



Book of Abstracts

Conference on Recent Trends in Algebra and Related Topics

January 19–20, 2023

Organized by
Department of Mathematics, Faculty of Science,
Chiang Mai University, Chiang Mai, Thailand

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Program Schedule

Conference on Recent Trends in Algebra and Related Topics

January 19-20, 2023 (GMT +7)

Department of Mathematics, Faculty of Science, Chiang Mai University, Thailand

January 19, 2023		
08.30 – 09.00	Participants enter the Zoom meeting in preparation	
09.00 – 09.10	Opening Ceremony <ul style="list-style-type: none"> • Welcome Speech by Prof. Dr.Sorasak Leeratanavalee The Chair of Program Committee • Opening Address by Assoc. Prof. Dr.Nattakorn Sukantamala The Head of Department of Mathematics, Faculty of Science, Chiang Mai University 	
09.10 – 09.15	Take a Group Photo	
09.15 – 10.00	Invited Speaker 1: Assoc. Prof. Dr.Bundit Pibaljommee <i>Semirings and k-ideals</i>	Chair: Assoc. Prof. Dr. Somnuek Worawiset
10.00 – 10.45	Invited Speaker 2: Assoc. Prof. Dr.Teerapong Suksumran <i>Construction of a gyrogroup from a group</i>	Chair: Prof. Dr. Thawhat Changphas
10.45 – 11.00	Break	
Contributed Talks 1		
11.00 – 11.15	Anak Nongmanee [†] and Sorasak Leeratanavalee <i>Ternary Menger algebras and their algebraic properties</i>	Chair: Assoc. Prof. Dr. Kritsada Sangkhanan
11.15 – 11.30	Anusorn Simuen [†] , Ronnason Chinram, Winita Yonthanthum and Aiyared Iampan <i>Picture \mathcal{N}-sets and applications in semigroups</i>	
11.30 – 11.45	Somsak Lekkoksung, Aiyared Iampan, Pongpun Julatha and Nareupanat Lekkoksung [†] <i>Some representations of ordered semigroups</i>	
11.45 – 12.00	Thawhat Changphas [†] <i>Quasi-ideals on the direct product of two semigroups</i>	
12.00 – 13.00	Lunch Break	
13.00 – 13.45	Invited Speaker 3: Asst. Prof. Dr.Songpon Sriwongsa <i>Orthogonal decomposition for a modular Lie algebra \mathfrak{sl}_n</i>	Chair: Prof. Dr. Sorasak Leeratanavalee
13.45 – 14.00	Break	
Contributed Talks 2		
14.00 – 14.15	Thodsaporn Kumduang [†] and Khwancheewa Wattanatripop <i>The partial algebras of completely expanded terms</i>	Chair: Asst. Prof. Dr. Sarawut Phuapong
14.15 – 14.30	Pornpimol Kunama [†] and Sorasak Leeratanavalee <i>Regularity of generalized hypersubstitutions for algebraic systems</i>	
14.30 – 14.45	Khwancheewa Wattanatripop [†] , Thawhat Changphas and Thodsaporn Kumduang	

