

# INTERNATIONAL CONFERENCE



The Second International Conference on  
Engineering and Technology Development

# 2<sup>nd</sup> ICETD 2013

27, 28, 29 August 2013, Bandar Lampung, Indonesia



## PROCEEDINGS



In  
Cooperations  
With :



Hosted by :

Faculty of Engineering and Faculty of Computer Science,  
Bandar Lampung University (UBL), Indonesia

# 2<sup>nd</sup> ICETD 2013

THE SECOND INTERNATIONAL CONFERENCE  
ON ENGINEERING AND TECHNOLOGY DEVELOPMENT

28 -30 January 2013  
Bandar Lampung University (UBL)  
Lampung, Indonesia

## PROCEEDINGS

Organized by:



Faculty of Computer Science and Faculty of Engineering  
Bandar Lampung University (UBL)  
Jl. Zainal Abidin Pagar Alam No.89 Labuhan Ratu, Bandar Lampung, Indonesia  
Phone: +62 721 36 666 25, Fax: +62 721 701 467  
website : [www.ubl.ac.id](http://www.ubl.ac.id)

## **PREFACE**

The Activities of the International Conference is in line and very appropriate with the vision and mission of Bandar Lampung University (UBL) to promote training and education as well as research in these areas.

On behalf of the Second International Conference on Engineering and Technology Development ( 2<sup>nd</sup> ICETD 2013) organizing committee, we are very pleased with the very good response especially from the keynote speaker and from the participants. It is noteworthy to point out that about 80 technical papers were received for this conference.

The participants of the conference come from many well known universities, among others : University Kebangsaan Malaysia – Malaysia, APTIKOM – Indonesia, Institut Teknologi sepuluh November – Indonesia, Surya Institute – Indonesia, International Islamic University – Malaysia, STMIK Mitra Lampung – Lampung, Bandung Institut of Technology – Bandung, Lecture of The Malahayati University, B2TP – BPPT Researcher – Lampung, Starch Technology Center – Lampung, Universitas Islam Indonesia – Indonesia, Politeknik Negeri Malang – Malang, University of Kitakyushu – Japan, Gadjah Mada University – Indonesia, Universitas Malahayati – Lampung, Lampung University – Lampung, Starch Technology Center – Lampung, Universitas Riau – Riau, Hasanuddin University – Indonesia, Diponegoro University – Indonesia, King Abdulaziz University – Saudi Arabia, Parahyangan Catholic University – Indonesia , National Taiwan University– Taiwan, Surakarta Christian University – Indonesia, Sugijapranata Catholic University – Indonesia, Semarang University – Indonesia, University of Brawijaya – Indonesia, PPKIA Tarakanita Rahmawati – Indonesia, Kyushu University, Fukuoka – Japan, Science and Technology Beijing – China, Institut Teknologi Sepuluh Nopember – Surabaya, Researcher of Starch Technology Center, Universitas Muhammadiyah Metro – Metro, National University of Malaysia – Malaysia.

I would like to express my deepest gratitude to the International Advisory Board members, sponsor and also to all keynote speakers and all participants. I am also grateful to all organizing committee and all of the reviewers who contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector of Bandar Lampung University (UBL) who give us endless support to these activities, so that the conference can be administrated on time

Bandar Lampung, 29 August 2013-08-26

Mustofa Usman, Ph.D  
2<sup>nd</sup> ICETD Chairman

# **PROCEEDINGS**

## **2<sup>nd</sup> ICETD 2013**

The Second International Conference  
On Engineering And Technology Development

**28 -30 January 2013**

### **INTERNATIONAL ADVISORY BOARD**

Y. M Barusman, Indonesia  
Ahmad F. Ismail, Malaysia  
Mustofa Usman, Indonesia  
Moses L. Singgih, Indonesia  
Andreas Dress, Germany  
Faiz A.M Elfaki, Malaysia  
Warsono, Indonesia  
Raihan Othman, Malaysia  
Zeng Bing Zen, China  
Tjin Swee Chuan, Singapore  
Khomsahrial R, Indonesia  
Rony Purba, Indonesia  
Alex Tribuana S, Indonesia  
Hon Wei Leong, Singapore  
Imad Khamis, USA  
Rozlan Alias, Malaysia  
Rudi Irawan, Indonesia  
Gusri Ibrahim, Indonesia  
Jamal I Daoud, Malaysia  
Riza Muhida, Indonesia  
Heri Riyanto, Indonesia  
Agus Wahyudi, Indonesia  
Lilies Widojoko, Indonesia

