A^{3}G MONTHLY MEETING &
SEMINAR SERIES
SEMESTER II, 2013/2014

Date/Day : Monday, 24 March 2014
Time : 9:00 pm – 11:30 pm
Venue : Meeting & Presentation Room, Dept. of Mathematical Sciences (C22-310)

TENTATIVE SCHEDULE

Time	Speakers
9:00 – 9:15 am	Hidayat Ullah Khan **NEW INTERPRETATION OF INTERIOR IDEALS OF ORDERED SEMIGROUPS**
9:15 – 9:30 am	Mustafa Anis El-Sanfaz **THE PROBABILITY THAT AN ELEMENT OF THE DIHEDRAL GROUPS FIXES A SET UNDER CONJUGATE ACTION**
9:30 – 9:45 am	Muhanizah Abdul Hamid **THE RELATIVE *n*-th NILPOTENCY DEGREE OF TWO SUBGROUPS OF A FINITE GROUP**
9:45 – 10:00 am	Rosita Zainal **THE NONABELIAN TENSOR SQUARE OF SOME FINITE GROUPS**
10:00 – 10:15 am	Adnin Afifi Nawi **THE SCHUR MULTIPLIER OF PAIRS FOR SOME FINITE GROUPS**
10:15 – 10:30 am	Siti Norziahidayu Amzee Zamri **AN ANALYSIS OF GRAPHS DEVELOPED BASED ON TRIAXIAL TEMPLATE PATTERNS**
10:30 – 10:50 am	**Refereshment**
10:50 – 11:05 am	Nurhidaya Mohamad Jan **REVERSE WATSON-CRICK PETRI NETS**
11:05 – 11:20 am	Muhammad Azrin Ahmad **SECOND ORDER LIMIT LANGUAGE ASSOCIATED WITH TWO RULES**
11:20 – 11:23 am	Gan Yee Siang **Finite Automata in DNA Splicing and Sticker Systems**
11:23 – 11:26 am	Mathuri a/p Selvarajoo **PROBABILISTIC SPLICING AND STICKER SYSTEMS IN DNA COMPUTING**
11:26 – 11.30 am	Sanaa Mohamed Saleh Omer **GENERALIZATION OF THE COMMUTATIVITY DEGREE AND GRAPHS OF SOME FINITE GROUPS**

Organized by
Applied Algebra and Analysis Group (A^{3}G),
Nanotechnology Research Alliance
Universiti Teknologi Malaysia, Johor Bahru, Johor
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ABSTRACTS

NEW INTERPRETATION OF INTERIOR IDEALS OF ORDERED SEMIGROUPS

Hidayat Ullah Khan
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
hidayatullak@yahoo.com

Supervisors:

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
nhs@utm.my
Dr Asghar Khan
Department of Mathematics, Abdul Wali Khan University Mardan,
Mardan, Khyber Pakhtunkhwa, Pakistan
azhar4set@yahoo.com

Abstract

Interval-valued fuzzy set is an accepted and useful generalisation of Zadeh's fuzzy set theory where the membership grades are closed sub intervals of $[0,1]$ instead of the points in $[0,1]$. It is natural to investigate more general form of the existing ordinary interval-valued fuzzy interior ideals and $(\overline{\in}, \overline{\in} \vee \overline{q})$-fuzzy interior ideals. In this paper, we considered ordered semigroup and introduced interval-valued fuzzy interior ideals of type $(\overline{\in}, \overline{\in} \vee \overline{q})$. This new notion is linked with the existing ordinary interior ideals by using level set. Further, it is proved that every interval-valued fuzzy interior ideal of an ordered semigroup is an interval-valued $(\overline{\in}, \overline{\in} \vee \overline{q})$-fuzzy interior ideal.

Keywords: interior ideal; interval-valued fuzzy interior ideal; interval-valued $(\overline{\in}, \overline{\in} \vee \overline{q})$-fuzzy interior ideal; interval-valued $(\overline{\in}, \overline{\in})$-fuzzy interior ideal

THE PROBABILITY THAT AN ELEMENT OF THE DIHEDRAL GROUPS FIXES A SET UNDER CONJUGATE ACTION

Mustafa Anis El-sanfaz
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
kabeto_sanfaz@yahoo.com

Supervisors:

Associate Professor Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
nhs@utm.my

Abstract

In this paper, let G be a dihedral group of order $2n$, n is even and $\frac{n}{2}$ is even. Let Ω be the set of all subsets of all commuting elements of size two in the form of (a,b), where a and b commute and $|a|=|b|$ =2. The probability that an element of a group fixes a set is considered as one of the generalization of the commutativity degree that can be obtained by some group actions on a set. In this paper, the probability that an element in of G fixes the set Ω is computed.