	<i>Algebras of full terms constructed from transformations with fixed set</i>	
14.45 – 15.00	Bunlong Lang [†] , Pongsakorn Kitpratyakul and Bundit Pibaljommee <i>Semigroups of an inductive composition of tree languages</i>	
15.00 – 15.15	Break	
Contributed Talks 3		
15.15 – 15.30	Worachad Sommanee [†] <i>Regularity of the semigroup of transformations preserving a length</i>	Chair: Asst. Prof. Dr. Kittisak Tinpun
15.30 – 15.45	Muhammad Mansur Zubairu and Nasiru Mohammed Mangga [†] <i>On the maximal subsemigroups and rank properties of certain semigroups of partial injective contractions of a finite chain</i>	
15.45 – 16.00	Muhammad Mansur Zubairu and Abubakar Jibrin [†] <i>On the subsemigroups of full contraction mappings of a finite chain</i>	
16.00 – 16.15	Muhammad Mansur Zubairu [†] , Abdullahi Umar and Muhammad Jada Aliyu <i>On the combinatorial and rank properties of certain subsemigroups of full contractions of a finite chain</i>	
January 20, 2023		
08.30 – 09.15	Participants enter the Zoom meeting in preparation	
09.15 – 10.00	Invited Speaker 4: Assoc. Prof. Dr. Ronnason Chinram <i>Transformation semigroups never die : Magnifying elements in transformation semigroups</i>	Chair: Dr. Panuwat Luangchaisri
10.00 – 10.45	Invited Speaker 5: Assoc. Prof. Dr. Aiyared Iampan <i>Introducing UP-modules</i>	Chair: Assoc. Prof. Dr. Samruam Baupradist
10.45 – 11.00	Break	
Contributed Talks 4		
11.00 – 11.15	Krittapon Chaikan [†] , Aniruth Phon-On and Kittisak Tinpun <i>On the relative rank of orientation-preserving or orientation-reversing transformation semigroups with restricted range</i>	Chair: Asst. Prof. Dr. Nareupanat Lekkoksung
11.15 – 11.30	Denpong Pongpipat [†] and Nuttawoot Nupo <i>On metric dimension of Cayley digraphs of rectangular groups</i>	
11.30 – 11.45	Jaturon Wattanapan [†] , Watchareepan Atiponrat, Santi Tasena and Teerapong Suksumran <i>Extension of Haar's theorem</i>	
11.45 – 12.00	Samruam Baupradist [†] <i>On S-M-cyclic submodules</i>	
12.00 – 13.00	Lunch Break	
13.00 – 13.45	Invited Speaker 6: Assoc. Prof. Dr. Chakkrid Klin-eam <i>The algebraic coding theory and related algebraic problems</i>	Chair: Asst. Prof. Dr. Warud Nakkhasen
13.45 – 14.00	Break	
Contributed Talks 5		
14.00 – 14.15	Nuchanat Tiprachot [†] and Somsak Lekkoksung <i>The coincidence of bi-hyperideals and interior hyperideals</i>	Chair: Dr. Nuttawoot Nupo

14.15 – 14.30	Kanrop Hukaew [†] and Samruam Baupradist <i>Some properties of S-multiplication modules and S-comultiplication modules</i>	
14.30 – 14.45	Nagornchat Chansuriya [†] <i>The study on the finite dimensional Poisson modules over a Poisson algebras</i>	
15.45 – 15.00	Poramate Sangchan [†] and Samruam Baupradist <i>Some properties of S-essential submodules</i>	
15.00 – 15.15	Closing Ceremony <ul style="list-style-type: none"> • An invitation to The 16th International Conference of Young Algebraists in Thailand (ICYAT) • Closing speech by Prof. Dr.Sorasak Leeratanavalee The Chair of Program Committee 	

Abstract (Invited Speakers)

Semirings and k -ideals

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Abstract

As a generalization of a ring, a semiring [2] is an algebraic structure consisting of a nonempty set with two associative binary operations on the set and both operations are connected with distributive law. It is known that every ideal of a ring is a kernel of a ring homomorphism but it is not generally true in case of ideals of semirings [1]. However, this condition can be true for restricted ideals of semirings called k -ideals [1]. Later, many researchers working on semirings gave many results related to k -ideals. Nowadays, many topics related to k -ideals of n -ary semirings are interestingly investigated.

References

- [1] M. Henriksen, Ideals in semirings with commutative addition, *Am. Math. Soc. Notices*, 6 (1958), 321.
- [2] H. Vandiver, Note on a simple type of algebra in which cancellation law of addition does not hold, *Bull. Amer. Math. Soc.*, 40 (1934), 914–920.

[†]Speaker

Construction of a gyrogroup from a group

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Abstract

A gyrogroup is a non-associative algebraic structure, which may be viewed as a suitable generalization of a group, arising from the study of the parametrization of the Lorentz transformation group by Abraham A. Ungar. In this talk, we present a few constructions of gyrogroups from generic groups and mention several related properties of groups and their corresponding gyrogroups.

