# 2012 IEEE International Power Engineering and Optimization Conference

(PEOCO 2012)

Malaysia 6-7 June 2012



**IEEE Catalog Number: ISBN:** 

CFP1295J-PRT 978-1-4673-0660-7

# TECHNICAL PROGRAM

# WEDNESDAY, 6<sup>TH</sup> JUNE 2012

# **Session 1A**

**Electrical Machines, Drive and Traction** 

Room: Function Room 2, Level 2

Time : 14:00 - 16:00

Chair: Prof. Dr. Saad Mekhilef

14:00 <u>Speed-Sensorless Control of Parallel-Connected PMSM Fed by a Single Inverter</u> Using MRAS 35

Ahmad Asri Abd Samat, Dahaman Ishak, Pais Saedin, Shahid Igbal

14:13 <u>Development of Combined Vector and Direct Torque Control Methods for</u> Independent Two Induction Motor Drives 78

Md Hairul Nizam Talib, Zulkifilie Ibrahim, Nasrudin Abdul Rahim, Nurazlin Mohd Yaakop

14:26 <u>Vector Control Drive of Permanent Magnet Synchronous Motor Based</u> dSPACE DS1103 Implementation 147

Cheok Yong Seng, Zulkifilie Ibrahim

14:39 Designing of Blower Motors on Mining Trucks 242

Saeid Mirzaei, David L. Perugini

14:52 Speed Performance of SVPWM Direct Torque Control for Five Leg Inverter Served
Dual Three-Phase Induction Motor 323

Nurazlin Mohd Yaakop, Zulkifilie Ibrahim, Marizan Sulaiman, Md Hairul Nizam Talib

15:05 Stepper Motor Drives for Robotic Applications 361

Benetta Aranjo, Prashant Kumar Soori, Puja Talukder

15:18 Sizing Equation and Finite Element Analysis Optimum Design of Axial-Flux Permanent-Magnet Motor for Electric Vehicle Direct Drive 1

Solmaz Kahourzade, Amin Mahmoudi, Nasrudin Abdul Rahim, Hew Wooi Ping

15:31 Analysis of Indirect Rotor Field Oriented Vector Control for Squirrel Cage Induction Motor Drives 505

Mehdi Mohammadzadeh Rostami

15:44 <u>Design Study of High Torque and High Power Density Hybrid Excitation Flux</u> Switching Synchronous Motor for HEV Applications 333

Erwan Sulaiman, Md Zarafi Ahmad

# Session 1B

Room Time	ization Technique : Function Room 3, Level 2 : 14:00 - 16:00 : Assoc. Prof. Dr. Ismail Bin Musirin	
14:00	An Efficient-Fast Method for Determining Minimum Loss Configuration in Radial Distribution Networks Based on Sensitivity Analysis Mohsen Cheraghi, Parviz Ramezanpour  46	
14:13	Fault Detection Using Dynamic Parity Space Approach Hazrul Mohamed Basri, Kasumawati Lias, Wan Azlan Wan Zainal Abidin, Kai Meng Tay, Hushairi Zen	
14:26	Throughput Improvement for Power Line Communication by Adaptive MAC Protocol Kuan-Hung Liu, Dung-Rung Hsieh, Jen-Yuan Hsu, Shih-Yu Chang	135
14:39	Generation and Load Life-cycle Cost Optimisation Study at an Offshore Hub Platform Adam Junid, Mohamad Faudzi Yasir, Amri Ithnin, Vijanth Sagayan Asirvadam, Mohd Iqbal Ridwan, Asnawi M. Busrah	<b>306</b>
14:52	Multi-objective Quantum-inspired Artificial Immune System Approach for Optimal Network Reconfiguration in Distribution System 384 Norlee Husnafeza Ahmad, Titik Khawa Abdul Rahman, Norziana Aminudin	
15:05	DG Sizing Impact for Loss Minimization Considering Cost Factor Omar Aliman, Ismail Musirin, Mohd Herwan Sulaiman	
15:18 <sub>-</sub>	Optimal Location and Sizing of Distributed Generation Using OptimizationTechnique527Nur Zahirah Mohd Ali, Ismail Musirin, Mohd Redzuan Ahmad, Zulkeflee Khalidin	
15:31	Optimum Allocation and Sizing of DG Unit for Efficiency Enhancement of Distribution System 165 Adnan Anwar, Hemanshu R. Pota	