Keywords : Commutativity degree, dihedral group, conjugation.

THE RELATIVE *n*-th NILPOTENCY DEGREE OF TWO SUBGROUPS OF A FINITE GROUP

Muhanizah Abdul Hamid
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
muhanizah.maths@gmail.com

Supervisors:

Dr Nor Muhainiah Mohd Ali, Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
normuhainiah@utm.my, nhs@utm.my

Prof Dr Ahmad Erfanian
Department of Mathematics
School of Mathematical Sciences
Ferdowsi University of Mashhad, Iran
erfanian@um.ac.ir

Abstract

The commutativity degree of a group is the probability that two randomly chosen elements of *G* commute. The concept of commutativity degree is then extended to the relative commutativity degree of a group, which is defined as the probability that two arbitrary elements one in *H* and another in *G* commute. Similarly, we can extend it to two arbitrary elements one in *H* and another in *K*, where *H* and *K* are two subgroups of *G*. In this research, the relative commutativity degree concept is further extended to the relative n-th nilpotency degree of two subgroups of a group *G* which is defined as the probability that the commutator of two arbitrary elements $h \in H$ and $k \in K$ belong to $Z_n(G)$, where $Z_n(G)$ is the *n*-th central series of *G*. We give some upper and lower bounds for the about probability and compute it for some known groups.

Keywords: Commutativity degree, relative commutativity degree, relative *n*-th nilpotency degree of two subgroups

THE NONABELIAN TENSOR SQUARE OF SOME FINITE GROUPS

Rosita Zainal
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
rosita.zainal@gmail.com

Supervisors:

Dr Nor Muhainiah Mohd Ali, Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
normuhainiah@utm.my, nhs@utm.my

Assist Prof Dr Samad Rashid
Department of Mathematics, Faculty of Science
Shahre Rey Branch, Islamic Azad University, Iran
samadrashid47@yahoo.com

Abstract

The homological functors of a group including the nonabelian tensor square were originated in homotopy theory. The nonabelian tensor square is a special case of the nonabelian tensor product of groups. The nonabelian tensor square of a group G, $G \otimes G$, is the group generated by the symbols $g \otimes h$ and defined by the relations

$$gg' \otimes h = \left({}^{g}g' \otimes {}^{g}h\right)\left(g \otimes h\right), \qquad g \otimes hh' = \left(g \otimes h\right)\left({}^{h}g \otimes {}^{h}h'\right)$$

for all $g, g', h, h' \in G$, where ${}^{g}g' = gg'g^{-1}$. In this talk, the nonabelian tensor square are discussed for groups of order $8p$, where p is an odd prime.

Keywords: Nonabelian Tensor Square; Groups of Order $8p$

THE SCHUR MULTIPLIER OF PAIRS FOR SOME FINITE GROUPS

Adnin Afifi Nawi
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
adnin_afifi@yahoo.com

Joint work with:

Dr Nor Muhainiah Mohd Ali, Assoc Prof Dr Nor Haniza Sarmin, Rosita Zainal
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
normuhainiah@utm.my, nhs@utm.my, rosita.zainal@gmail.com

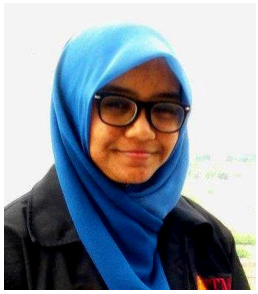
Assist Prof Dr Samad Rashid
Department of Mathematics, Faculty of Science
Shahr-e-Rey Branch, Islamic Azad University, Tehran, Iran
samadrashid47@yahoo.com

Abstract

The Schur multiplier of a group, $M(G)$ is the second homology group of G with integer coefficients. Let (G,N) be an arbitrary pair of finite groups, then the Schur multiplier of pairs of a group, $M(G,N)$ is a finite abelian group with exponent dividing the order of G. Theoretically, Schur multiplier of a group and Schur multiplier of pairs of a group are related to each other. In this research, we determine the Schur multiplier of pairs of groups of order p^3 and p^2q where p and q are prime numbers.

Keywords: Groups of order p^3, Groups of order p^2q, Schur multiplier of pairs of groups.

