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UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION

FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LED21503**
SUBJECT TITLE	:	**SHIPBOARD ELECTRICAL INSTALLATION AND AUXILIARY EQUIPMENT**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY IN ELECTRICAL AND ELECTRONICS (MARINE)**
TIME / DURATION	:	**09.00 AM – 12.00 PM (3 HOURS)**
DATE	:	**25 JUNE 2025**

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 questions paper consists of TWO (2) Sections; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer THREE (3) questions ONLY.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language only.
7. Answer should be written in blue or black ink except for sketching, graphic and illustration.

THERE ARE 9 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 25 marks)

INSTRUCTION: Answer all questions.

Please use the answer booklet provided.

1. Define the main function of the RADAR system on a ship?
   A. To detect water
   B. To determine ship's heading
   C. To detect object range, direction, and speed
   D. To calculate fuel efficiency

2. The Steering Gear system is used to:
   A. Adjust the ship's engine speed
   B. Turn the ship while sailing
   C. Measure water depth
   D. Detect wind direction

3. Echo sounding is primarily used for:
   A. Measuring wind pressure
   B. Detecting underwater mines
   C. Determining depth of water
   D. Measuring ship speed

4. Which instrument is used to measure the wind speed on board a ship?
   A. Anemometer
   B. Gyrocompass
   C. Speed log
   D. Radar

5. Which device provides directional information without using magnetic fields?
   A. Speed log
   B. GPS
   C. Gyrocompass
   D. Radar

6. Define the main function of GPS in ship navigation?
   A. Detecting storms
   B. Improving sonar range
   C. Providing real-time position data
   D. Regulating fuel usage

7. The DGPS system improves accuracy of:
   A. Anemometers
   B. VHF Radios
   C. Gyrocompasses
   D. GPS positioning

8. Define the unit of capacitance?
   A. Ohm
   B. Farad
   C. Henry
   D. Tesla

9. A 10 μF capacitor connected to a 12V source stores a charge of:
   A. 120 μC
   B. 1.2 C
   C. 83.3 μC
   D. 0.12 C

10. In a series connection of two capacitors (22 μF and 44 μF), the total capacitance is:
   A. 66 μF
   B. 14.67 μF
   C. 22 μF
   D. 33 μF

11. The unit of inductance is:
   A. Farad
   B. Ohm
   C. Henry
   D. Weber

12. An inductor opposes changes in:
    A. Voltage
    B. Current
    C. Resistance
    D. Capacitance

13. According to Lenz's Law, the direction of induced EMF always:
    A. Supports the change in flux
    B. Opposes the change in flux
    C. Increases the flux
    D. Is perpendicular to the flux

14. The time constant (τ) of an LR circuit is given by:
    A. L+RL+R
    B. L×RL×R
    C. LRRL
    D. RLLR

15. The right-hand rule for a solenoid determines:
    A. Current direction
    B. Magnetic field direction
    C. Voltage polarity
    D. Resistance value

16. Force on a current-carrying conductor in a magnetic field is calculated by:
    A. F=BILsin θ$F=BIL\sin\theta$
    B. F=BIL$F=ILB$
    C. F=VI$F=IV$
    D. F=Qt$F=tQ$

17. The Earth's magnetic south pole is located near its geographic:
    A. North Pole
    B. South Pole
    C. Equator
    D. Tropic of Cancer

18. A transformer with 400 primary turns and 100 secondary turns is a:
    A. Step-up transformer
    B. Step-down transformer
    C. Isolation transformer
    D. Autotransformer

19. If a transformer's primary voltage is 240V and turns ratio is 0.5, the secondary voltage is:
    A. 120V
    B. 480V
    C. 60V
    D. 24V

20. Ideal transformers dissipate:
    A. True power
    B. Reactive power
    C. No power
    D. Apparent power

21. In an RC circuit, the time constant (τ) is:
    A. R×C*R*×*C*
    B. RC*CR*
    C. CR*RC*
    D. R+C*R*+*C*

22. A capacitor in an AC circuit causes current to lead voltage by:
    A. 0°
    B. 45°
    C. 90°
    D. 180°

23. The flux density in a magnetic field is measured in:
    A. Farads
    B. Teslas
    C. Henries
    D. Ohms

24. A solenoid with a steel core becomes a magnet when:
    A. Current is reversed
    B. Current is stopped
    C. Current is applied
    D. Core is removed

25. The reactive power of a capacitor is measured in:
    A. Watts
    B. VAR
    C. VA
    D. Joules

SECTION B (Total: 75 marks)

INSTRUCTION: Answer THREE (3) questions only.

Please use the answer booklet provided

Question 1

With reference to AC and DC parameters: -

(a) Explain three main differences between alternating current (AC) and direct current (DC).

(6 marks)

(b) Explain the meaning of active power, reactive power, and apparent power in an AC system. Also provide the unit for each type of power.

(6 marks)

(c) List two types of field-effect transistors (FET) and state one application for each type.

(5 marks)

(d) Explain the operating principle of an AC Voltage Controller and mention one of its applications on a ship.

(4 marks)

(e) List two methods for testing semiconductor components and two important steps during their replacement.

(4 marks)

Question 2

With reference to DC motors: -

(a) Explain what is meant by "back E.M.F. (Eb)" in a DC motor and state its relationship with the supply voltage.

(5 marks)

(b) Describe two methods of controlling the speed of a DC motor and explain their effects on motor speed.

(5 marks)

(c) Name three types of DC motors and state one typical application for each.

(6 marks)

(d) State the reason why is the starting current in a DC motor very high. Explain how a DC motor starter overcomes this issue.

(4 marks)

(e) Draw and label the schematic for DC shunt wound motor.

(5 marks)

Question 3

With reference to DC and AC motor controls: -

(a) State two differences between AC motors and DC motors in terms of speed control and construction.

(4 marks)

(b) List three types of electric motors commonly used on ships and give one application for each.

(6 marks)

(c) Explain the synchronizing principle in a synchronous motor and state one application of this motor on board a ship.

(5 marks)

(d) Draw and label the Forward reverse stater for

i) control circuit and

(5 marks)

ii) main circuit

(5 marks)

Question 4

With reference to Protection devices: -

(a) Explain the main purpose of electrical protection devices in a ship's electrical system.

(8 marks)

(b) Name two types of circuit breakers used in marine electrical systems and describe their working principles.

(4 marks)

(c) Explain the earth's fault and how earth fault protection devices help in shipboard electrical safety.

(6 marks)

(d) Differentiate between overload protection and short circuit protection. Name one device for each.

(7 marks)

END OF EXAMINATION PAPER