# Session 2A

Protection & Power Quality Studies Room: Function Room 2, Level 2

Time: 16:15 - 18:00

Chair: Dr. Hadi Zayandehroodi

16:15 <u>Modeling and Simulation of Digital Negative Sequence Relay for Unbalanced Protection of Generator</u> 72

Muhammad Mohsin Aman, Ghauth Jasmon, Muhammad Qadeer Ahmed Khan, Ab. Halim. Halim Abu Bakar, Mohd Noor Abdullah

16:28 <u>Power Quality Improvement Using an Enhanced Premium Power Park</u> <u>Configuration</u> 129

Masoud Farhoodnea, Azah Mohamed, Hussain Shareef, Hadi Zayandehroodi

16:41 A New Tracking Method of Symmetrical Fault during Power Swing Based on S-Transform 141

Nor Zulaily Mohamad, Ahmad Farid Abidin, Wan Noraishah Wan Abdul Munim

- 16:54 <u>An Analysis of Harmonics from Dimmable LED Lamps</u> 182
  Sohel Uddin, Hussain Shareef, Azah Mohamed, M A Hannan
- 17:07 <u>A Novel Protection Coordination Strategy Using Back Tracking Algorithm for Distribution Systems with High Penetration of DG</u>

  Hadi Zayandehroodi, Azah Mohamed, Hussain Shareef, Marjan Mohammadjafari, Masoud Farhoodnea
- 17:20 <u>Design a Unified Power Quality Conditioner using V2G Technology</u> 521 F. M. Rabiul Islam, Hemanshu R. Pota, Adnan Anwar, A.B.M. Nasiruzzaman
- 17:33 <u>Modeling and Simulation of Reverse Power Relay for Generator Protection</u> 317

  Muhammad Mohsin Aman, Ghauth Jasmon, Qadeer Ahmed Khan, Ab. Halim Abu Bakar, Jasrul Jamani Jamian
- 17:46 Study the Harmonic Characteristics of DC Bias on the Single Phase Power Transformer 501

Siti Rahayu Mohamed, Syafruddin Hasan, Mohd Nor Khairul Anuar

# Session 2B

High Voltage Engineering & Electromagnetic Compatibility

Room: Function Room 3, Level 2

Time: 16:15 - 17:45

Chair: Ir. Dr. Zahrul Faizi Hussien

16:15 <u>Dielectric Property of Waste Tire Dust-Polypropylene (WTD-PP) Composite for High Voltage Outdoor Insulation Application</u>

Aminudin Aman, Abdul Rahim Abdullah, Mohd Yaacob

124

16:28 On the Consideration of the Channel Angle Effects on the Electromagnetic Fields

Associated with Inclined Lightning Channel

153

Mehdi Izadi, Mohd Zainal Abidin Ab Kadir, Chandima Gomes

16:41 <u>Leakage Current Analysis on Polymeric Surface Condition using Time-Frequency</u>
<u>Distribution</u> 171

Nur Qamarina Zainal Abidin, Abdul Rahim Abdullah, Nurbahirah Norddin, Aminudin Aman, Khairul Anwar Ibrahim

16:54 The Impact of Under Sized Cable on MV Vacuum Metal Clad Switchgear During Fault 312

Hazri Dahalan Razip, F. R. Khairudin, M. N. Harun

- 17:07 The Effect of Supply Voltage on Partial Discharge Properties in Solid Dielectric 490 Siti Salwani Samat, Ismail Musirin, Aida Sulinda Kusim
- 17:20 <u>Magnetostriction Assessment of Power Transformer (A Case Study of 30/40MVA, 132/33 kV Transformer at Bauchi Substation)</u> 114

  Ahmad Yusuf, Abdullahi Amoo, Usman Aliyu, Mohd Wazir Mustafa, Abdullah Asuhaimi Mohd Zin
- 17:33 The Reduction of Total Harmonic Distortion and Electromagnetic Interference in High Pressure Sodium Street Lighting using Single Stage Electronic Ballast 230 Mohd Omar, Hasimah Rahman, Mohammad Yusri Hassan, Md Shah Majid, Norzanah Rosmin
- 17:46 Effect of DC Bias on Magnetization Current Waveforms of Single Phase Power Transformer 496

