

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2024
Programme Name: B Tech (Marine Engineering)
Semester: III
Subject Code: UG114307
Subject Name: Electrical Machines

Date: 20.12.2024

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.
- (iii) Scientific Calculator is permitted

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable. (10x1=10 Marks)

1. Which of the following is the best suitable material for the construction of the armature of a dc machine?
a) Silicon steel
b) Cast Steel
c) Wrought iron
d) soft iron

2. An induction motor with 1000 r.p.m. speed and 50 Hz frequency will have:
a) 8 poles b) 6 poles c) 4 poles d) 2 poles

3. If any two phases for a three-phase induction motor are interchanged
a) the motor will run in reverse direction
b) the motor will run at reduced speed
c) the motor will not run
d) the motor will burn

4. Sequential starting of machineries after black out in engine room is necessary
a) To prevent overload of Generators
b) To Quickly restore the failed power supply in order
c) To prevent damage to machinery which has been switched off
d) All of the above

5. Which of the following circuit breaker has high reliability and minimum maintenance?

- a) Air blast circuit breaker
- b) SF6 circuit breaker
- c) Vacuum circuit breaker
- d) Oil circuit breaker

6. Overcurrent relays operate on the principle of

- a) Change in voltage
- b) Rate of change of current
- c) Magnitude of current exceeding a preset threshold
- d) Impedance measurement

7. The emergency generator should have independent fuel supply having flash point

- a) Not less than 43°C
- b) Not less than 33°C
- c) Not less than 23°C
- d) None of the above

8. If the field of a synchronous motor is under excited, the power factor will be

- a) Lagging
- b) Leading
- c) Unity
- d) More than unity

9. Lap winding is preferred for _____ DC machines.

- a) low current and low voltage
- b) high current and high voltage
- c) high current and low voltage
- d) low current and high voltage

10. V-curves of a synchronous motor are drawn between:

- a. field current and armature current
- b. terminal voltage and load factor
- c. power factor and field current
- d. armature current and power factor

Section B

Five Questions of 02 Marks each (5x2=10)

11. Give the reasons for blackout on onboard ship.

12. What will the effect of reducing the flux value on speed and torque in case of DC series motor?.

13. Why is the air gap between the rotor and stator of a 3-phase induction motor kept as minimal as possible?

14. Why are DC motor brushes made of carbon?

15. Why do the squirrel cage induction motor's rotor slots have a skewed structure?

Section C

Seven Questions of 10 Marks each of which any five questions to be answered. (5x10=50)

16 a) Draw and explain schematic diagram of three-point starter of DC motor. (6)

b) With suitable equivalent circuit diagram of DC motor explain significance of back emf. (4)

17. (a) A 230 V DC shunt motor has an armature resistance of 0.5Ω and field resistance of 115Ω . At no load, the speed is 1200 r.p.m. and the armature current 2.5 A. On application of rated load, the speed drops to 1120 r.p.m. Determine the line current and input power when the motor delivers rated load. (5)

(b) A 4- Pole DC motor has lap connected armature winding with flux of 0.6 weber. The number of armature conductors is 250. When connected to 230 V DC supply, it draws an armature current of 40 A. Calculate the back e.m.f. and speed with which motor is running. Assume armature resistance of 0.6Ω . (5)

18. Explain the Ward-Leonard method for controlling the speed of a DC motor. Enumerate the benefits and drawbacks of using this technique. (10)

19. a) Explain single phasing in electrical motors. What are the causes and effects? (5)

b) Draw and explain with the aid of sketch, the working principle of IGBT in varying motor speed control. (5)

20. (a) Explain the impact of insulation resistance and polarization index on high voltage equipment. (5)

(b) What does synchronous capacitance mean? Explain. (5)

21. a) Discuss advantages and disadvantages of Electric propulsion over diesel propulsion. (5)

b) Explain how to use HV personal protection equipment (PPE) while working on high voltage installations. (5)

22. Name the different types of starters used for induction motor. Explain any two starters in detail. (10)