# **PROCEEDINGS**

## **2<sup>nd</sup> ICETD 2013**

The Second International Conference  
On Engineering And Technology Development

**28 -30 January 2013**

### **STEERING COMMITTEE**

#### **Executive Advisors**

Dr. M. Yusuf S. Barusman  
Andala R. P. Barusman, MA.Ec

#### **Chairman**

Mustofa Usman, Ph.D

#### **Co-Chairman**

Dr. Ir. Hery Riyanto, MT  
Ahmad Cucus, S.Kom., M.Kom

#### **Secretary**

Marzuki, S.Kom., M.Kom  
Maria Shusanti Febrianti, S.Kom., M.Kom

#### **Technical Committee**

Indyah Kumoro, ST. IAI  
Ardiansyah, ST., MT  
Sofiah Islamiah, ST. MT  
Taqwan Thamrin, ST., MSc  
Dina Ika Wahyuningsih, S.Kom  
Agus Sukoco, M.Kom  
Hj. Susilowati, ST. MT  
Haris Murwadi, ST, MT  
Robby Yuli Endra, S.Kom., M.Kom  
Fenty Arian, S.Kom., M.Kom

#### **Treasure**

Samsul Bahri, SE  
Dian Agustina, SE

# **PROCEEDINGS**

## **2<sup>nd</sup> ICETD 2013**

The Second International Conference  
On Engineering And Technology Development

**28 -30 January 2013**

### **ORGANIZING COMMITTEE**

#### **Chair Person**

Dr. Ir. Hery Riyanto, MT

#### **Vice Chair Person**

Yuthsi Aprilinda, S.Kom., M.Kom

#### **Treasure**

Dian Agustina, S.E

#### **Secretary**

Aprizal, ST. MT

Ir. Tjejeng Sofyan, MM

Ir. Muhammad Zein, MT

Ir. Bambang Pratowo, MT

#### **Special Events**

Ir. Juniardi, MT

Ir. Indra Surya, MT

Ir. Sugito, MT

DR. Baginda Simaibang, M.Ed

Berry Salatar, S.Pd

Yanuar Dwi Prasetyo, S.Pd.I., M.A

#### **Receptionist**

Ir. Najamudin, MT

Kunarto, ST. MT

IB. Ilham Malik, ST. MT

Ir.A Ikhsan Karim, MT

Ir. Asikin, MT

Usman Rizal, ST., M.MSi

#### **Transportation and Acomodation**

Irawati, SE

Desi Puspita Sari, S.E

Tanto Lailam, S.H

Ilyas Sadad, S.T., M.T

**Publication and Documentation**

Ir. Indriati Agustina Gultom, M.M

Noning Verawati, S.Sos

Hesti, S.H

Rifandi Ritonga, SH

Violita, S.I.Kom

**Cosumption**

Dra. Yulfriwini, M.T

Wiwin Susanty, S.Kom., M.Kom

Fenty Ariani, S.Kom., M.Kom

Reni Nursyanti, S.Kom., M.Kom

Erlangga, S.Kom

Arnes Yuli Vandika, S.Kom

**Facility and Decoration**

Siti Rahma Wati, SE

Dina Ika Wahyuningsih, S.Kom

Zainal Abidin, SE

Ahyar Saleh, SE

Eko Suhardiyanto

Wagino

Sugimin

## Table Of Content

Organizing Committee .....	i
Table Of Content.....	v

### Keynote Speaker

1. Recent Advances in Biofuel Cell and Emerging Hybrid System <b>Abdul Aziz Ahmad and Raihan Othman</b> .....	1
2. Waste Utilization Study Tailing Gold Mine in Way Linggo-Lampung, as Fine Aggregate Materials for Producing Mortar Materials based on concept of Green Technology <b>Lilies Widojoko &amp; Susilawati</b> .....	8
3. Infrastructure Health Monitoring System (SHM) Development, a Necessity for Maintance and Investigation <b>Prof. Dr. Priyo Suprobo, Faimun, Arie Febry</b> .....	17
4. Four Phases Quality Function Deployment (Qfd) By Considering Kano Concept, Time And Manufacturing Cost <b>Prof. Dr. Moses L Singgih, Dyah L. Trenggonowati, Putu D. Karningsih</b> ....	22