Syafruddin Hasan, Soib Taib, Risnidar Chan, Siti Rahayu Mohamed

# TECHNICAL PROGRAM

# THURSDAY, 7<sup>TH</sup> JUNE 2012

# **Session 3A**

Renewable	Energy
-----------	--------

Room: Function Room 2, Level 2

Time : 08:45 - 10:45 Chair : Dr. Akin Cellatoglu

- **08:45** On the Monthly Optimum Tilt Angle of Solar Panel for Five Sites in Malaysia 7

  Tamer Khatib, Azah Mohamed, Kamaruzzaman Sopian
- 08:58 <u>Analysis of Modular Renewable Energy Plants Functioning in Electrical Power Network</u> 23

Akin Cellatoglu, Ahmet Yasli, Karuppanan Balasubramanian

09:11 <u>An Intelligent Under Frequency Load Shedding Scheme for Islanded Distribution</u>
<u>Network</u> 40

Javed Ahmed Laghari, Hazlie Mokhlis, Ab. Halim Abu Bakar, Mazaher Karimi, Amidaddin Shahriari

09:24 <u>Modelling and Simulation of Microturbine for a Distribution System Network with</u> Hybrid Filter 204

Muhammad Shakir Laili, Zetty Nurazlinda Zakaria, Nasrul Helmei Halim, Pungut Ibrahim

- **09:37** Novel Radio Frequency Energy Harvesting Model

  Hossam ElAnzeery, Mohamed Abd ElAziz Saad ElBagouri

  209
- 09:50 Optimum Maximum Voltage Angle and Current Total Harmonic Distortion of Uninterruptible Power Supply on Three Level Single Phase Photovoltaic Wind Power Hybrid Inverter 225

Muhammad Irwanto Misrun, Tunku Muhammad Nizar Tunku Mansur, Mohd Irwan, Gomesh Nair Shasidharan

10:03 Novel Hybrid Photovoltaic and Thermoelectric Panel 269

M.M.M. Daud, Nursyarizal Mohd Nor, Taib Ibrahim

- 10:16 <u>Study on Energy Efficient Street Lighting System Design</u> 291 Safaa Alzubaidi, Prashant Kumar Soori
- 10:29 <u>Split-Parallel In-Wheel-Motor Retrofit Hybrid Electric Vehicle</u> 11 Saiful A. Zulkifli, Nordin Saad, Syaifuddin Mohd, and A. Rashid A. Aziz

# **Session 3B**

Power System Dynamics and Control Room: Function Room 3, Level 2

Time: 08:45 - 10.30

Chair : Mr. Md. Zarafi Ahmad

08:45 Combination of Adaptive and Intelligent Load Shedding Techniques for Distribution Network 57

Mazaher Karimi, Hazlie Mokhlis, A. H. A. Bakar, Javed Ahmed Laghari, A. Shahriari, M. M. Aman

- **08:58** Effective Two-Terminal Single Line to Ground Fault Location Algorithm

  Muhd Hafizi Idris, Mohd Wazir Mustafa, Yazhar Yatim

  246
- **09:11** <u>Mathematical Model of Reliability Assessment for Generation System</u> **258** *Vikram Kumar Kamboj, Amit Bhardwaj, Harkamaljeet Singh Bhullar, Krishan Arora, Kulraj Kaur*
- **09:24** Power System Network Sensitivity to Voltage Collapse 379
  Fahad Althowibi, Mohd Wazir Mustafa
- 09:37 <u>Fuzzy-based Static VAR Compensator Controller for Damping Power System Disturbances</u> 538

Nurul Aziah Arzeha, Mohd Wazir Mustafa, Rasyidah Mohamad Idris

- 09:50 A Novel PQM Placement Method Using Cp and Rp Statistical Indices for Power

  Transmission and Distribution Networks
  Asadollah Kazemi, Azah Mohamed, Hussain Shareef
- 10:03 Tolerance Analysis of Flicker Pst Short Term Perceptibility Assessment for One Minute Observation Time 281

  Rodney H.G. Tan, V.K. Ramachandaramurthy
- 10:16 Condition Assessment of OLTC Using Duval Triangle and Static Winding Resistance Test 432

Mohd Shahril Ahmad Khiar, Yasmin Md Thayoob, Young Zaidey Yang Ghazali, Sharin Ab Ghani, Imran Sutan Chairul