[†]Speaker

Orthogonal decomposition for a modular Lie algebra \mathfrak{sl}_n

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Abstract

An orthogonal decomposition problem of Lie algebras over the complex numbers has been studied since the 1980s. It has many applications and relations to other areas of Mathematics and Sciences. In this talk, we consider an orthogonal decomposition problem over a finite commutative ring with identity. We define a suitable type of orthogonal decomposition of a modular Lie algebra and construct it for Lie algebra \mathfrak{sl}_n under some sufficient conditions. A necessary condition is also discussed of this type of Lie algebra. Moreover, we analyze the problem over finite fields by using some important facts of modular Lie algebras over fields of positive characteristic.

[†]Speaker

Transformation semigroups never die : Magnifying elements in transformation semigroups

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Abstract

A transformation semigroup is a collection of transformations that is closed under function composition. Transformation semigroup theory is one of main research in semigroup theory. An element a of a semigroup S is called a *left (right) magnifying element* if there exists a proper subset M of S satisfying $aM = S(Ma = S)$. In this talk, we focus on research of magnifying elements of transformation semigroups.

Keywords: transformation semigroups; magnifying elements.

Introducing UP-modules

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Abstract

The goal of this study is to introduce the concept of a new type of the hybrid algebra between Abelian groups and UP-algebras: UP-modules. We introduce the concept of fuzzy UP-submodules of UP-modules and provides properties and finds the necessary and sufficient conditions for this concept. We define fuzzy sets in UP-modules of many forms, supplying their properties and their relation to fuzzy UP-submodules. We also define and study the fuzzy UP-submodule generated by a set of fuzzy sets in UP-modules, as well as provide for their properties and their relation to fuzzy UP-submodules. Finally, we apply the concept of fuzzy UP-ideals of UP-algebras while providing properties and find the results of the composition and the product between fuzzy UP-ideals and fuzzy UP-submodules.

Keywords: UP-algebra, UP-module, fuzzy UP-ideal, fuzzy UP-submodule.

2020 MSC: 03G25, 06D99, 08A72.

The algebraic coding theory and related algebraic problems

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Abstract

Algebraic coding theory studies the design of error-correcting codes for the reliable transmission of information across noisy channels. In this talk, we discuss error-correcting codes. We begin with the fundamentals of coding theory, and then explore linear codes, which are subspaces of vector spaces. We then use results from abstract algebra to understand more complex codes such as cyclic codes and constacyclic codes as generalizations of cyclic codes. In addition, we will discuss current research topics related to algebraic coding theory.

[†]Speaker

Abstract (Contributed Talks)

Ternary Menger algebras and their algebraic properties

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Abstract

In this talk, we start by introducing the algebraic structure of ternary Menger algebras of rank n , where n is a fixed natural number, which can be considered as a canonical generalization of arbitrary ternary semigroups. In addition, some of its interesting algebraic properties are shown. Moreover, we also introduce the notion of v -regular ternary Menger algebras of rank n , which may be regarded as a generalization of regular ternary semigroups. Based on the concept of n -place functions (n -ary operations), we constructed ternary Menger algebras of rank n of all full n -place functions. Finally, a special class of full n -place functions, the so-called left translations, is studied.

Keywords: Ternary Menger algebras; v -Regular ternary Menger algebras; Left translations.

2020 MSC: 20M10, 20M17.

Picture \mathcal{N} -sets and applications in semigroups

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Abstract

In this conference, we study picture \mathcal{N} -structures and apply it to semigroups. Moreover, we define picture \mathcal{N} -ideals in semigroups and investigate several properties of these ideals in semigroups.

Keywords: \mathcal{N} -sets, picture \mathcal{N} -structures, picture \mathcal{N} -ideals.

2020 MSC: 03E72.

†Speaker

Some representations of ordered semigroups

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Abstract

The concept of fuzzy ideals in ordered semigroups has been studied since 2002 by Kehayopulu and Tsingelis. After their studies, several generalized notions of fuzzy ideals in ordered semigroups have been widely investigated nowadays. The idea of (α, β) -fuzzy ideals is one of them. This talk addresses why such a generalization of fuzzy ideals in ordered semigroups is significant.

Keywords: ordered semigroup, fuzzy ordered semigroup, representation.

2020 MSC: 06F05, 08A72, 20M12.

Quasi-ideals on the direct product of two semigroups

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Abstract

Let a and b be two elements in semigroups S_1 and S_2 , respectively. The purpose of this talk is to give necessary and sufficient conditions when $Q((a, b)) = Q(a) \times Q(b)$ and $Q_{(a,b)} = Q_a \times Q_b$.