Speaker

1. Comparative Analysis for The Multi Period Degree Minimum Spanning Tree Problem  
**Wamiliana, Amanto, and Mustofa Usman**..... 39
2. Choosing The Right Software In Supporting The Successful of Enterprise ERP Implementation  
**Yodhie Yuniarthe, Idris Asmuni**..... 44
3. Climate Adaptive Technology In Maintaining Vernacularism Of Urban Kampong Case study: Kampung Adat (Indiginous) Mahmud, Bandung District, West Java  
**Marcus Gartiwa**..... 50
4. The Prospect Of Dieselhol In Facing Fossil Fuel Crissis  
**M.C. Tri Atmodjo**..... 63
5. The Potential Of Agriculture And Forestry Biomass Wastes As Source Of Bioenergy  
**Hardoyo**..... 66
6. The Importance of Education Facility as Sustainable Urban Generation Tool  
**Fritz Akhmad Nuzir, Haris Murwadi and Bart Julien Dewancker** ..... 71
7. The implementation of Secton Method for Solving Systems of Non Linear Equations  
**Nur Rokhman** ..... 80
8. Quality Control Analysis Into Decrease The Level Defects On Coffee Product  
**Heri Wibowo, Sulastri and Emy Khikmawati** ..... 85
9. Public Transportion Crisis In Bandar Lampung  
**Ida Bagus Ilham Malik** ..... 89
10. Geospatial Analysis of Land Use Change in Way Kuripan Watershed, Bandar Lampung City  
**Candra Hakim Van Rafi'il., Dyah Indriana Kusumastuti2., Dwi Jokowinarno**..... 99
11. Material Utilization Technology Of Agriculture And Forestry Waste  
**Hardoyo**..... 105
12. The Supply Chain System Of Cassava On The Tapioca Industry  
**Hardoyo**..... 108
13. Glass Technology In Natural Light Glasses On Aperture Element In The Architecture World  
**Muhammad Rija & MT Pedia Aldy** ..... 113

14. An Eksperimental Permeable Asphalt Pavement Using Local Material Domato Stone On Quality Of Porous Asphalt <b>Firdaus Chairuddin, Wihardi Tjaronge, Muhammad Ramli, Johannes Patanduk</b> .....	117
15. Coordination Of Architectural Concepts And Construction Systems <b>Eddy Hermanto.</b> .....	129
16. Seismic Assessment of RC Building Using Pushover Analysis <b>Riza Ainul Hakim.</b> .....	136
17. Viscosity and Liquidity Index Relation for Elucidating Mudflow Behavior <b>Budijanto Widjaja and Shannon Hsien-Heng Lee.</b> .....	143
18. The Use of Pozzolanic Material for Improving Quality of Strontium Liquid Waste Cementation in Saline Environment during Nuclear Waste Immobilization Process <b>Muhammad Yusuf, HayuTyasUtami, Tri SulistiyoHariNugroho, SusetyoHarioPutero</b> .....	148
19. Geospatial Analysis Of Land Use And Land Cover Changes For Discharge At Way Kualagaruntang Watershed In Bandar Lampung <b>Fieni Yuniarti, Dyah Indriana K, Dwi Joko Winarno.</b> .....	153
20. Wifi Network Design For High Performance <b>Heru Nurwarsito, , KasyfulAmron,BektiWidyaningsih</b> .....	161
21. Studi on The Efficiency Using Nature Materials in The Structural Elements of Reinforced Concrete Beam <b>Yasser , Herman Parung , M. Wihardi Tjaronge, Rudy Djamaluddin.</b> .....	167
22. The Research Of Slow Release Nitrogen Fertilizer Applied In Sugarcane (Saccharum Officinarum) For Green Energy Bioethanol <b>M.C. Tri Atmodjo, Agus Eko T. Nurul Rusdi, Sigit Setiadi, and Rina.</b> .....	179
23. Energy Utilization Technology Of Agriculture And Forestry Waste <b>Hardoyo.</b> .....	185
24. Implementation Of Fuzzy Inference System With Tsukamoto Method For Study Programme Selection <b>Fenty Ariani and Robby Yuli Endra.</b> .....	189
25. The Analysis of Video Conference With ITU Standarization (International Telecommunication Union) That Joining in Inherent At Bandar Lampung University <b>Maria Shusanti F, Happy Reksa</b> .....	201

