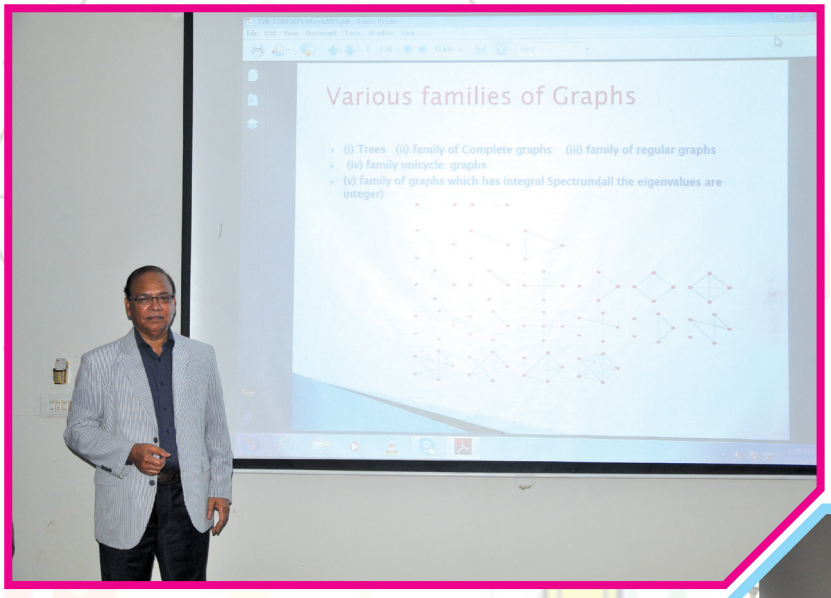
Prof. Dr. Tariq Shah
(QAU, Islamabd)





Dr. Imran Javaid (BZU, Multan)

Dr. Kashif Shafique (GCU, Faisalabad)



Prof. Dr. F. M. Bhatti
(LUMS, Lahore)

Dr. Ahmad Mahmood Qureshi
(FCU, Lahore)

Chief Guests

Prof. Dr. G. M. HabibUllah (President
Punjab Mathematical Society)

Prof. Dr. M. Ahmad Farooqi (Director
DDP, CIIT Lahore)

Audience

Discussion Session

Convener of the Workshop:
Dr Sarfraz Ahmad

Dr. G. M. Habib Ullah
diistributing shields

Organising Committee

Workshop
on Modern Aspects of Algebra and Graph Theory
(March 27 - 28 , 2015)

Organized by
Department of Mathematics, CIIT Lahore Campus

Schedule and Abstracts

Venue
COMSATS Institute of Information Technology, *Defense Road Off Raiwind Road Lahore, Pakistan.*

For further information Contact
wmaag@ciitlahore.edu.pk

COMSATS Institute of Information Technology
Defense Road, Off Raiwand Road, Lahore UAN: 042-111-001-007 Ext: 896
Department of Mathematics

Workshop on Modern Aspects of Algebra and Graph Theory
(March 27-28, 2015)
http:// http://www.ciitlahore.edu.pk/wmaag/index.aspx

Day 1: March 27, 2015 (Friday)

Time	Talk	Speakers
08:45 - 9:30	**Registration and opening ceremony**	
09:30 -10:20	**Spectra of Some Families of Graph**	**Dr. F. M. Bhatti** *Lahore University of Management Sciences, Lahore.*
10:20 -10:45	***Tea & Refreshment***	
10:45 -11:35	**Semi-quotient Mapping and Spaces**	**Dr. Moez-ud-din Khan** *COMSATS Institute of Information Technology*
11:40 -12:30	**Chormaticity and h-Chromatcity of Linear Uniform Hypergraphs**	**Dr. Akhlaq Ahmad Bhatti** *National University of Computer Engineering Sciences-FAST, Lahore*
12:30 -14:20	***Lunch & Juma Prayer Break***	
14:20 -15:10	**On Uniqueness of Central Products and Central Decompositions of Group**	**Dr. Ghulam Qanber Abbasi** *Virtual University, Pakistan.*
15:10 -16:00	**Molecular Topological Descriptors of Graphs, Theoretical and Computational Aspects**	**Dr. Muhammad Imran** *National University of Science Technology, Islamabad.*
16:00 -16:30	***Tea & Refreshment***	
16:30 -17:30	**Problem Solving Session**	

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Workshop on Modern Aspects of Algebra and Graph Theory
(March 27-28, 2015)
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Day 2: March 28, 2014 (Saturday)

Time	Talk	Speaker
09:00 -09:50	**Groups in Locales**	**Dr. Muhammad Nawaz** *Balochistan University of Information Technology Engineering & Management Sciences, Quetta*
09:50 -10:40	**Galois rings and Galois fields : coding Theory and Crytography perspective**	**Dr. Tariq Shah** *Quaid-i-Azam University, Islamabad*
10:40 -11:10	***Tea & Refreshment***	
11:10 -12:00	**Metric Dimension & Related Parameters in Graphs**	**Dr. Imran Javaid** *Bahauddin Zakariya University, Multan*
12:00 -12:45	**Problems Solving Activity**	
12:45 -14:00	***Lunch & Prayer Break***	
14:00 -14:50	**On Planar Hamiltonian Graphs**	**Dr. Ahmad Mahmood Qureshi** *Forman Christian College, Lahore*
14:50 -15:40	**On Graph labeling of Regular and Disconnected graph**	**Dr. Kashif Shafiq** *Government College University, Faisalabad*
15:40 -16:30	**Refreshment and Closing ceremony**	