10:29 <u>Analysis on Speed Characteristics of Five Leg Inverter for Different Carrier Based</u> <u>PWM Scheme</u> 96

Md Hairul Nizam Talib, Zulkifilie Ibrahim, Nasrudin Abdul Rahim, Ahmad Shukri Abu Hasim

# Session 4A

Renewable Energy and N	Next Generation <b>•</b>	Grid
------------------------	--------------------------	------

Room: Function Room 2, Level 2

Time : 10:45 - 12:45 Chair : Dr. Chin Kim Gan

# 10:45 Development of Micro Air Flow Generator for Electrical Charging System 329

A.S.A. Shabri, Taib Ibrahim, Nursyarizal Mohd Nor

# 10:58 <u>Mathematical Model of Compressed Air Energy Storage in Smoothing 2MW Wind</u> Turbine 339

Nor Shahida Hasan, Mohammad Yusri Hassan, Md Shah Majid, Hasimah Rahman

# 11:11 <u>Using Preisach Technique to Investigate Effects of Harmonics on the Hysteresis</u> <u>Loss of a Solid Core</u> 344

Ramadan Elmoudi, Safiuddin Mohammad

# 11:24 A Review of Recent Development in Smart Grid and Micro-Grid Laboratories 367 Meysam Shamshiri, Chin Kim Gan, Chee Wei Tan

# 11:37 Power Optimization for a Small-sized Stallregulated Variable-speed Wind Turbine 373 Norzanah Rosmin, Suhaila Samsuri, Mohammad Yusri Hassan, Hasimah Rahman

# 11:50 Impact of a 200 MW Concentrated Receiver Solar Power Plant on Steady-State and Transient Performances of Oman Transmission System Omar H. Abdalla, Rashid Al-Badwawi, Hilal Al-Hadi, Hisham Al-Riyami, Ahmed Al-Nadabi

# 12:03 Environmental Outturns of Cogeneration Installation at Industrial and Service Sectors in Malaysia 427

Mohamed Shaaban, A. H. Azit, Khalid Mohamed Nor

12:16 Mini-Grid Power System Optimization Design and Economic Analysis of Solar Powered Sea Water Desalination Plant for Rural Communities and Emergency Relief Conditions 465

Nor Hanisah Baharudin, Tunku Muhammad Nizar Tunku Mansur, A. A. A. Wahab, Nurulazmi A. Rahman, E. A. R. E. Ariff, A. Ali

12:29 <u>Multi Population Genetic Algorithm for Allocation and Sizing of Distributed</u> Generation 108

Wen Shan Tan, Mohammad Yusri Hassan, Md Shah Majid

# **Session 4B**

Room Time	iter and Al Application in Power Engineering : Function Room 3, Level 2 : 10:45 – 12:45 : Mr. Syed Qaseem Ali
10:45	Optimal Allocation and Sizing of Distributed Generation in Distribution System via Firefly Algorithm 84 Mohd Herwan Sulaiman, Mohd Wazir Mustafa, Azralmukmin Azmi, Omar Aliman, Siti Rafidah Abdul Rahim
10:58	Pursuit Algorithm for Optimized Load Scheduling 193 Syed Qaseem Ali, Syed Maqbool, Imthias Ahamed
11:11	Differential Evolution Ant Colony Optimization (DEACO) Technique In Solving Economic Load Dispatch Problem 263 Nur Azzammudin Rahmat, Ismail Musirin
11:24	Approaches for FACTS Optimization Problem in Power Systems Ahmad Rezaee Jordehi, Jasronita Jasni
11:37	BCO Based Technique for Line Outage Identification in Congestion Management Muhammad Norazam Rahim, Ismail Musirin, Zulkiffli Hamid, Nor Azwan Mohamed Kamari
11:50	Application-based Context-Awareness in Collaborative Workspaces: A Review Nor Azlina Fadzillah, Nasiroh Omar, Siti Z. Z. Abidin 411
12:03	Assessing the Performance of DG in Distribution Network 436 Siti Rafidah Abdul Rahim, Ismail Musirin, Mohd Herwan Sulaiman, Muhamad Hatta Hussain, Azralmukmin Azmi
12:16	Short Term Load Forecasting Using Artificial Neural Network with Feature  Extraction Method and Stationary Output 480  Muhammad Murtadha Othman, M.H.H. Harun, Ismail Musirin
12:29	Enhancement of Branch and Bound Method in Composite Power System  Expansion Planning Using Multithreading Technique  Mohd Fuad Abdul Latip, Muhammad Murtadha Othman, Norliza Zaini, Ismail Musirin
12. 40	Placement and Sizing of Thyristor Controlled Series Compensator Using PSO Based Technique for Loss Minimization 285 Siti Amely Jumaat, Ismail Musirin, Muhammad Murtadha Othman, Hazlie Mokhlis