[†]Speaker

The partial algebras of completely expanded terms

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Abstract

A term which is a formal expression defined by variables and operation symbols can be described by tree diagram. The class of terms under which the longest distance from the root to each vertex is equal is called completely expanded. In this work, we consider the partial many-sorted operation defined on the family of all completely expanded terms of type τ and construct the partial system satisfying the clone axioms.

Keywords: partial system, term, operation, clone, weak homomorphism .

2020 MSC: 08A05, 08A60, 08B20, 20N15.

Regularity of generalized hypersubstitutions for algebraic systems

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Abstract

The concept of a generalized hypersubstitution for algebraic systems of type (τ, τ') is an extension of the concept of a generalized hypersubstitution for universal algebra of type τ . The set of all generalized hypersubstitutions for algebraic systems of type (τ, τ') together with a binary operation defined on the set and its identity forms a monoid. The properties of this structure are expressed by terms and formulas. In this paper, we study the semigroup properties of the monoid of type $((n), (m))$ for arbitrary natural numbers $n, m \geq 2$. In particular, we characterized the idempotent as well as regular elements in this monoid.

Keywords: Hypersubstitutions, generalized hypersubstitutions, algebraic systems, regular elements.

2020 MSC: 20M07, 08B15, 08B25.

Algebras of Full Terms Constructed from Transformations with Fixed Set

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Abstract

Based on the notion of full transformations with fixed set, in this paper, we present a novel concept of n -ary $Fix(I_n, Y)$ -full terms. This term can be considered as a generalization of strongly full terms, permutational full terms and full terms. Together with the superposition operation, one can form a Menger algebra of rank n . The freeness of such algebra with respect to a variety of algebras of the same types is discussed. Furthermore, we apply hypersubstitution theory to define a $Fix(I_n, Y)$ -full closed identity, a $Fix(I_n, Y)$ -full closed variety and present some concrete examples.

Keywords: transformations with fixed set, full term, strongly full term, permutational full term, Menger algebra, hypersubstitution.

2020 MSC: 08B15, 08A62.

Semigroups of an Inductive Composition of Tree Languages

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Abstract

Let $W_\tau(X_n)$ denote the set of all n -ary terms of type τ . Each element of $\mathcal{P}(W_\tau(X_n))$ is called a tree language. Let $W_\tau^r(X_n)$ be a subset of $W_\tau(X_n)$ which contains all n -ary terms of type τ except all proper subterms of a fixed term r . With an r -inductive product, $W_\tau^r(X_n)$ forms a semigroup of an inductive composition of term. The generalization of such operation on tree languages is called an r -inductive product of tree languages. This operation is not associative on $\mathcal{P}(W_\tau(X_n))$, but on its subset $\mathcal{P}(W_\tau^r(X_n))$. In this work, we define a new semigroup of languages with an inductive composition operation and study its the algebraic structures including idempotent elements and regular elements.

Keywords: tree languages, inductive composition of tree languages, inductive product of tree languages, idempotent elements, regular elements

2020 MSC: 08A70, 08A40, 20M10.

[†]Speaker

Regularity of the Semigroup of Transformations Preserving a Length

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Abstract

Let $X_n = \{1, 2, \dots, n\}$ be a finite set ($n \geq 2$) and T_n the full transformation semigroup on X_n . For $l \in \{1, 2, \dots, n-1\}$, we introduce the new transformation subsemigroups of T_n defined by

$$T_n(l) = \{\alpha \in T_n : \forall x, y \in X_n, |x - y| = l \Rightarrow |x\alpha - y\alpha| = l\}$$

and

$$T_n^*(l) = \{\alpha \in T_n : \forall x, y \in X_n, |x - y| = l \Leftrightarrow |x\alpha - y\alpha| = l\}.$$

Of course, $T_n^*(l)$ is a subsemigroup of $T_n(l)$. In this talk, we give a necessary and sufficient condition for $T_n(l)$ to be regular. Moreover, we prove that $T_n^*(l)$ is a regular semigroup.

