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Jatinangor, October 23rd-24th, 2013

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Proceedings of

INTERNATIONAL CONFERENCE ON
MATHEMATICAL AND COMPUTER SCIENCES

PREFACE

This event is a forum for mathematician and computer scientist for discussing and exchanging information and knowledge in their area of interest. It aims to promote activities in research, development and application not only on mathematics and computer sciences areas, but also all areas that are related to those two fields.

This proceeding contains sorted papers from the International Conference on Mathematical and Computer Sciences (ICMCS) 2013. ICMCS 2013 is the inaugural international event organized by Mathematics Department Faculty of Mathematics and Natural Sciences University of Padjadjaran, Indonesia.

In this proceeding, readers can find accepted papers that are organized into 3 track sections, based on research interests which cover (1) Mathematics, (2) Applied Mathematics, (3) Computer Sciences and Informatics.

We would like to express our gratitude to all of keynote and invited speakers:

- Prof. Dr. M. Ansjar (Indonesia)
- Assoc. Prof. Dr. Q. J. Khan (Oman)
- Prof. Dr. Ismail Bin Mohd (Malaysia)
- Prof. Dr. rer. nat. Dedi Rosadi (Indonesia)
- Prof. Dr. T. Basarudin (Indonesia)
- Assoc. Prof. Abdul Thalib Bin Bon (Malaysia)
- Prof. Dr. Asep K. Supriatna (Indonesia)

We also would like to express our gratitude to all technical committee members who have given their efforts to support this conference.

Finally, we would like to thank to all of the authors and participants of ICMCS 2013 for their contribution. We hope your next participation in the next ICMCS.

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TABLE OF CONTENTS

PREFACE.....	iii
EDITORS.....	iv
REVIEWERS.....	v
SCIENTIFIC COMMITTEE	vi
ORGANIZING COMMITTEE.....	vii
TABLE OF CONTENTS.....	viii
A Noble Great Hope for Future Indonesian Mathematicians, Muhammad ANSJAR	1
Determining Radius of Convergence of Newton’s Method Using Curvature Function, Ridwan PANDIYA, Herlina NAPITUPULU, and Ismail BIN MOHD	9
Optimization Transportation Model System, Abdul Talib BON, Dayang Siti Atiqah HAMZAH	21
Outstanding Claims Reserve Estimates by Using Bornhutter-Ferguson Method, Agus SUPRIATNA, Dwi SUSANTI	36
Bankruptcy Prediction of Corporate Coupon Bond with Modified First Passage Time Approach, Di Asih I MARUDDANI, Dedi ROSADI, GUNARDI & ABDURAKHMAN	45
Subdirect Sums of Nonsingular M -Matrices and of Their Inverses, Eddy DJAUHARI, Euis HARTINI	53
Teaching Quotient Group Using GAP, Ema CARNIA, Isah AISAH & Sisilia SYLVIANI	60
Analysis of Factors Affecting the Inflation in Indonesia by Using Error Correction Model, Emah SURYAMA, Sukono, Satria BUANA	67
Network Flows and Integer Programming Models for The Two Commodities Problem, Lesmana E.	77

Necessary Conditions for Convergence of Ratio Sequence of Generalized Fibonacci, Endang RUSYAMAN & Kankan PARIKANTI	86
Mean-Variance Portfolio Optimization on Some Islamic Stocks by Using Non Constant Mean and Volatility Models Approaches, Endang SOERYANA, Ismail BIN MOHD, Mustafa MAMAT, Sukono, Endang RUSYAMAN	92
Application of Robust Statistics to Portfolio Optimization, Epha Diana SUPANDI, Dedi ROSADI, ABDURAKHMAN	100
Multivariate Models for Predicting Efficiency of Financial Performance in The Insurance Company, Iin IRIANINGSIH, Sukono, Deti RAHMAWATI	108
A Property of $z^{-1}F^m [z^{-1}]$ Subspace, Isah AISAH, Sisilia SYLVIANI	119
Fractional Colorings in The Mycielski Graphs, Mochamad SUYUDI, Ismail BIN MOHD, Sudradjat SUPIAN, Asep K. SUPRIATNA, Sukono	123
Simulation of Factors Affecting The Optimization of Financing Fund for Property Damage Repair on Building Housing Caused by The Flood Disaster, Pramono SIDI, Ismail BIN MOHD, Wan Muhamad AMIR WAN AHMAD, Sudradjat SUPIAN, Sukono, Lusiana	134
Analysis of Variables Affecting the Movement of Indeks Harga Saham Gabungan (IHSG) in Indonesia Stock Exchange by using Stepwise Method, Riaman, Sukono, Mandila Ridha AGUNG	142
Learning Geometry Through Proofs, Stanley DEWANTO	153
Mathematical Modeling In Inflammatory Dental Pulp On The Periapical Radiographs, Supian S., Nurfuadah P., Sitam S., Oscanda F., Rukmo M., and Sholahuddin A	157
The Selection Study of International Flight Route with Lowest Operational Costs, Warsito, Sudradjat SUPIAN, Sukono	164
Scientific Debate Instructional to Enhance Students Mathematical Communication, Reasoning, and Connection Ability in the Concept of Integral., Yani RAMDANI	172