26. The E-internal audit iso 9001:2008 based on accreditation form assessment matrix in study program for effectiveness of monitoring accreditation <b>Marzuki, Maria Shusanti F.</b> .....	207
27. The Developing Of e-Consultations For Effectiveness of Mentoring Academy <b>Ahmad Cucus, Endang K</b> .....	214
28. The Evaluation of information system performance in higher education case study with EUCS model at bandar lampung university <b>Reni Nursyanti, Erlangga.</b> .....	221
29. The Analysis Of History Collection System Based On AndroidSmartphone With Qr Code Using Qr CodeCase Study: Museum Lampung <b>Usman Rizal, Wiwin Susanty, Sutrisno.</b> .....	230
30. Application of Complaint Handling by Approach Model of ISO 10002 : 2004 to Increase Complaint Services <b>Agus Sukoco and Yuthsi Aprilinda.</b> .....	235
31. Towards Indonesian Cloud Campus <b>Taqwan Thamrin, Iing Lukman, Dina Ika Wahyuningsih</b> .....	252
32. Bridging Router to ADSL Modem for Stability Network Connection <b>Arnes Yuli Vandika and Ruri Koesliandana.</b> .....	257
33. The Effect of Use Styrofoam for Flexural Characteristics of Reinforced Concrete Beams <b>Yasser , Herman Parung, M. Wihardi Tjaronge, Rudy Djamaluddin</b> .....	261
34. The Estimation Of Bioethanol Yield From Some Cassava Variety <b>M.C. Tri Atmodjo</b> .....	273
35. Effect of Superficial Velocity of Pressure Difference on The Separation of Oil And Water by Using The T-Pipe Junctionl <b>Kms. Ridhuan and Indarto.</b> .....	277
36. The use of CRM for Customer Management at Cellular Telecommunications Industry <b>Ayu Kartika Puspa.</b> .....	293
37. Indonesian Puslit (Centre Of IT Solution) Website Analysis Using Webqual For Measuring Website Quality <b>Maria Shusanti Febrianti and Nurhayati.</b> .....	297
38. The E-internal audit iso 9001:2008 based on accreditation form assessment matrix in study program for effectiveness of monitoring accreditation <b>Marzuki, Maria Shusanti F.</b> .....	307

39. Enhancing Quality Software Through CMMI-ISO 9001:2008 and ISO 9126 <b>Agus Sukoco</b> .....	320
40. Value Analysis Of Passenger Car Equivalent Motorcycle (Case Study Kartini Road Bandar Lampung) <b>Juniardi, Aflah Efendi</b> .....	337
41. Alternative Analysis Of Flood Control Downstream Of Way Sekampung River <b>Sugito, Maulana Febramsyah.</b> .....	347
42. Analysis Of Fitness Facilities And Effective Use Of Crossing Road <b>Juniardi, Edi Haryanto.</b> .....	353
43. Study On Regional Development Work Environment Panjang Port Lands In Support Bandar Lampung City As A Service And Trade <b>Ir. A. Karim Iksan, MT, Yohn Ferry.</b> .....	359
44. Analytical And Experimental Study Bamboo Beam Concrete <b>Hery Riyanto, Sugito, Juli</b> .....	370
45. Comparative Analysis Of Load Factor Method Static And Dynamic Method (Case Study Akdp Bus Route Rajabasa - Bakauheni) <b>A. Ikhsan Karim, MT., Ahmad Zulkily.</b> .....	378
46. Optimization Utilization Of Water Resources dam Batutegi Using Method Of Linear Program <b>Aprizal, Hery Fitriyansyah</b> .....	386
47. Characteristics Generation Traffic Patterns And Movement In Residential Area (Case Study Way Kandis Residential Bandar Lampung) <b>Fery Hendi Jaya, Juniardi,</b> .....	392
48. Use Study On Slight Beam Reinforced Concrete Floor Plate in Lieu Of Secondary Beam <b>Hery Riyanto, Sugito, Lilies Widodjoko, Sjamsu Iskandar</b> .....	399
49. Observation Of The Effect Of Static Magnetic Field 0.1 Mt On A-Amylase Activity In Legume Germination <b>Rochmah Agustrina, Tundjung T. Handayani, and Sumardi.</b> .....	405
50. Effectiveness Analysis Of Applications Netsupport School 10 Based Iso / Iec 9126-4 Metrics Effectiveness <b>Ahmad Cucus, Nelcy Novelia</b> .....	413
51. Comparative Performance Analysis Of Banking For Implementing Internet Banking <b>Reza Kurniawan</b> .....	418