AN ANALYSIS OF GRAPHS DEVELOPED BASED ON TRIAXIAL TEMPLATE PATTERNS



Siti Norziahidayu Amzee Zamri
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
norzisan@gmail.com

Supervisors:

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
nhs@utm.my

Dr Noor Aishikin Adam
Faculty of Computer and Mathematical Sciences
UiTM Melaka, 78000 Alor Gajah, Melaka
aishikin@melaka.uitm.edu.my

Abstract

A template for triaxial patterns was created in an investigation of food cover weaving. From the template, some three-dimensional graphs have been developed by using a software called iMac Grapher. In this research, we use some mathematical properties in graph theory to analyze the graphs of two-colour strands, which are red and yellow, where the number of ordered-strands increases from two to six. The analysis shows that the graphs of similar triaxial template patterns possessed the same characteristics in graph theory. For instance, the Flock of Pigeons pattern with different orientation has the same characteristic which is a complete graph with three vertices, and they show their homomorphisms for each other. The nature of these triaxial graphs can be generalized in some simple theorems.

Keywords: triaxial template pattern, triaxial graphs, graph theory

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REVERSE WATSON-CRICK PETRI NETS

Nurhidaya Mohamad Jan
Department of Mathematical Sciences, Faculty of Science,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
nurhidayamj@gmail.com

Supervisors:

Dr Fong Wan Heng
Ibnu Sina Institute for Fundamental Science Studies,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
fwh@ibnusina.utm.my

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
nhs@utm.my

Dr Sherzod Turaev
Department of Computer Science, Kulliyyah of Information and Communication Technology,
International Islamic University Malaysia, 53100 Kuala Lumpur
sherzod@iium.edu.my

Abstract

A Watson-Crick Petri net is a model that relates between Watson-Crick automaton and a Petri net where the control unit of the Watson-Crick automaton is replaced by the Petri net. The language generated by a Watson-Crick Petri net can be determined either by using the class of labelling functions or the set of final markings. In this paper, another type of Watson-Crick Petri net known as reverse Watson-Crick Petri net is introduced. Two examples are given to illustrate this new concept.

Keywords: Petri nets; Watson-Crick Petri nets; reverse Watson-Crick Petri nets; Petri net languages

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SECOND ORDER LIMIT LANGUAGE ASSOCIATED WITH TWO RULES

Muhammad Azrin Ahmad
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
azrinahmad1@gmail.com

Supervisors:

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
nhs@utm.my

Dr Fong Wan Heng

Ibnu Sina Institute for Fundamental Science Studies,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
fwh@ibnusina.utm.my
Dr Yuhani Yusof
Faculty of Industrial Science and Technology
26300 UMP Gambang, Pahang

Abstract

The concepts of splicing system involve the study of cut and paste phenomenon of deoxyribonucleic acid (DNA). The splicing language, which is resulted from a splicing system, can be classified as inert persistent language, active persistent language and limit language. As one of the types of splicing language, limit language can biologically be referred as the remaining molecule after the process has attained its equilibrium state. In this paper, the possibilities of existence of second order limit language are explored strictly using at most two initial strings and two rules. In addition, the actual biological examples are presented. By using the Y-G splicing system, the results obtained are then used to prove the existence of second order limit language in few classes of Y-G splicing system.

Keywords : Y-G splicing system; splicing language; second order limit language

Finite Automata in DNA Splicing and Sticker Systems

Gan Yee Siang
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
ysgn88@gmail.com

Supervisors:

Dr Fong Wan Heng
Ibnu Sina Institute for Fundamental Science Studies,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
fwh@ibnusina.utm.my

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science,
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
nhs@utm.my

Dr Sherzod Turaev
Department of Computer Science, Kulliyyah of Information and Communication Technology,
International Islamic University Malaysia, 53100 Kuala Lumpur
sherzod@iium.edu.my

Abstract

In formal language, automata are mathematical models used as language recognition devices. There are two types of mathematical models involving DNA, namely the splicing system and the sticker system. Splicing system is the first mathematical model for the recombination behaviour of DNA molecules with the presence of some enzymes and ligase. Later, sticker system is introduced where the concept of sticker system originates from the laboratory experiment in solving the Hamiltonian path problems. In sticker system, the incomplete DNA strands stick to each other by their sticky ends which are complementary in

their nucleobases pairs. These two DNA based devices are then used as the language generator according to the mathematical modelling on the recombinant behaviour of DNA molecules. Thus, the languages generated by splicing and sticker systems can be recognized using automata. The languages generated by finite components of splicing and sticker system are only regular in the Chomsky hierarchy. In this research, weights are used as restriction to increase the generative power of splicing and sticker systems. Here, automata can be used as tools to study the properties of weights, where finite automata and Watson-Crick finite automata are used to investigate the properties of groups as one of the weighting spaces. Moreover, some variants of weighted splicing and sticker systems are also developed. Lastly, the generative power of weighted splicing and sticker systems together with their variants are also examined.