Rice Supply Prediction Integrated Part Of Framework For Forecasting Rice Crises Time In Bandung-Indonesia, Yuyun HIDAYAT, Ismail BIN MOHD, Mustafa MAMAT, Sukono	183
Global Optimization on Mean-VaR Portfolio Investment Under Asset Liability by Using Genetic Algorithm, Sukono, Sudradjat SUPIAN, Dwi SUSANTI	193
Controlling Robotic Arm Using a Face, Asep SHOLAHUDDIN, Setiawan HADI	202
Image Guided Biopsies For Prostate Cancer, Bambang Krismono TRIWIJOYO	214
Measuring The Value of Information Technology Investment Using The Val It Framework (Case Study : Pt Best Stamp Indonesia Head Office Bandung), Rita KOMALASARI, Zen MUNAWAR	231
Assessment Information Technology Governance Using Cobit Framework Domain Plan and Organise and Acquire and Implement (Case Study: Pt. Best Stamp Indonesia Bandung Head Office), Zen MUNAWAR	242
Curve Fitting Based on Physichal Model Accelerated Creep Phenomena for Material SA-213 T22, Cukup MULYANA, Agus YODI	254
Growing Effects in Metamorphic Animation of Plant-like Fractals based on Transitional IFS Code Approach, Tedjo DARMANTO, Iping S. SUWARDI & Rinaldi MUNIR	260
Mining Co-ocurance Crime Type Patterns for Spatial Crime Data, Arief F HUDA, Ionia VERITAWATI	267
An Improved Accuracy CBIR using Clustering and Color Histogram in Image Database, Juli REJITO	276

KEYNOTE SPEAKER

Fractional Colorings in The Mycielski Graphs

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Abstract: In this paper, we will investigate the results of graph coloring by Michael Larsen, James Propp and Daniel Ullman 1995. Namely, "fractional chromatic number of Mycielski Graf," that the fractional clique number of a graph G bounded below by the number of clique integer, and it is equal to the fractional chromatic number, which is bounded above by the number of chromatic integer. In other words,

$$\omega(G) \leq \omega_F(G) = \chi_F(G) \leq \chi(G)$$

Given this relationship, giving rise to a question whether the difference $\omega_F(G) - \omega(G)$ and $\chi(G) - \chi_F(G)$ can be made arbitrary large. The question then will be proved in the affirmative, with the order of the graph to show the differences between them are increased without limit. Proof to determine the fractional coloring and the fractional chromatic number, will be shown in two different ways: first intuitively, combinatorial way marked in relation to with graph homomorphisms, and then in relation to with an independent set, with calculations using linear programming. In this second context, will be defined fractional clique, and see how this relates to fractional coloring. Relationship between coloring fractions and fractional clique is the key proof of Larsen, Propp, and Ullman.

Keywords: fractional clique number, fractional chromatic number, Mycielski Graf, linear programming.

1. Introduction

In this paper, we discuss a result about graph colorings from 1995. The paper we will be investigating is "The Fractional Chromatic Number of Mycielski's Graphs," by Michael Larsen, James Propp and Daniel Ullman [3].

We will begin with some preliminary definitions, examples, and results about graph colorings. Then we will define *fractional colorings* and the *fractional chromatic number*, which are the focus of Larsen, Propp and Ullman's paper. We will define fractional colorings in two different ways: first in a fairly intuitive, combinatorial manner that is characterized in terms of *graph homomorphisms*, and then in terms of independent sets, which as we shall see, lends itself to calculation by means of linear programming. In this second context, we shall also define *fractional cliques*, and see how they relate to fractional colorings. This connection between fractional colorings and fractional cliques is the key to Larsen, Propp and Ullman's proof.

2. Graphs and graph colorings

2.1 Basic definitions

A graph is defined as a set of vertices and a set of edges joining pairs of vertices. The precise definition of a graph varies from author to author; in this paper, we will consider only finite, simple graphs, and shall tailor our definition accordingly.

A graph G is an ordered pair $(V(G), E(G))$, consisting of a vertex set, $V(G)$, and an edge set, $E(G)$. The vertex set can be any finite set, as we are considering only finite graphs. Since we are only considering simple graphs, and excluding loops and multiple edges, we can define $E(G)$ as a subset of the set of all *unordered* pairs of *distinct* elements of $V(G)$.