
Indian Maritime University
(A Central University, Govt of India)

Mar/Apr '26 SE
Programme Name: B Tech (ME)

Semester: V

Subject Code: UG11T4508

Subject Name: MARINE ELECTRICAL MOTORS: STARTERS AND DRIVE CONTROLS

Date: 12.03.2026	Max Marks: 70
Duration: 03 Hrs	Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Why is slip essential in an induction motor?
A) To reduce rotor losses
B) To produce relative motion between the stator field and rotor conductors
C) To maintain constant speed at all loads
D) To improve power factor
 2. In a DC motor, the starting current is high compared to the load current because:
A) The armature resistance is very low at start
B) The back emf is zero at start
C) Both A and B
D) None of the above
 3. What is the main function of an overcurrent relay in motor protection?
A) To maintain constant motor speed
B) To disconnect the motor in case of excessive current flow
C) To improve the efficiency of the motor
D) To regulate voltage fluctuations
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4. The Ward-Leonard drive is primarily used to:

- A) Achieve variable speed control of DC motors
- B) Provide constant torque in AC motors
- C) Improve motor cooling efficiency
- D) Protect motors against single phasing

5. The main difference between a DC servo motor and a common DC motor is:

- A) DC servo motors are designed for continuous constant speed operation
- B) DC servo motors are designed for precise control of position and speed
- C) DC servo motors have higher starting torque and lower control accuracy
- D) There is no difference between them

6. A two-phase AC servomotor is commonly used because:

- A) It is simpler and provides smoother control of speed and torque
- B) It requires no control signal for operation
- C) It is less efficient but more powerful than DC motors
- D) It does not produce torque at zero speed

7. What is the main advantage of using an IGBT in motor speed control?

- A) It increases motor size
- B) It allows high-frequency and high-current switching with better efficiency
- C) It reduces motor torque output
- D) It eliminates the need for feedback control

8. In a three-phase induction motor, how does varying the supply frequency affect motor speed?

- A) Speed increases with decrease in frequency
- B) Speed remains constant regardless of frequency
- C) Speed increases with increase in frequency
- D) Frequency has no relation to speed

9. What is the primary purpose of under-voltage protection in generators and motors?

- A) To prevent excessive current during overload conditions
- B) To avoid overheating due to low voltage and protect the winding insulation
- C) To reduce mechanical vibration
- D) To increase motor speed during voltage dips

10. Which of the following is a common cause of insulation failure in electric motors?

- A) High humidity and condensation
 - B) Proper lubrication of bearings
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- C) Adequate air ventilation
 - D) Regular inspection and cleaning

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Section B

Five Questions of 02 Marks each

- 11. Describe two key considerations when selecting starting methods for AC motors.
- 12. What are the effects of single phasing on a three-phase motor?
- 13. Explain why monitoring air flow and ventilation is necessary in a cage induction motor.
- 14. List two maintenance checks necessary to prevent deterioration of insulation in a cage induction motor.
- 15. What is the function of an overcurrent relay in motor protection, and how is the overcurrent relay (OLR) set for a motor.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

- 16. Explain the construction, working principle, and operation of the Ward Leonard system used for DC motor speed control in marine applications.
 - 17. Describe the construction, working, and operation of Direct-On-Line (DOL) and Star-Delta starters used for starting three-phase induction motors on board ships.
 - 18. Explain the principle, construction, and operation of Variable Frequency Drive (VFD) starters used in marine motor control systems.
 - 19. Discuss the role and operation of protective relays used in marine motor circuits, with special emphasis on the Under-Voltage Relay (UVR).
 - 20. Describe the routine maintenance, testing, and troubleshooting procedures for AC motors used on board ships.
 - 21. Explain the constructional and operating features of a DC Motor on board-ship.
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22. Explain the construction, working principle, and applications of AC and DC servo motors used in marine control systems. Compare the advantages and limitations of both types.

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