



**UNIVERSITI KUALA LUMPUR**  
**MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY**

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**FINAL EXAMINATION**  
**JANUARY 2017 SEMESTER**

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**COURSE CODE** : LEB40803

**COURSE NAME** : SHIP ELECTRICAL POWER SYSTEM

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

**DATE** : 10/07/2017 MON

**TIME** : 9.00 AM - 12.00 PM

**DURATION** : 3 HOURS

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read **CAREFULLY** the instructions given in the question paper.
  2. This question paper has information printed on both sides.
  3. This question paper consists of **TWO (2)** sections; Section A and Section B. Answer **ALL** questions in Section A and **THREE (3)** questions from Section B.
  4. Please write yours answers on the answer booklet provided.
  5. Write your answers only in **BLACK** or **BLUE** ink.
  6. Answer all questions in English.
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**THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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

(a) The current at which a circuit breaker may operate on board may be different from manufacturer's current rating.

i. Evaluate this situation.

[7 marks]

ii. Explain why the operating current on board ship is expected to be lower than the design current for the same breaker ashore.

[5 marks]

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

[8 marks]

**Question 2 (CLO 3)**

(a) There are two 220V, 50 KW generators are in parallel in engine room of a ship. Calculate maximum current ( $I_{max}$ ), Voltage ( $V_{max}$ ) and resistance of this two generator

[5 marks]

(b) Explain the power generation onboard ship.

[6 marks]

(c) Describe what happen when main power failure occurs.

[2 marks]

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

[3 marks]

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

[4 marks]

## PART B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.

Please use the answer booklet provided.

## Question 3 (CLO4)

Motor control play an important role in switching on various types of motor.

- (a) Analyze the diagram Figure 1 in Attachment 1. Describe the switching ON and OFF operation for the motor control and explain the function of all its component. (CLO 2)  
[12 marks]
- (b) The rotor of a main AC generator provides the field excitation from its electromagnetic poles. Classify TWO (2) types of Rotor used on generators. (CLO 1)  
[2 marks]
- (c) Refer to the circuit in Figure 2. Discuss the 3 fault that occur in the circuit. Classify fault A, B and C. (CLO 3)

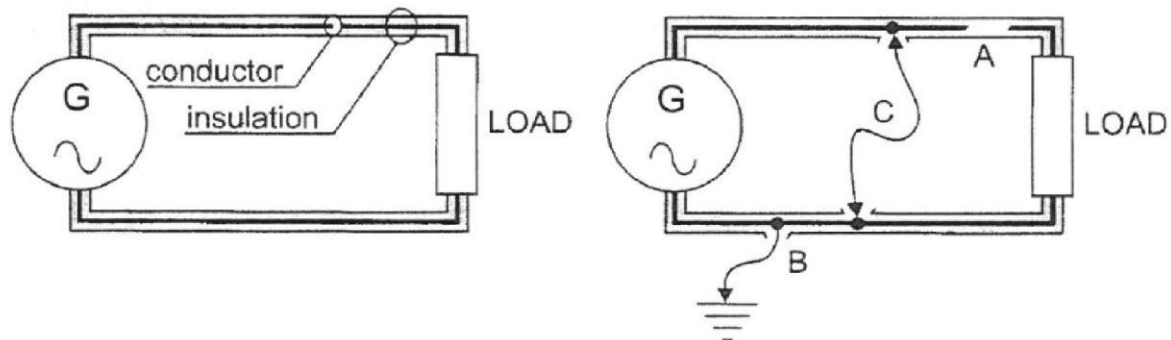


Figure 2

[6 marks]

**Question 4 (CLO 2)**

- (a) State the THREE (3) types of circuit faults.  
[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) Discuss and compare the effect of earth fault on the 'earth distribution system' and 'insulated distribution system'.  
[10 marks]
- (d) State TWO (2) reasons why protection equipment is essential in an electric distribution system.  
[2 marks]

**Question 5 (CLO3, CLO4)**

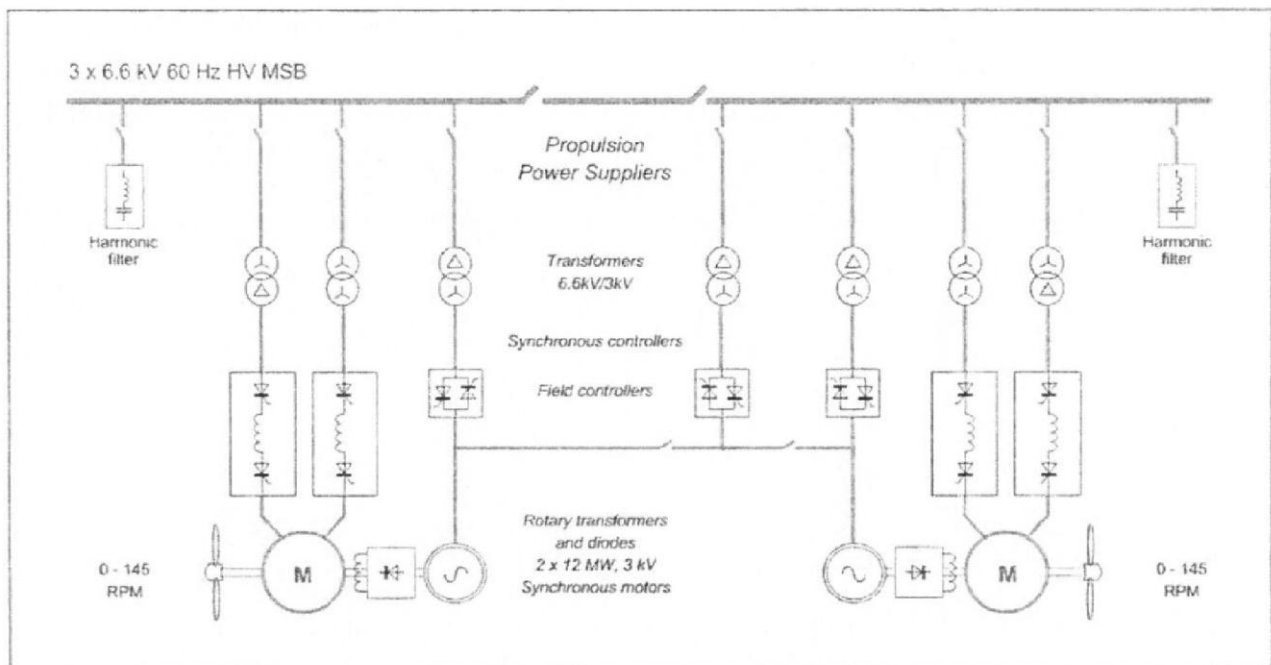
Various methods have been devised to supply the correct DC field (excitation) current to produce the required AC output voltage from the stator terminals. The excitation must be continually regulated to maintain the generator output voltage as the load power demand fluctuates. A brushless excitation scheme with AVR using rectification of the AC exciter voltage is achieved by six shaft-mounted silicon diodes that form a three-phase rotating rectifier.

