Kanazawa University -
University of the the Philippines Baguio

Joint Seminar in Mathematics: Algebra and Number Theory

August 1, 2022, via Zoom

12:55 - 13:00 JST / 11:55 - 12:00 PST	**Opening**

13:00 - 15:00 JST / 12:00 - 14:00 PST	**Session** (Moderator: Julius Fergy Rabago)

S. = Speaker · **T.** = Title · **A.** = Abstract

13:00 - 13:50 JST / 12:00 - 12:50 PST	**First Talk**

S. **Manabu Oura**

Faculty of Mathematics and Physics, Institute of Science and Engineering, Kanazawa University, oura@se.kanazawa-u.ac.jp

T. Some topics around association schemes

A. I review what I learned from my teachers and friends. In particular we discuss some of our results around association schemes.

13:55 - 14:15 JST / 12:55 - 13:15 PST	**Second Talk**

S. **Gina May R. Natividad**[1,*], Edna N. Gueco[2] and Dennis I. Merino[3]

[1,2]*Department of Mathematics and Computer Science, University of the Philippines Baguio*

[1]*Mathematics Department, Pangasinan State University, Lingayen, Pangasinan*

[3]*Department of Mathematics, Southeastern Louisiana University*

[1]grnatividad@up.edu.ph, [2]engueco@up.edu.ph, [3]dmerino@selu.edu

T. J-Householder matrices over $\mathbb{Z}_n$

A. Let $J = \begin{bmatrix} 0 & I \\ -I & 0 \end{bmatrix}$. We say that $A \in M_{2k}(\mathbb{Z}_n)$ is J-orthogonal or symplectic if $J^{-1}A^\top J = A^{-1}$ and A is J-symmetric if $J^{-1}A^\top J = A$. A matrix $H \in M_{2k}(\mathbb{Z}_n)$ is said to be a J-Householder if H is symplectic and rank $(H - I) = 1$. We show that J-Householder matrices have the form $I - \alpha x x^\top J$, for any scalar α and $0 \neq x \in \mathbb{Z}_n^{2k}$. Let $u \in \mathbb{Z}_n^{2k}$ with $uu^\top \neq 0$ be given. The J-Householder matrix corresponding to u is given by $H_u = I - uu^\top J$.

We determine forms of the power, inverse, transpose, and the Jordan canonical form of J-Householder matrices corresponding to a vector in $M_{2k}(\mathbb{Z}_n)$. We also present properties of J-Householder matrices that hold in $M_{2k}(\mathbb{Z}_n)$ when n is an odd prime.

References:

[1] K.L. de la Rosa, D.I. Merino, and A.T. Paras, *The J-Householder matrices*, Linear Algebra and Its Applications **436** (2012) 1189-1194.

[2] R.A. Horn, and C.R. Johnson, *Matrix Analysis*. Cambridge University Press, New York, (1985).

14:15 - 14:35 JST / 13:15 - 13:35 PST	**Third Talk**

S. **Richard J. Taclay**[1,*], Jerico B. Bacani[2]
[1,2]*Department of Mathematics and Computer Science, University of the Philippines Baguio*
[1]*Nueva Vizcaya State University-Bayombong Campus, Nueva Vizcaya*
[1]rjtaclay@up.edu.ph, [2]jbbacani@up.edu.ph

T. On the quartic Diophantine equation $2^a px^4 + y^4 = z^4$

A. In this paper, we consider the quartic Diophantine equation $2^a px^4 + y^4 = z^4$, where p is a prime number, $x, y, z \in \mathbb{Z}$ and $a \in \mathbb{Z}^+$. We show the impossibility of primitive nonzero integer solutions of the equation under consideration if $p \equiv 3 \pmod 4$, $p \not\equiv 1 \pmod{16}$, $p \equiv 3, 4 \pmod 5$, $p \equiv 7, 8, 11 \pmod{13}$, and $p \equiv 4, 5, 6, 9, 13, 22, 28 \pmod{29}$, given that $a = 2k + 3$, $k \in \mathbb{N}_0$. Also, we provide parametric solutions for the case $p = 4^{a-3}I^8 + J^8$, where $I, J \in \mathbb{Z}$. Moreover, if p is the nth Fermat prime, the quartic diophantine equation has a solution for some $a = 2^{n-1} + 3$, $n \in \mathbb{Z}^+$.

14:35 - 14:55 JST / 13:35 - 13:55 PST	**Last Talk**

S. **William S. Gayo, Jr.**
College of Arts and Sciences, Don Mariano Marcos Memorial State University,
North La Union Campus, wgayo@dmmmsu.edu.ph

T. The search for integer solutions of equations of the form $a^x + b^y = z^2$: A Diophantine Analysis

A. Diophantine analysis is one of the major trends in Number Theory researches these days. Its main goal is to seek the solutions of Diopantine equations like the equation $a^x + b^y = z^2$, which has been studied extensively for the past decades. In this talk, we will present elementary methods and concepts in solving this Diophantine equation. Moreover, solutions to specific forms of this equation will be tackled.

14:55 - 15:00 JST / 13:55 - 14:00 PST	**Closing**

The Zoom details for the meeting are as follows:

Link: https://up-edu.zoom.us/j/95002648258
Meeting ID: 950 0264 8258
Passcode: KUUPB0801