# Session 5A

Transmission and Distribution Room: Function Room 2, Level 2

Time : 14:00 - 16:00 Chair : Dr. Taib Ibrahim

14:00 Modified Centrality Measure Based on Bidirectional Power Flow for Smart and Bulk Power Transmission Grid 159

A.B.M. Nasiruzzaman, Hemanshu R. Pota, Adnan Anwar, F. M. Rabiul Islam

- 14:13 <u>Long-Term Load Balancing Program in LV Distribution Networks</u> 220

  Ali Raminfard, S. Mohammad Shahrtash, Taraneh Herizchi, Hamid Khoshkhoo
- **14:26** <u>High Impedance Fault Localization in a Distribution Network using the Discrete</u> Wavelet Transform 349

Mohd Syukri Ali, A. B. Halim Abu Bakar, Hazlie Mokhlis, Hamzah Aroff , Hazlee Azil Illias, Muhammad Mohsin Aman

- 14:39 Evaluation of Transformer Core and Winding Conditions from SFRA Measurement
  Results using Statistical Techniques for Distribution Transformers
  Sharin Ab Ghani, Yasmin Md Thayoob, Young Zaidey Yang Ghazali, Mohd Shahril Ahmad Khiar,
  Imran Sutan Chairul
- 14:52 Risk based Uncertainty (RibUt) of Power System Considering the Increased of Load Demand 454

  Muhammad Murtadha Othman. Siti Rohani Kasim. Nur Ashida Salim. Ismail Musirin
- 15:05 Risk based Uncertainty (RibUt) Assessment of a Power System Using Bootstrap
  Technique 460
  Muhammad Murtadha Othman, Siti Rohani Kasim, Nur Ashida Salim, Ismail Musirin
- 15:18 Optimal Flexible Solutions of Capacity Benefit Margin Considering Interconnected System Reliability 470

Muhammad Murtadha Othman, Nurulazmi Abd Rahman, Daw Sasi, Ismail Musirin

- 15:31 Inter-Area Transfer Capability Assessment Considering Optimal Flexible Solutions of Capacity Benefit Margin 475
  - Muhammad Murtadha Othman, Nurulazmi Abd Rahman, Daw Sasi, Ismail Musirin
- 15:44 Forecasting Short Term Electric Load based on Stationary Output of Artificial
  Neural Network Considering Sequential Process of Feature Extraction Methods
  Muhammad Murtadha Othman, M.H.H. Harun, Ismail Musirin

# Session5B

Power	<b>System Planning and Operation</b>
Room	: Function Room 3, Level 2

Time : 14:00 - 16:00 Chair : Mr. Omar Aliman

- 14:00 <u>A Numerical Method for Calculating the Loss of Life of Power Transformers</u> 29

  Mohammad Tolou Askari, Mohd Zainal Abidin Ab Kadir, Jasronita Jasni
- 14:13 The Calculation of Low Voltage Solution Based on State Space Search Method in Ill-Conditioned System 62

Amidaddin Shahriari, Hazlie Mokhlis, Mazaher Karimi, Javed Ahmed Laghari

- 14:26 <u>Impact of Load Modeling in Distribution State Estimation</u> 67 *Mazaher Karimi, Hazlie Mokhlis, Amidaddin Shahriari*
- 14:39 <u>Firefly Algorithm Technique for Solving Economic Dispatch Problem</u> 90

  Mohd Herwan Sulaiman, Mohd Wazir Mustafa, Zetty Nurazlinda Zakaria, Omar Aliman, Siti Rafidah
  Abdul Rahim
- 14:52 <u>Comparative Study of Power Grid Centrality Measures using Complex Network</u> <u>Framework</u> 176

A.B.M. Nasiruzzaman, Hemanshu R. Pota, Adnan Anwar

- 15:05 <u>Statistical Distributions of Load Profiling Data</u> 199

  Arfah Ahmad, Intan Azmira, Suziana Ahmad, Nur Ilyana Anwar Apandi
- 15:18 <u>Unit Commitment in Electrical Power System A Literature Review</u> 275

