



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE : LEB40803

COURSE NAME : SHIP ELECTRICAL POWER SYSTEMS

PROGRAMME NAME : BACHELOR OF ENGINEERING TECHNOLOGY IN
(FOR MPU: PROGRAMME LEVEL) MARINE ELECTRICAL AND ELECTRONICS

DATE : 13TH JANUARY 2016

TIME : 03.00 PM – 05.30 PM

DURATION : 2½ HOURS

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections; Section A and Section B.
4. Answer **ALL** questions in Section A. For Section B, answer **ONLY THREE (3)** questions.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language **ONLY**.

THERE ARE 8 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

PART A (Total: 40 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1 (CLO 1)**

a) General electrical maintenance can be classified into three categories (Breakdown maintenance, Planned maintenance and Condition monitoring).

i. Elaborate three (3) categories of electrical maintenance.

[3 marks]

ii. Explain two (2) disadvantages of breakdown maintenance.

[2 marks]

iii. Explain two (2) advantages of planned maintenance.

[2 marks]

b) Describe what happens when main power failure occurs.

[2 marks]

c) Analyze four (4) general techniques (Planning, Background knowledge, Diagnostic performance and Search strategy) used to solve the fault finding.

[8 marks]

d) Describe three (3) characteristics of a system to minimize the safety risk to personnel and equipment.

[3 marks]

Question 2 (CLO 3)

- a) Generator onboard ships regularly runs almost every day. Determine five (5) parameters to be monitored by ship staffs during its operation.

[5 marks]

- b) Explain the power generation onboard ship.

[6 marks]

- c) The sea water cooling system on a large generator is out of service due to a faulty inlet valve and the sea water cooling is unavailable for the generator. Explain how this will affect the generator operation.

[4 marks]

- d) Determine what is the synchronous speed of a six (6)-pole motor supplied at 60 Hz.

[2 marks]

- e) If a six (6)-pole motor is supplied at 60 Hz and runs with actual rotor speed 1140 rpm, calculate the rotor slip.

[3 marks]

PART B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.

Please use the answer booklet provided.

Question 3 (CLO4)

- a) Explain the causes of large current surge in open transition starters when going from the start to the run condition.

[6 marks]

- b) Define:

- i. Line voltage
- ii. Phase voltage

[4 marks]

- c) Analyze the **Figure 1** below regarding the principle of generator operation.

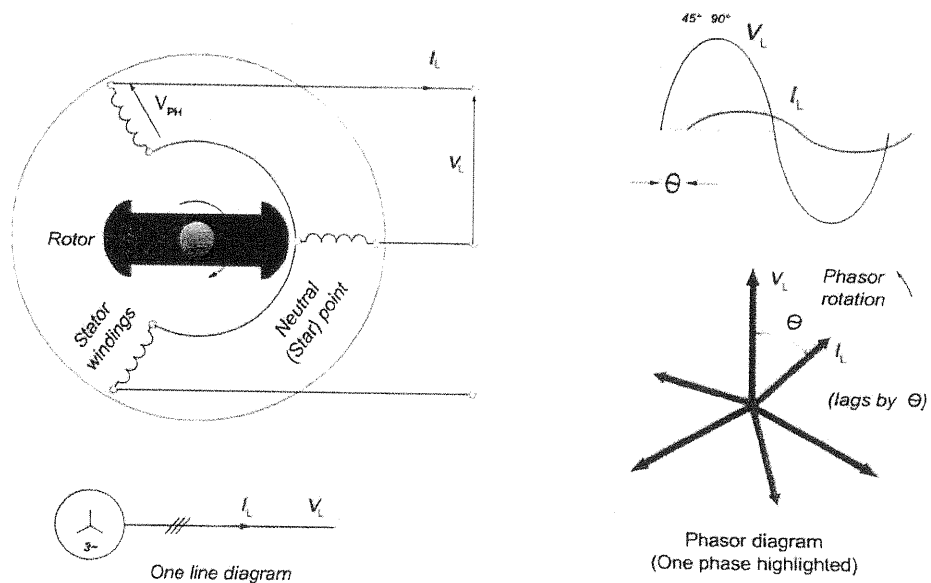


Figure 1

[10 marks]