Abstract No.1

Groups in Locales

Dr.Muhammad Nawaz

Locale is pointless version of topological space. A group object in the category of locales is called localic group. Thus localic group is pointless version of topological group. In this talk we shall investigate the properties inherited by open subsets of a topological group from its group structure. Not every topological group is a localic group because locale products do not in general coincide with space products. However for a locally compact space, it happens. A lattice theoretic definition of continuous multiplication will be given. It will be shown that opens of locally compact topological semi-group inherit multiplication in this sense. Lattice theoretic axiomatisation of neighbourhood filter of identity element of topological group will be discussed and it will be shown that a semi-group having such a point is monoid. A morphism will be constructed and it will be shown that a monoid equipped with such morphism is group in the category of locales.

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Banaschewski, B.; Vermeulen, J. J. C., **On the completeness of localic groups,** Commentationes Mathematicae Universitatis Carolinae, vol. 40 (1999), issue 2, pp. 293-307

Picado, J; Pultr, Ales., Entourages, Covers and Localic Groups, Appl Categor Struct (2013) 21: 49-66

Abstract No.2

Semi-quotient mappings and spaces

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moiz@comsats.edu.pk
Co-authers: M. Siddique Bosan and Ljubisa D.R. Koˇ
ˇ cinac

Abstract

In this talk, we continue the discussion of *s*-topological and irresolute-topological groups. We will define semi-quotient mappings which are stronger than semi-continuous mappings, and then consider semi-quotient spaces and groups. We will proved that for some classes of irresolute- topological groups $(G, \square *, \tau)$ the semi-quotient space G/H is regular. Semi- isomorphisms of *s*-topological groups will be also discussed.

2010 Mathematics Subject Classification: Primary 54H11; Secondary 22A05, 54C08, 54H99.
Keywords: Semi-continuity, semi-homeomorphism, *s*-topological group, irresolute-topological group, semi-quotient space, semi-quotient group.

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Abstract No.3

Spectra of some families of Graphs

Faqir M Bhatti
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Lahore Univ. of Management Sciences(LUMS)
DHA, Lahore. Pakistan
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Abstract: Spectral graph theory is the study of properties of a graphs in relationship to the characteristic polynomial, and eigensystem of various matrices associated to the graph which include adjacency and Laplacian matrices. For all the undirected graphs matrices associated with them are symmetric and thus give real eigenvalues. Graph spectra have many curious and surprising relationships to graph structure and make it interesting area of research in terms of applications.

The aim of my talk is to present various properties of spectra of some family of graphs, like inner dual graphs of hexagonal systems, graph generated through integer partitions and Young Tableaux.

Abstract No.4

Galois rings and Galois fields: Coding Theory and Cryptography perspective

Dr.Tariq Shah

Department of Mathematics, Quaid-i-Azam University, Islamabad

For a prime integer p, Z_{p^k} and Z_p are respectively the local commutative ring with identity and

prime field with cardinality p^k and p. The Galois ring and Galois field extensions of Z_{p^k} and Z_p respectively are $GR(p^k, r)$ and $GF(p, r)$ with cardinality p^{kr} and p^r. We address the role of these algebraic structures in coding theory and cryptography. In coding theory the BCH codes form a class of parameterized random error-correcting cyclic codes. The both Galois ring and Galois field extensions play a key role in the construction of BCH codes over a local ring and finite field. To increase the usage of error-correcting codes, it is valuable for the data transmission and wireless communication to spread the use of binary streams in place of other symbol. Consequently, the codes over binary field Z_2 and correspondingly the Galois field extension $GF(2, r)$ are of specific interest. Furthermore, the BCH codes having symbols from four elements structures Z_4 and $GF(2,2)$ have interesting and valued application in refurbishment of DNA sequences. Substitution boxes (S-boxes) are the elementary part in almost all the cryptosystems. In the development of symmetric, or private-key, cryptosystems, a significant portion of the time spent on design or on analysis is centered on the S-boxes of the algorithm. This is due to the reason that the rest of the algorithm is linear; a simple weakness in the S-boxes can therefore lead to a cryptosystem which is certainly broken. These S-boxes are used as a gauging device to confirm the strength of cryptographic algorithms.

Accordingly the construction of S-boxes must be cryptographically strong in order to pattern protected cryptosystems. In reality S-boxes in modern
cryptography are usually constructed over finite Galois fields $GF(2, r)$, for $2 \leq r \leq 8$. Though, most
recently a construction technique of S-boxes is given by the use of the multiplicative cyclic subgroup of
group of units of the Galois rings $GR(2^2, 2)$ and $GR(2^2, 4)$.