  Amit Bhardwaj, Vikram Kumar Kamboj, Vijay Shukla, Bhupinder Singh, Preeti Khurana
- 15:31 <u>Risk Evaluation of Uncertainties in Generation Scheduling Using Monte Carlo</u> Simulation 422

Mohd Dzulhafizi Mohd Usman, Mohamed Shaaban

15:44 <u>Bagasse Saving and Emission Reduction in Power Dispatch at Sugar Factory by Cogeneration and Solar Energy</u> 407

Faisal R. Pazheri, Zakariya M. Kaneesamkandi, Mohd Fauzi Othman

# Session 6A

Power	System	Sta	bility	

Room: Function Room 2, Level 2

Time : 16:15 - 18:00 Chair : Dr. Jasronita Jasni

- 16:15 A New Approach for Wind and Solar Type DG Placement in Power Distribution
  Networks to Enhance Systems Stability 296
  Naruttam K. Roy, Hemanshu R. Pota, Adnan Anwar
- 16:28 <u>Dynamic Small Disturbance Voltage Instability Prediction based on Wide Area</u>

  <u>Measurement System</u> 214

  Hamid Khoshkhoo, S. Mohammad Shahrtash
- 16:41 <u>Dynamic Stability Improvement of a Power System Incorporating DFIG Wind Power Plant Using Optimized Control Parameters of a SVC</u> 416

  Morteza Mohammadi, Mohsen Gitizadeh, Alireza Roosta
- 16:54 <u>Computational Intelligence Approach for SVC-PID Controller in Angle Stability Improvement</u> 442

  Nor Azwan Mohamed Kamari, Ismail Musirin, Zulkiffli Hamid, Muhammad Norazam Rahim
- 17:07 Analysis of Fuzzy Power System Stabilizer using Various Defuzzification Interface
  for Takagi-Sugeno Fuzzy Logic

  Nur Safura Ab Khalid, Mohd Wazir Mustafa, Rasyidah Mohamad Idris
- 17:20 Evaluation of the Effectiveness of Voltage Stability Indices on Different Loadings 543
  Zi Jie Lim, Mohd Wazir Mustafa, Zaniah Muda
- 17:33 <u>Small Signal Stability Assessment and Control of Power Systems</u> 515 Shojaeddin Mirfendereski, Noor Izzri Abdul Wahab, Jasronita Jasni, Mohammad Lutfi Othman
- 17:46 <u>Stability Index Tracing for Determining FACTS Devices Placement Locations</u>

  Zulkiffli Hamid, Ismail Musirin, Muhammad Norazam Rahim, Nor Azwan Mohamed Kamari

# Session 6B

Power	Electron	ics An	nlication	and C	onverters
IUWCI	LICCU OI	uco Ap	piication	anu c	OHVEL LELS

Room: Function Room 3, Level 2

Time : 16:15 - 18:00

Chair: Dr. Nursyarizal Mohd Nor

# 16:15 Comparative Study of Different PWM Control Scheme for Three-Phase Three -Wire Shunt Active Power Filter 119

Ahmad Shukri Abu Hasim, Md Hairul Nizam Talib, Zulkifilie Ibrahim

# 16:28 UPS Parallelizing by Applying SVPWM Switching Method to Droop Control Strategy 236

Hamid Reza Tajoddin, Hamed Tebianian

# 16:41 Novel Reduced Parts On-Line Uninterruptible Power Supply 252

Bahram Ashrafi, Mehdi Niroomand, Behzad Ashrafi Nia,

# 16:54 Recessed Y-Gate AlN/GaN/AlGaN DHFET With GaN Cap Layer At The Gate Edge Md Shofiqul Islam Khan, Hossain Mohammad Mesbah Maruf, Mostakin Ahmed, M. A. Choudhury

# **17:07** Speed Control of Induction Motor Drive Using Universal Controller Puja Talukder, Prashant Kumar Soori, Benetta Aranjo 509

# 17:20 <u>Analysis on Speed Characteristics of Five Leg Inverter for Different Carrier Based</u> PWM Scheme 96

Md Hairul Nizam Talib, Zulkifilie Ibrahim, Nasrudin Abdul Rahim, Ahmad Shukri Abu Hasim