## Comparative Analysis for The Multi Period Degree Minimum Spanning Tree Problem

Wamiliana, Amanto, and Mustofa Usman

Department of Mathematics, Faculty of Mathematics and Natural Sciences, Lampung University

**Abstract-***The Multi Period Degree Constrained Minimum Spanning Tree Problem (MPDCMST) concerns of finding the total minimum cost of networks installation, where the installation process is divided into some periods. In the beginning of installation process, the center of the networks already set (as server, reservoir, etc). The installation process is divided into some period due to some factors, usually fund limitation. During the installation process, the networks is supposed to be maintained its reliability by restrict the numbers of links that can be connected to the node that already in the networks. In this paper we will discuss and improve the performance of WADR1 and WADR2 algorithms by setting the number of elements in the set of vertices that must be in installed in a certain period as a fix number and adding the length of the path in DFS. The result shows that the modifications works better.*

**Keywords:** *Multi period, degree constrained, minimum spanning tree, comparative analysis*

### 1. Introduction

Combinatorial optimization problems arise in various applications including communication network design, VLSI design, airline crew scheduling, database query design, transportation network design, etc. In addition, combinatorial optimization problems occur in many diverse areas such as graph theory, linear and integer programming, number theory and artificial intelligence.

A network is a system which involves the movement or flow of some commodity such as products, information, electrical current, mail, people, cars, trains, water, heat, and so on. By using the connections available in the network, the commodity usually originates from the origin (source) and moves to the terminal (sink). Therefore any structure that appears in the form of a system of lines and a system of components having a common purpose is considered a network. For example, a

transportation network is a collection of stations or depots that are linked by the railways or roads to enable people or goods to be transported from one station to another. Indeed, telecommunication networks, electrical networks and computer networks are included in such networks [9]

Network design as one of the areas of combinatorial optimization, plays an important role in many real-life applications. In this modern age where accurate models and efficient solution techniques are required, it provides the representation of problems at hand. Some examples of network design include: transportation networks for the movement of commodities; communication networks for the transmission of information; powerful multiprocessor systems for solving complex problems such as radar signal processing and many more [5].

Multi Period Degree Constrained Minimum Spanning Tree Problem (MPDCMST) is one of network problems that frequently occur in real life situation, especially in networks installation. For example the installation of power supply networks system, the installation of telecommunication networks, computer networks, water supply networks, and so on. However, in reality the installation process needs to be done in some periods, mostly because of the fund limitation. When the installation process only needs one period, the problem is called as Degree Constrained Minimum Spanning Tree Problem [12].

This paper is organized as follow: in Section 1 we give the Introduction about MPDCMST, in Section 2 we give the survey about the methods that already investigated for solving the MPDCMST, in Section 3 we discuss about the algorithm developed, in Section 4 we give the implementations and results, followed by conclusion.

## 2. The Multi Period Degree Constrained Minimum Spanning Tree Problem

One of the classical problem in networks design is finding The Minimum Spanning Tree (MST) problem. To find a minimum-spanning tree, there are two well-known algorithms: Kruskal's and Prim's. However, the earliest algorithm for finding a minimum spanning tree according to Graham and Hell [4] was suggested by Boruvka in 1926 who developed an algorithm for finding the most economical layout for a power-line network [16].

Adding the degree restriction during the construction of the MST will reduced the problem to the Degree Constrained Minimum Spanning Tree (DCMST)

problem. The DCMST problem can be formulated as a Mixed Integer Linear Programming as follow [9]:

$$\text{Minimise } \sum_i^n \sum_j^n c_{ij} x_{ij} \quad (2.1)$$

subject to

$$\sum_{i,j} x_{ij} = n - 1 \quad (2.2)$$

$$\sum_{i,j \in V'} x_{ij} \leq |V'| - 1, \quad \forall \emptyset \neq V' \subseteq V \quad (2.3)$$

$$1 \leq \sum_{j=1, j \neq i} x_{ij} \leq b_i \quad i = 1, 2, \dots, n \quad (2.4)$$