Keywords: regularity, transformations, preserve a length

2020 MSC: 20M20.

On the maximal subsemigroups and rank properties of certain semigroups of partial injective contractions of a finite chain

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Abstract

Let $[n] = \{1, 2, \dots, n\}$ be a finite chain and let \mathcal{CI}_n be the semigroup of partial injective contractions on $[n]$. Denote \mathcal{ODDP}_n , \mathcal{ODCI}_n and \mathcal{OCI}_n to be the semigroups of "order-preserving order-decreasing partial isometries, order-preserving order-decreasing and order-preserving injective partial contractions", respectively. In this paper, we characterize all the maximal subsemigroups of \mathcal{ODDP}_n , \mathcal{ODCI}_n and \mathcal{OCI}_n respectively, we also characterise the Green's relations and the Starred analogues in \mathcal{ODCI}_n and further investigate its rank properties.

Keywords: patial injectice contraction on a finite chain, maximal subsemigroups, rank of a semigroup.

†Speaker

On the subsemigroups of full contraction mappings of a finite chain

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Abstract

Let $[n] = \{1, 2, \dots, n\}$ be a finite chain and CT_n be the semigroup of full contraction mappings on $[n]$. Denote $DCT_n, OCT_n, ORCT_n$ and $ODCT_n$ be the subsemigroups of order-decreasing, order-preserving, order-preserving or order-reversing and order-decreasing order-preserving full contraction mappings, respectively. In this paper, we characterize the generalized Green's relations for the semigroups $CT_n, DCT_n, OCT_n, ORCT_n$ and $ODCT_n$. Moreover we further investigate that OCT_n and $ORCT_n$ are weakly abundant semigroups..

Keywords: Full Contractions maps on chain, weakly abundant semigroup, contractive refinement, contractive convex refinement.

On the combinatorial and rank properties of certain subsemigroups of full contractions of a finite chain

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Abstract

Let $[n] = \{1, 2, \dots, n\}$ be a finite chain and let \mathcal{CT}_n be the semigroup of full contractions on $[n]$. Denote \mathcal{ORCT}_n and \mathcal{OCT}_n to be the subsemigroup of order preserving or reversing and the subsemigroup of order preserving full contractions, respectively. It was shown in [?] that the collection of all regular elements (denoted by $\text{Reg}(\mathcal{ORCT}_n)$ and $\text{Reg}(\mathcal{OCT}_n)$, respectively) and the collection of all idempotent elements (denoted by $\text{E}(\mathcal{ORCT}_n)$ and $\text{E}(\mathcal{OCT}_n)$, respectively) of the subsemigroups \mathcal{ORCT}_n and \mathcal{OCT}_n , respectively are subsemigroups. In this paper, we study some combinatorial and rank properties of these subsemigroups.

Keywords: ull Contractions maps on chain, regular element, idempotents, rank properties.

2020 MSC: 20M20.

On The Relative Rank of Orientation-preserving or Orientation-reversing Transformation Semigroups with Restricted Range

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Abstract

The relative rank of a semigroup S modulo a non-empty set A is the minimal size (cardinality) of a non-empty set B such that $A \cup B$ generates S where A and B are subsets of S . It is denoted by $rank(S : A) := \min\{|B| \mid \langle A \cup B \rangle = S \text{ and } A, B \subseteq S\}$. Let X be a finite chain and Y be a subchain of X . In this talk, we mention about $\mathcal{T}(X, Y)$ the semigroup of all full transformation with restricted range. In addition, we study all subsemigroups of $\mathcal{T}(X, Y)$ and find the relative rank of the semigroup $\mathcal{OPR}(X, Y)$ of all orientation-preserving or orientation-reversing transformations modulo the semigroup $\mathcal{OD}(X, Y)$ of all order-preserving or order-reversing transformations.

Keywords: relative rank, orientation-preserving, orientation-reversing, order-reversing.

2020 MSC: 20M20, 20M15.

On Metric Dimension of Cayley Digraphs of Rectangular Groups

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Abstract

A vertex x in a digraph Γ is said to resolve a pair u, v of vertices of Γ if the distance from u to x does not equal the distance from v to x . A set W of vertices of Γ is a resolving set for Γ , if every pair of vertices of Γ is resolved by a vertex of W . The smallest cardinality of a resolving set for Γ , denoted by $\dim(\Gamma)$, is called the metric dimension for Γ . In this research, we investigate the metric dimension $\dim(\text{Cay}(S, A))$ of the Cayley digraphs of rectangular groups S with various connection sets A .

