+1/1/60+

SM50 **Finale**

SM50 A2023 Examination on Jan., 18st, 2024

Firstname and lastname:

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Duration : 60 minutes.
No document allowed. The use of the calculator is forbidden.
This exam is a multiple choice test, for every question there is only ONE correct answer. In total there are 32 questions, every correct response gives +0.625 points, every wrong answer or question with multiple answers gives -0.3125 points, if you do not answer you get 0 points.
Thank you to make a cross or fill the box of your answer with a good readable pen (black or blue).

Présentation Sudnya Vaidya
Battery Models and Tests

Question 1 What kind of model does Sudnya Vaidya use to analyse the results:

- ☐ Energetic Current Model
- ☐ Extrapolation Capacity Model
- ☐ Electrochemical Combination Model
- ☐ Equivalent Circuit Model

Question 2 The subject of the presentation of the Sudnya Vaidya was:

- ☐ Onboard Estimators for State of Charge and Health for electric ships.
- ☐ HIL Simulations Experimental Test Bench for EV Battery Aging.
- ☐ Embedded Integrated Monitoring of the State of Charge and Health of Storage Batteries.
- ☐ Precise monitoring of State of Temperature of Second Life Batteries.

Question 3 Different faults exist in Li-Ions on cell level. What are the main defaults?

- ☐ Low Voltage, SOV, SOI, SOH
- ☐ Short Circuits, SOH, SOC, SOT
- ☐ High Current, SOC, SOD, SOE
- ☐ Long Frequency, SOT, SOF, SOD

Question 4 Sudnya Vaidya uses potentiostatic EIS. How does this work?

- ☐ Sinusoidal voltage signal at different frequencies is imposed and current response is measured and analysed.
- ☐ Sinusoidal frequency signal at different voltages is imposed and current response is measured and analysed.
- ☐ Sinusoidal current signal at different frequencies is imposed and voltage response is measured and analysed.
- ☐ Sinusoidal frequency signal at different currents is imposed and voltage response is measured and analysed.

Question 5 Two characteristic plots are used to represent EIS. They are:

- ☐ Nyquist and Bode
- ☐ Runge and Kutta
- ☐ Newton and Raphson
- ☐ Kirchhoff and Wheatstone

Présentation Sudnya Vaidya
Artificial Intelligence

Question 6 To create a model that is able to predict a solution with the help of a labeled dataset, where a labeled dataset is one where you already know the target answer is called:

- ☐ Supervised
- ☐ Deep Learning
- ☐ Un-supervised
- ☐ Machine Learning

Question 7 In the work an NN is used, but what does NN stand for:

- ☐ Negative Number
- ☐ Neutral Nominator
- ☐ Nominal Node
- ☐ Neural Network

Question 8 What definition of AI is correct?

- ☐ Artificial intelligence is the sub-topic of machine learning that focuses on building algorithmic models that can identify patterns and relationships in data.
- ☐ Artificial intelligence is a branch of engineering sciences that focusses on the use of mathematical approaches that can learn to autonomously evolve and carry out improvement on behalf of a human being.
- ☐ Artificial intelligence is the sub-topic of automation that focusses on the improving energetic algorithmic models that can modify and improvement mathematic models in data.
- ☐ Artificial intelligence is a branch of computer sciences that focusses on building and managing technology that can learn to autonomously make decisions and carry out actions on behalf of a human being.

Development of real-time supervision HIL emulator of shaded PV systems
C. Lopez, M. Inzouddine

Question 9 What is modeled and was is real?

- ☐ The PV and the power converter are modelled.
- ☐ The PV is real, the power converter is modeled.
- ☐ The PV module is modeled.
- ☐ The PV is modelled, the power converter is real.

Question 10 A special method to decrease the computation effort is used. How is the used method called?

- ☐ Newton-Raphson method
- ☐ Euler method
- ☐ FPGA
- ☐ Newtons second principle

Question 11 What is NOT an impact of shading on PV cell?

- ☐ Decrease of electrical energy
- ☐ Interaction with power converters
- ☐ Risk of structural failures
- ☐ Decrease of temperature

Question 12 The system is emulated. What does emulation mean?

- ☐ Compute the behaviour...
- ☐ Simulate the behaviour of... on a computer.
- ☐ Evaluate the behaviour... on a computer.
- ☐ Imitate the behaviour of... by calculation.

Experimental validation of an optimized power allocation strategy for multi-stack fuel cell

L. Oyer, B. Alisse, J. Boudy

Question 13 What type of fuel cell was studied in this work?

- ☐ PAFC
- ☐ MCFC
- ☐ PEMFC
- ☐ SOFC

Question 14 Why to associate fuel cell systems in series and/or parallel?

- ☐ Faster response
- ☐ Increase Durability
- ☐ Volume saving
- ☐ Decrease of State of Health

Question 15 What part of the system was emulated?