$$x_{ij} = 0 \text{ or } 1, \quad 1 \leq i \neq j \leq n. \quad (2.5)$$

$c_{ij}$  is the weight (or distance or cost) of the edge  $(i,j)$ ,  $b_i$  is the degree bound on vertex  $i$  and  $n$  is the number of vertices. Constraint (2.2) ensures that  $(n-1)$  edges are selected. Constraint (2.3) is the usual subtour elimination constraints. Constraint (2.4) specifies the degree restriction on the vertices. The last constraint (2.5), is just the variable constraint, which restricts the variables to the value of 0 or 1.  $x_{ij}$  is 1 if the edge  $x_{ij}$  is selected or included in the tree  $T$  and 0, otherwise. This formulation is the most common formulation for the DCMST problem.

Some methods already investigated for solving the DCMST, for example: greedy heuristics based on Prim's or Kruskal's algorithms [8], Genetic Algorithm [16] Simulated Annealing [6], Iterative Refinement [1], [2]; Modified Penalty [10],[11],[14]; and Tabu Search [2], [11], [12].

Adding the periods to the DCMST will reduced the problem to The MPDCMST

Problem. The MPDCMST problem is a problem of determining how many vertices should be installed in a certain period in such a way so that the total cost of installation is minimum. After all periods completed, all vertices in the networks should be connected, and the total cost is the minimum.

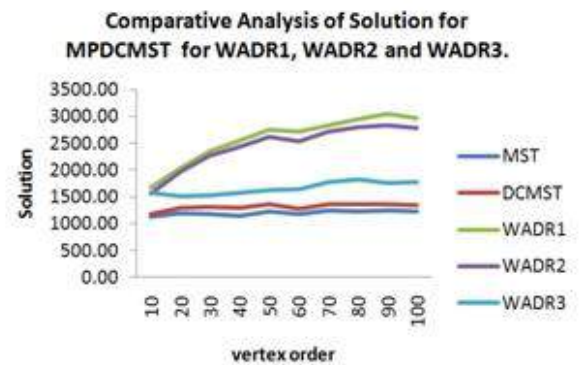
The first method investigated for MPDCMST was proposed by [11] where branch exchange technique used as a hybrid to lagrangean Relaxation, and the method was implemented using vertices varying from 40 to 100; 10 year planning horizon; the time period for activating each terminal is uniformly distributed from 1 to 6; and set vertex 1 as central vertex.

The other type of MPDCMST was investigated in [13] where in this paper they used one year planning horizon and divided the installation into three periods (for month each) and four periods (three month each). That modification of MPDCMST was made to mimic the real situation in Indonesia where the funding for every project usually divided into three terms or periods. In the method developed they got feasible solution for all data tested. In [5] the method was improved from the method proposed in [13] and tested using some problems taken from TSPLIB. WADR1 and WADR2 algorithm were investigated in [15]. These algorithms adopt and modified Kruskal's algorithms altogether with DFS technique for  $k = 2$ ,  $k$  is the depth of child vertex. In the algorithm they introduced a set  $HVT_i$  as a set of vertices that must be already in the networks after period  $i$  finished. The use of  $HVT_i$  to tackle the problem that some facility (for example hospital, police station, or other public need facilities) must be in the network earlier to handle public needs. The difference between WADR1 and WADR2 lied on the process of installation  $HVT_1$ .

In this paper we propose the improve of WADR1 and WADR2 algorithms by setting  $HVT_i = 3$ ,  $\text{Max} \left[ \frac{n-1}{3} \right]$  and set  $k \leq 3$ .

### 3. Implementations and Results.

We use complete graph  $K_n$  with vertex order  $n$  to represent the problem. The data generated assigned for edge weight are uniformly distributed with the weight vary between 1-1000, for every order of the graph we generate 30. That data also used by Junaidi et al (2008). We implement our problem using C++ programming language running on dual core computer with 1.83GHz, 2 GB RAM. The following chart shows the results.



From the chart we can see that the solution of WADR3 is better than WADR1 and WADR2 and its solutions closer to the lower bound (DCMST).

### References

- [1]. Boldon, B., N. Deo and Nishit Kumar (1996). ' Minimum Weight degree-constrained spanning tree problem: Heuristics and Implementation on an SIMD parallel machine', *Parallel Computing* vol. 22, pp.369 –382.