Question 4 (CLO 2)

- a) A 10 motor operates from a 220 V insulated system. The supply cables have a total impedance of 0.01Ω . Determine the value of current flow through the circuit in each following case:
- i. An open-circuit fault [3 marks]
 - ii. An earth fault, and [3 marks]
 - iii. A short-circuit [3 marks]
- b) Determine the ohmic value of a neutral earthing resistor (NER) to limit the earth fault current to the full load rating of a 2 MW, 0.8 pf, 3.3 kV, three-phase AC generator? [5 marks]
- c) Determine the indication of clampmeter if it clipped around a 3 core cable that is known to be carrying 100AC to a motor. [3 marks]
- d) State THREE (3) reasons why protection equipment is essential in an electric distribution system. [3 marks]

Question 5 (CLO3, CLO4)

A brushless excitation scheme with AVR is shown in **Figure 2**. Rectification of the AC exciter voltage is achieved by six shaft-mounted silicon diodes that form a three-phase rotating rectifier.

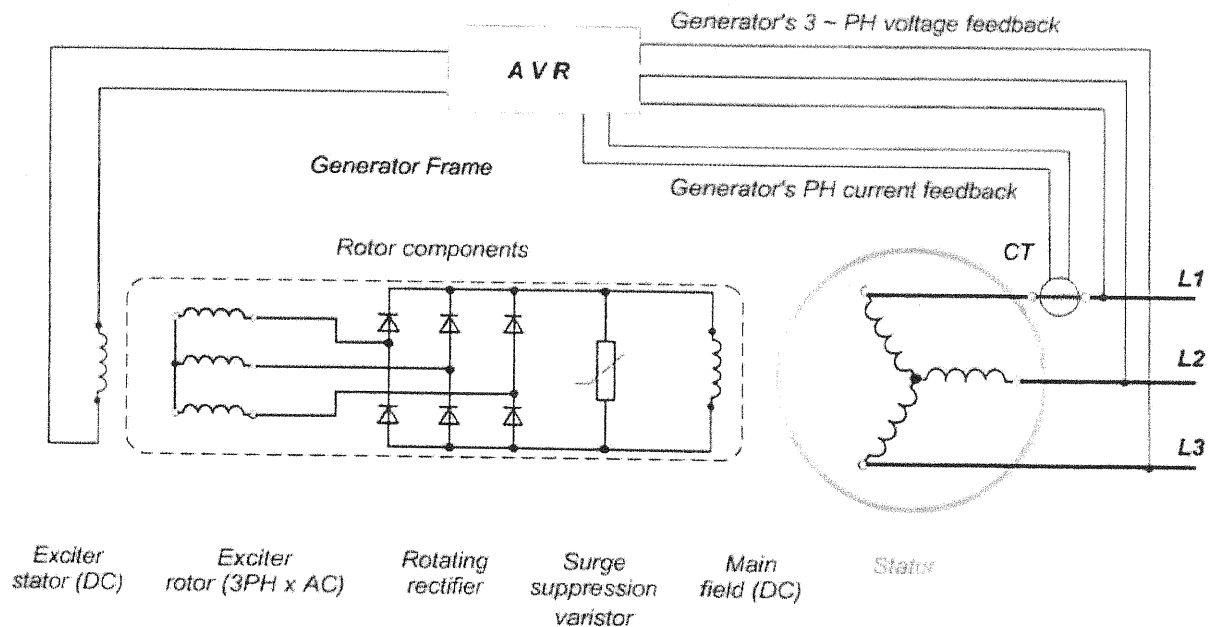


Figure 2 : Brushless Excitation Scheme with Automatic Voltage Regulator (AVR)