- (a) Sketch a schematic diagram of a brushless AC generator with labelling the principal components.  
(10 marks)
- (b) Explain the function of thyristors incorporated into such a machine  
(4 marks)
- (c) Distinguish one benefit of this self-contained excitation system.  
(3 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**

Attachment 1

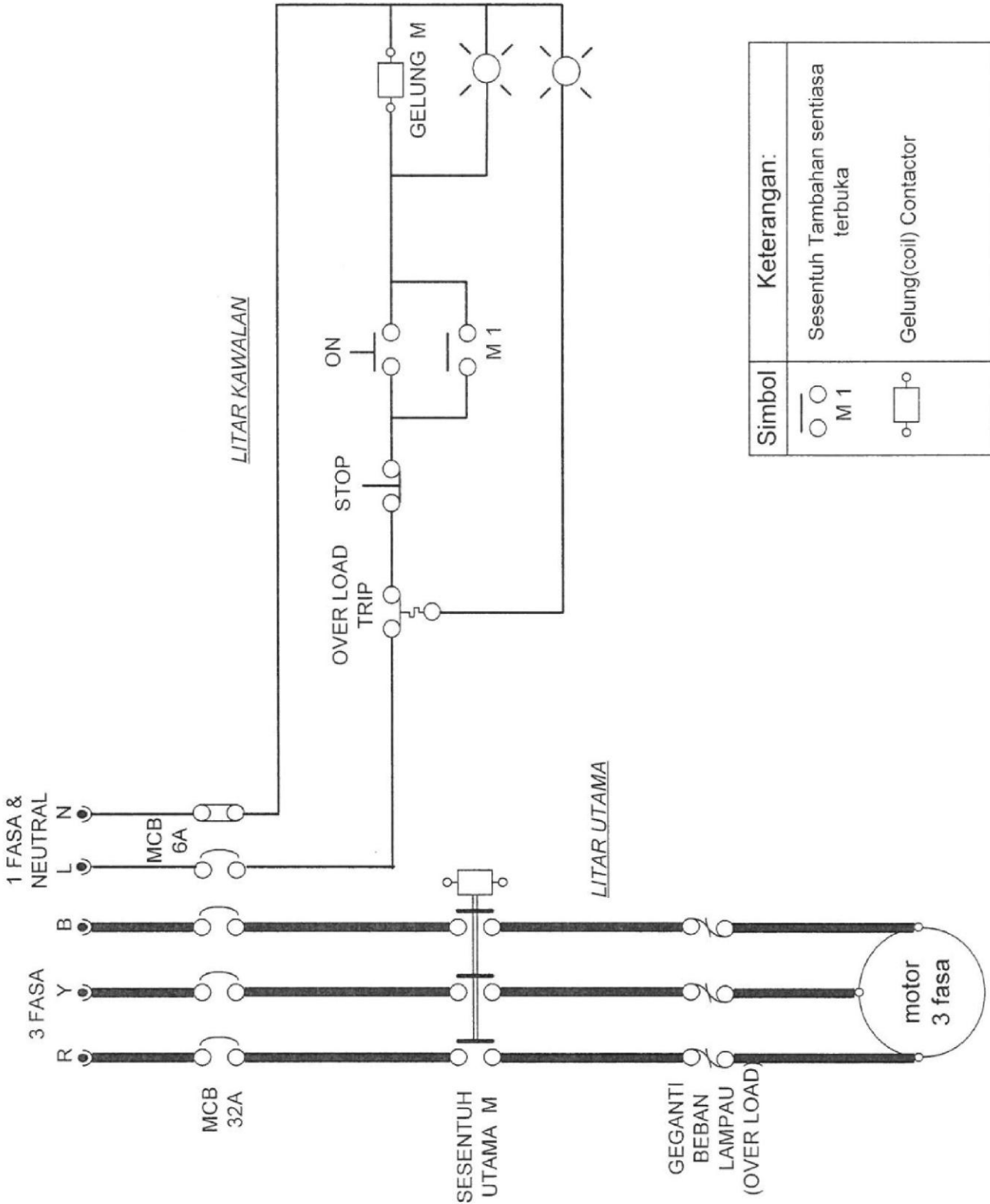


Figure 1