- ☐ The entire system was emulated.
- ☐ The fuel cells have been emulated by DCDC load.
- ☐ The converter has been evaluated by an Opal RT System.
- ☐ The fuel cells have been emulated by DCDC voltage source.

Question 16 The 4 studied fuel cell stacks have been connected:

- ☐ In series
- ☐ 2 in series, 2 in parallel
- ☐ The connection was not presented.
- ☐ In parallel

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25 kV–50 Hz railway power supply system emulation for power-hardware-in-the-loop testing

F. Dufour, T. Euillot

Question 17 How the limitation by microproseccor was overcome in this case?

- ☐ Use of FPGA
- ☐ Limitation of emulated length
- ☐ Parallelling of several computers
- ☐ Reduce number of states

Question 18 What kind of real time target was used in this study?

- ☐ Opal RT
- ☐ Typhoon HIL
- ☐ SpeedGoat
- ☐ Matlab/Simulink

Question 19 Which energy transmission effect was modelled using MATLAB?

- ☐ Bone effect
- ☐ Nail effect
- ☐ Skin effect
- ☐ Hair effect

Question 20 What was the scope of the study?

- ☐ Stability of the speed
- ☐ Magnetic fields of breaks
- ☐ Harmonics of the line
- ☐ Temperature of contact

Hardware-in-the-Loop Validation of an FPGA-Based Real-Time Simulator for Power Electronics Applications

J. GORJUP, M.S. BA

Question 21 The study contained 2 main steps, namely:

- ☐ Comparing FPGA and CPU based sampling results and the speed of the FPGA solution.
- ☐ Comparing FPGA-based sampling results with those performed offline and the correspondence of the model during HIL experiment.
- ☐ Comparing FPGA and hardware solution and the harmonics of the system.
- ☐ Comparing CPU and hardware results and the precision of the CPU solution.

Question 22 In CPUs,

- ☐ you can achieve real parallel processing.
- ☐ the simulation step time should be 20 times smaller than the switching frequency.
- ☐ the switching frequency should be 20 times smaller than the simulation step time.
- ☐ you need specific programming software to control the field programmable gate arrays.

Question 23 The hardware that was emulated in the study was a:

- ☐ Three-level, two-phase inverter
- ☐ Two-phase induction machine
- ☐ Three-phase DC machine
- ☐ Two-level, three-phase inverter

Question 24 The real time target used in this study was:

- ☐ Speedgoat Performance Machine
- ☐ Opal RT 4510
- ☐ Typhoon 402
- ☐ compactRIO-9033

Full Power Constraints HiL Setup for Battery Module Testing in Electric Vehicles
J. BUHR and L. DEL BARCO

Question 25 The real time target that was used in this case was provided by?

- ☐ Typhoon HIL
- ☐ Cigergia power interface
- ☐ Siemens Simcenter Amesim
- ☐ Bluways

Question 26 The aim of this study was to:

- ☐ Emulate the temperature increase of the EV battery and the battery on a reference driving cycle.
- ☐ Validate the compliance between EV battery and battery with a reference driving cycle.
- ☐ Estimate the aging of the EV battery and the battery of a reference driving cycle.
- ☐ Verify the driving range with the EV battery and the battery on a reference driving cycle.

Question 27 What was one main outcome of the HIL power tests?

- ☐ The tested module does not exceed the temperature limits during a standard velocity cycle.
- ☐ The tested module ages less than during a standard velocity cycle.
- ☐ The tested module exceeds current limits during a standard velocity cycle.
- ☐ The tested modules stay between its normal operation limits during a standard velocity cycle.

Question 28 The simulation used WLTC but what was this?

- ☐ The model of the tested vehicle.
- ☐ A standard procedure to analyse batteries.
- ☐ The reference driving cycle.
- ☐ The type of the battery.

Power Management of a Hybrid Micro-Grid with Photovoltaic Production and Hydrogen Storage

L. PAWLICKI and S. POSADA RAMIREZ

Question 29 What real time target es used in this study?

- ☐ compactRIO-9033
- ☐ Typhoon 802
- ☐ Opal RT 4510
- ☐ dSpace DS1202

Question 30 The article does NOT address the following topic:

- ☐ Islanded micro-grid.
- ☐ Influence of EV fast charging on electric grid.
- ☐ Energy storage systems.
- ☐ Intermittency impact on the stability of an electrical grid.

Question 31 The system is controlled by a DeMPC. D stands for distributed, e stands for explicit, but what does MPC stand for?

- ☐ Minimum Perturbation Control
- ☐ Multi Power Control
- ☐ Mega Potential Control
- ☐ Model Predictive Control

Question 32 What element is NOT simulated?

- ☐ Supercapacitor system.
- ☐ Battery system.
- ☐ Photovoltaic system.
- ☐ Fuel cell system.