Keywords : Automata, splicing systems, sticker systems, generative power, weights, groups.

PROBABILISTIC SPLICING AND STICKER SYSTEMS IN DNA COMPUTING

Mathuri a/p Selvarajoo
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor
mathuri87@yahoo.com

Supervisors:

Dr Fong Wan Heng
Ibnu Sina Institute for Fundamental Science Studies
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
fwh@ibnusina.utm.my

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor
nhs@utm.my

Assist Prof Dr Sherzod Turaev
Department of Computer Science, Kulliyah of Information and Communication Technology
International Islamic University Malaysia, 53100 Kuala Lumpur
sherzod@iium.edu.my

Abstract

In DNA computing, the modeling of biological systems in DNA involves Formal Language Theory, which comprises of Theoretical Computer Science and Applied Discrete Mathematics. These modelings are based on the behavior of deoxyribonucleic acid (DNA) molecules. Two of the mathematical modelings used in DNA computing are splicing system and sticker system. Splicing system is a 4-tuple $\gamma = (V, T, A, R)$, which represents the operation of cutting and pasting of DNA molecules in the presence of restriction enzymes; while sticker system, $\gamma = (V, \rho, A, D)$, uses the Watson-Crick complementarity principle of DNA molecules. The probability is labeled as $p(x)$, $p(y)$ and $p(z)$ where $p(z) = p(x) \cdot p(y)$. In splicing system,

probability is attached to the DNA strands; while in sticker system, probability is attached to the axioms and dominoes of the DNA strands. In this research, probability is introduced as a restriction in splicing system and sticker system to increase the computational power of the languages generated. The application of probability in splicing system, sticker system, variants of splicing and sticker systems are established as an extension of the original models of splicing system and sticker system. Moreover, the languages generated by probabilistic splicing system, probabilistic sticker system and variants of probabilistic splicing and sticker systems are developed by considering the threshold languages in order to increase the computational power of the languages generated according to the Chomsky hierarchy. The original models of splicing system, sticker system, and variants of splicing and sticker systems with finite components can only generate regular languages. Here, it has been found that some probabilistic splicing system, probabilistic sticker system, and variants of probabilistic splicing and sticker systems generate non-regular languages. Besides, the inclusion properties of the languages generated by probabilistic splicing system, probabilistic sticker system and variants of probabilistic splicing and sticker systems are explained. Lastly, a computer programming is designed to illustrate the application of probability in splicing system and variants of splicing system.

Keywords : DNA computing; Probability; Splicing system; Sticker system; Computational power

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GENERALIZATION OF THE COMMUTATIVITY DEGREE AND GRAPHS OF SOME FINITE GROUPS

Sanaa Mohamed Saleh Omer
Department of Mathematical Sciences, Faculty of Science
81310 UTM Johor Bahru, Johor
mohamedsana51@yahoo.com

Supervisors:

Assoc Prof Dr Nor Haniza Sarmin
Department of Mathematical Sciences, Faculty of Science
Universiti Teknologi Malaysia 81310 UTM Johor Bahru, Johor
nhs@utm.my

Prof Dr Ahmad Erfanian
Department of Mathematics
School of Mathematical Sciences
Ferdowsi University of Mashhad, Iran
erfanian@um.ac.ir

Abstract

The commutativity degree of a group is the probability that a pair of elements randomly selected commute. The objective of this research is to generalize the commutativity degree of a group by defining the probability that an element of a group fixes a set, where the elements of the set are all commuting elements of size two. In this research, this probability was obtained for some finite non-abelian groups including metacyclic 2-groups, symmetric groups and alternating groups, where the probability was studied under some group action on the set. Moreover, some upper and lower bounds are found. Another objective of this research is to find a formula for the commutativity degree in terms of centralizers. The commutativity degree in terms of centralizers was also generalized by introducing the relative commutativity degree in terms of centralizers. The obtained results were applied to graph theory, more specifically to graph related to conjugacy classes. As a consequence, some graph properties such as the chromatic number, clique number, dominating number and independent number were found. The orbit graph, graph related to centralizers and graph related to isotropy groups were introduced.

Keywords: Commutativity degree; Graph theory; Group action.