Keywords: Metric dimensions, Cayley digraphs, Rectangular groups.

2020 MSC: 05C25, 05C35, 05C50.

Extension of Haar's theorem

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Abstract

Haar's theorem ensures a unique nontrivial regular Borel measure on a locally compact Hausdorff topological group, up to multiplication by a positive constant. In this work, we extend Haar's theorem to the case of locally compact Hausdorff strongly topological gyrogroups. We simultaneously prove the existence and uniqueness of a Haar measure on a locally compact Hausdorff strongly topological gyrogroup, using the method of Steinlage. As an application of this result, we study some properties of a convolution-like operation on the space of Haar integrable functions defined on a locally compact Hausdorff strongly topological gyrogroup.

Keywords: Haar measure, topological gyrogroup, uniformizable space, Haar integral, convolution.

2010 MSC: 28C10, 20N05, 54E15, 43A05.

On S - M -cyclic submodules

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Abstract

In this paper, we introduce S - M -cyclic submodules which are a generalization of M -cyclic submodules. Let M, N be right R -modules and S a multiplicatively closed subset of a ring R . A submodule A of N is said to be an S - M -cyclic submodule if there exist $s \in S$ and $f \in \text{Hom}_R(M, N)$ such that $As \subseteq f(M) \subseteq A$. Besides giving many properties of S - M -cyclic submodules, we generalize some results on M -cyclic submodules to S - M -cyclic submodules. Furthermore, we characterize M -cyclic submodules in terms of S - M -cyclic submodules.

Keywords: M -cyclic submodules, S - M -cyclic submodules.

2020 MSC: 16D10, 16D80, 16D90.

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The coincidence of bi-hyperideals and interior hyperideals

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Abstract

This talk explores the concept of ordered hypersemigroups, a generalization of ordered semigroups. Specifically, we focus on regular duo ordered hypersemigroups. Our aim is to demonstrate that hyperideals, quasi-hyperideals, bi-hyperideals, and interior hyperideals in regular duo ordered hypersemigroups all coincide.

Keywords: Ordered hypersemigroup, regular ordered hypersemigroup, duo ordered hypersemigroup, left (right, two-sided, quasi-, bi-, interior) hyperideal.

2020 MSC: 20M12, 20M17, 06F05.

Some properties of S -multiplication modules and S -comultiplication modules

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Abstract

In this talk, we would like to study a special class of modules called S -multiplication modules introduced by D. D. Anderson et al., which is generalization of multiplication modules. In this presentation, we would like to give a counterexample of S -multiplication module which is not a multiplication module. Moreover, we will give some result concerning S -multiplication modules.

Keywords: multiplication modules, S -multiplication modules, comultiplication modules, S -comultiplication modules

2020 MSC: 13A15, 16P40

The study on the finite dimensional Poisson modules over a Poisson algebras

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Abstract

A Poisson algebra A is a commutative algebra over a field F together with a bilinear map $\{-, -\} : A \times A \rightarrow A$ such that $(A, \{-, -\})$ is a Lie algebra and satisfies the Leibniz identity:

$$\{xy, z\} = x\{y, z\} + \{x, z\}y, \text{ for all } x, y, z \in A.$$

In this study, we focus on the Poisson algebras constructed by many researchers. We use the method of Erdmann and Wildon (2006) to determine the finite dimensional simple Poisson modules which is annihilated by each of the Poisson maximal ideals of each Poisson algebras.

Keywords: Poisson algebra, Poisson Modules, Poisson maximal ideal, Simple Poisson Modules.

2020 MSC: 16D25, 17B63.

Some properties of S -essential submodules

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Abstract

In this talk, we study S -essential submodules, extending notions introduced by S. Rajae, Journal of Algebra and Related Topics (2022) which is a generalization of essential submodule. Besides giving many examples and properties of S -essential submodules, we generalize some results of essential submodules to S -essential submodules.

Keywords: essential submodules, S -essential submodules, S -essential monomorphism.

2020 MSC: 16D80, 16D10, 16D70.

Appendix

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