- [2].Caccetta L., and Wamiliana, 2001. Heuristics Algorithms for The Degree Constrained Minimum Spanning Tree Problem, in Proceeding of The International Congress on Modeling and Simulation (MODSIM 2001), Canberra. Editor : F. Ghassemi et al. , pp. 2161-2166.
- [3].Deo,N. and Nishit Kumar, 1997. ‘Computation of Constrained Spanning Trees: A Unified Approach’, *Network Optimization* ( Lecture Notes in Economics and Mathematical Systems, Editor : Panos M. Pardalos, et al , Springer-Verlag, Berlin, Germany, pp. 194 – 220.
- [4].Graham, R.L., and Hell, P., ‘ On the history of the Minimum Spanning Tree Problem’, 1982. *Mimeographed*, Bell Laboratories, Murray Hill, New Jersey
- [5]. Junaidi, A., Wamiliana, Dwi Sakethi, and Edy Tri Baskoro, 2008. Computational Aspect of Greedy Algorithm for The Multi Period Degree Constrained Minimum Spanning Tree Problem, *Jurnal Sains MIPA*, Special Edition Vol. 14 No. 1. Pp 1-6
- [6] Krishnamoorthy, M., A.T. Ernst and Yazid M Sharaila (2001), ‘Comparison of Algorithms for the Degree Constrained Minimum Spanning Tree’, *Journal of Heuristics*, **Vol. 7**, no. 6, pp. 587-611.
- [7].Kawatra, 2002.A multi period degree constrained Minimum Spanning Tree Problem, *European Journal of Operational Research*, Vol **143**, pp. 53 – 63.
- [8]. Narula,S. C., and Cesar A.Ho, 1980. ‘ Degree-Constrained Minimum Spanning Tree’, *Computer and Operation Research* , **Vol. 7**,pp. 239-249
- [9]. Wamiliana,2002. Combinatorial Methods for Degree Constrained Minimum Spanning Tree Problem, Doctoral Thesis, Department of Mathematics and Statistics, Curtin University and Technology, Australia.
- [10]. Wamiliana, 2002. ‘The Modified Penalty Methods for The Degree Constrained Minimum Spanning Tree Problem’, *Jurnal Sains dan Teknologi*, **Vol. 8**, pp.1-12.
- [11]. Wamiliana, 2004. ‘Solving the Degree Constrained Minimum Spanning Tree Using Tabu and Penalty Method’, *Jurnal Teknik Industri*, pp.1-9.
- [12] Wamiliana and Caccetta. 2003. “Tabu search Based Heuristics for the Degree Constrained Minimum Spanning Tree Problem,Proceeding of South East Asia Mathematical Society, pp. 133-140
- [13] Wamiliana, Dwi Sakethi, Akmal J, and Edy Tri Baskoro, 2005. The Design of Greedy Algorithm for Solving The Multi Period degree Constrained Minimum Spanning Tree Problem, *Jurnal sains dan Teknologi* **Vol 11** No. 2, pp. 93 – 96.
- [14] Wamiliana and L. Caccetta, 2006. Computational Aspects of The Modified Penalty for Solving The Degree Constrained Minimum Spanning Tree



Problem, *Journal of Quantitative Methods*  
**Vol. 2** No. 2 pp. 10 – 16.

[15] Wamiliana, Dwi sakethi, and Restu Yuniarti, 2010. Computational Aspect of WADR and WADR2 Algorithms for The Multi Period Degree Constrained Minimum Spanning Tree Problem, Proceeding SNMAP 2010, pp. 208 – 214.

[16] Wamiliana, 2013. Computational Aspect of Modified Kruskal Algorithms for Degree Restricted Minimum Spanning Tree Problem, The 5<sup>th</sup> International Conference on Numerical Optimizations and Operations Research (ICNOOR-V), Banda Aceh, 26 – 28 June, 2013.

[17] Zhou G., and Mitsuo Gen, 1997. A Note on Genetic Algorithms for The Degree Constrained Minimum Spanning Tree Problem, *Networks*, Vol. 30, pp. 91-95.



**universitas  
bandar lampung**

Jl. Z.A. Pagar Alam No.26 Labuhan Ratu  
Bandar Lampung 35142 Phone: +62 721 701463  
[www.ubl.ac.id](http://www.ubl.ac.id)  
Lampung - Indonesia

copyright © 2013