Abstract No.5

Chromaticity and *h*-Chromaticity of Linear Uniform Hypergraphs

Akhlaq Ahmad Bhatti

Department of Sciences and Humanities

National University of Computer and Emerging Sciences

Lahore Campus

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Abstract

In this talk an overview of the study of chromaticity in Simple Graphs and Hypergraphs will be discussed. More emphasize will be given to the study of Linear h-uniform Hypergraphs. Few open problems regarding Chromaticity and *h*-chromaticity of Linear Uniform Hypergraphs will be presented for MS/M.Phil and PhD Scholars.

Key words: Chromaticity, *h*-Chromaticity, Linear Uniform Hypergraphs

Abstract No.6

On Uniqueness of Central Products and Central Decompositions of Groups

Dr. G. Qanber Abbasi

Abstracts

One of the standard methods of investigating finite groups is by constructing them with the help of given finite groups of smaller order and, by using the properties of latter, one can obtain the necessary facts about the former ones. In fact such constructions like direct product, semi-direct products, splitting and extension of groups can be found in the fundamentals of whole of the groups theory. Other constructions, proving their own significance, include the generalized/central products of groups. The most famous application of these products is concerned with the semi-simple groups, i.e the central product of Quasi-simple groups and finite p-groups. If, on one hand generalized/central products behave almost like direct products, then, on the other hand, situation is somewhat complicated. The present talk is devoted to demonstrate one of the reasons of such (complicated) behavior of these products. Similarly we also observe that the central decompositions of a given group into centrally indecomposable factors is not unique.

Abstract No.7

METRIC DIMENSION AND RELATED PARAMETERS IN GRAPHS

IMRAN JAVAID

Abstract. Metric dimension of a graph is a well studied parameter which is the minimum number of vertices of a graph which are used to distinguish all the vertices in the graph using the concept of distance in graphs.
This is a survey type paper and is aimed to study some recent advances related to this parameter and parameter related to it such as determining number, resolving share, resolving value, resolving number and locatic number to name a few.

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Abstract No.8

ON PLANAR HAMILTONIAN GRAPHS

Ahmad Mahmood Qureshi
FC College University Lahore

Abstract:

The problem of determining the existance of a hamiltonian cycle is NP-complete even in the case of planar graphs. We shall discuss a necessary condition for a plane graph to be hamiltonian and consider planar graphs that possess hamiltonicity of varing extent and those that are non-hamiltonian.

Abstract No.9

METRIC DIMENSION AND EXCHANGE PROPERTY FOR RESOLVING SETS OF GRAPHS

MUHAMMAD IMRAN

Abstract. An ordered set of vertices $W \subseteq V(G)$ is called a *resolving set* or *locating set* for G if every vertex is uniquely determined by its vector of distances to the vertices in W. The *metric dimension* or *location number* of G is the minimum cardinality of a resolving set of G, denoted by $\beta(G)$.

The R-set relative to a pair of distinct vertices of a connected graph G is the set of vertices whose distances to these vertices are distinct.

Resolving sets are said to have the *exchange property* in G if whenever S and R are minimal resolving sets for G and $r \in R$, then there exists $s \in S$ so that $(S - s) \cup r$ is a minimal resolving set.

If the exchange property holds for a graph G, then every minimal resolving set for G has the same size and algorithmic methods for finding the metric dimension of G are more feasible.

In this talk, some properties of R-sets of connected graphs are discussed. It is proved that for a connected graph G of order n and diameter 2 the number of R-sets equal to $V(G)$ is bounded above by $\lfloor n^2/4 \rfloor$. It is conjectured that this bound holds for every connected graph of order n.

A lower bound for the metric dimension $\beta(G)$ of G is proposed in terms of a family of R-sets of G having the property that every subfamily containing at least $r \geq 2$ members has an empty intersection.

Three sufcient conditions, which guarantee that a family $\mathcal{G} = (G_n)_{n \geq 1}$ of graphs with unbounded order has unbounded metric dimension, are also proposed. Also, the exchange property for resolving sets of some classes of graphs has been explored.

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Abstract No.10

Muhammad Kashif Shafiq

Abstract

A *labeling* of a graph is a mapping that carries some set of graph elements into numbers (usually positive integers). An (*a, d*)-*edge-antimagic total labeling* of a graph, with *p* vertices and *q* edges, is a one-to-one mapping that takes the vertices and edges into the integers 1, 2, . . . , *p* + *q*, so that the sums of the label on the edges and the labels of their end vertices form an arithmetic progression starting at *a* and having diference *d*. Such a labeling is called *super* if the *p* smallest possible labels appear at the vertices.

We will deal with the existence of super (*a, d*)-edge-antimagic total labelings of regular graphs and disconnected graphs.

We prove that every even regular graph and every odd regular graph, with a 1-factor, admits a super (*a,* 1)-edge-antimagic total labeling, the super (*a,* 2)-edge-antimagic total labelings of disconnected graphs and present some necessary conditions for the existence of (*a, d*)-edge-antimagic total labelings for *d* even.

Also we use the connection between graceful labelings and edge-antimagic labelings for generating large classes of edge-antimagic total trees from smaller graceful trees.