- a) Diagnose what is likely to happen if one of the rotating diodes fails and becomes
 - i. an open circuit (3 marks)
 - ii. a short-circuit (3 marks)
- b) Identify three (3) factors govern the overall voltage response of a generator to sudden (transient) load changes. (3 marks)
- c) **Sketch and Explain** the principle of Automatic Voltage Regulation operation. (8 marks)
- d) Discuss the precaution must be taken when testing the insulation of generator cables and wiring connected to an AVR unit. (3 marks)

Question 6 (CLO 5)

- a) As the demand for electrical power increases on ships particularly passenger ferries, cruise liners, specialist offshore vessel and platforms, the supply current rating becomes too high at 440 V. The Figure 3 had shown the HV Propulsion Power System on modern ships. Describe and explain the overall operation of this propulsion system.

[9 marks]

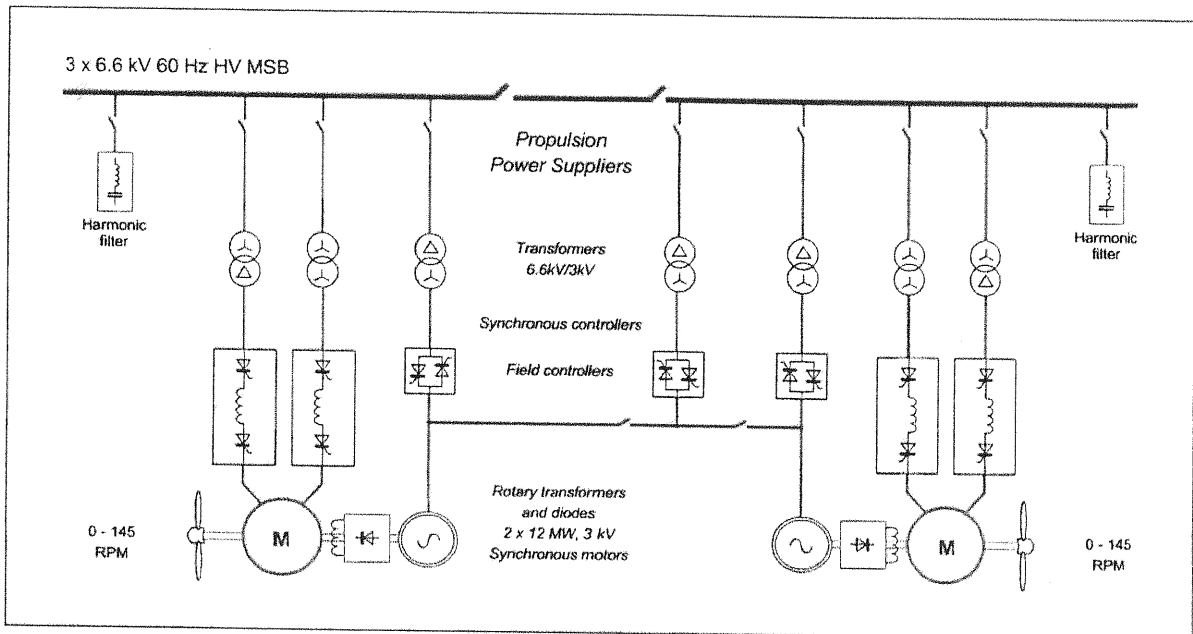


Figure 3 : HV Propulsion Power System

- b) A three-phase 6 MW ship's load supplied by 3 X 2MW, 0.8 pf diesel generator units requires the switchboard fault level current to be about 90kA. Determine a full-load current (FLC) that can be handle by each generator, circuit breaker and system cabling by these following systems:

- i. 440 V System [2 marks]
- ii. 6.6 KV System [2 marks]
- iii. Analyze the value of full-load current (FLC) for both systems [2 marks]

- c) Sketch and label the following three phase transformer.
- i. Wye-Delta connection [1 marks]
 - ii. Delta-Wye connection [1 marks]
- d) Maintenance need to be carried out on the electrical equipment/system. Describe how you carry out maintenance on the three phase transformer.
- [3 marks]

END OF QUESTION PAPER