Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – September/October 2024

Programme Name: B Tech (ME)

Semester: III

Subject Code: UG11T4307

Subject Name: Electrical Machines

Date: 28.09.2024 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.

Section A

Answer all the questions (10x1=10)

1. When the load on an alternator is varied, its terminal voltage also changes due to _____
   (A) Armature resistance
   (B) Leakage reactance
   (C) Armature reaction
   (D) All of the mentioned

2. A 3-phase 440 V, 50 Hz induction motor has 4% slip. The frequency of rotor current will be
   (A) 50 Hz
   (B) 25 Hz
   (C) 1.5 Hz
   (D) 2 Hz

3. Voltage induce in the induction motor is highest at _____
   (A) starting
   (B) standstill
   (C) rated speed
   (D) any of the mentioned

4. A starting resistance is inserted at the starting in an induction motor as well as dc motor.

(A) Induction motor has to control starting torque whereas in dc motor, it is done to avoid large current
(B) To limit starting current in both the machines
(C) To limit starting speed
(D) All of the mentioned

5. Voltage regulation for an alternator operating at leading power factor is negative due to _____
(A) magnetizing nature of armature reaction
(B) demagnetizing nature of armature reaction
(C) cross-magnetizing nature of armature reaction
(D) all of the mentioned

6. If field current is decreased in shunt DC motor, the speed of the motor
(A) remains same.
(B) increases.
(C) decreases.
(D) none of the above.

7. The V-curves of a synchronous motor show relationship between
(A) Excitation current and back e.m.f
(B) Field current and p.f.
(C) field current and AC armature current
(D) Armature current and supply voltage

8. For very sensitive and wide speed control, the preferable control method is
(A) Armature control.
(B) Ward-Leonard control.
(C) Multiple voltage control.
(D) Field control.

9. With the rise in temperature, the insulation resistivity of a cable
(A) Remain unchanged
(B) Decreases linearly
(C) Increases linearly
(D) Reduces exponentially

10. Which of the following shows the value PI for Large Power Transformer?
(A) IR at 10 min to IR at 1 min
(B) IR at 60 sec to IR at 15 sec
(C) IR at 1 min to IR at 10 min
(D) IR at 15 sec to IR at 60 sec

Section B

Answer all the questions (5x2=10)

11. Why the brushes used in electrical motors are made up of carbon?

12. What is the condition for maximum torque in induction motor?

13. What does hunting of synchronous motor mean?

14. What is the function of slip-rings in 3-phase induction motor?

15. Explain the advantages and disadvantages of using high voltage system on ships.

Section C

Answer any five questions (5x10=50)

16. A 4 pole, 50 Hz, 3-phase, wound rotor induction motor is taking 9100 watts from the line. Core loss is 290 watts, stator copper loss is 568 watts, rotor copper loss in 445 watts, friction and windage losses are 100 watts. Determine;
(a) power transferred across air gap [3]
(b) mechanical power output in watt [3]
(c) efficiency [4]

17. Explain the working of following starter used in Squirrel cage induction motor with neat diagram
(a) Star-Delta Starter [4]
(b) Stator Resistance Starter [3]
(c) Autotransformer Starter [3]

18. A 400-V, 50-Hz, 6-pole, 3-phase, Y-connected synchronous motor has a synchronous reactance of 4 ohm/phase and a resistance of 0.5 ohm/phase. On full-load, the excitation is adjusted so that machine takes an armature current of 60 ampere at 0.866 p.f. leading. Keeping the excitation unchanged, find the maximum power output. Excitation, friction, windage and iron losses total 2 kW. [10]

19. A 220 V, DC shunt motor is operating at a speed of 1440 rpm. The armature resistance is 1 ohm and armature current is 10 A. of the excitation of the machine is reduced by 10%, What will be the extra resistance to be put in the armature circuit to maintain the same speed and torque? [10]

20. Why synchronous motor is not self-starting? What are the methods of starting synchronous motor? Explain properly. [10]

21. Explain the Ward-Leonard method of speed control for DC motor? List out the advantages and disadvantages of this method. [10]

22. What is the procedure / precautions for measuring insulation resistance of a high voltage equipment ? Explain the working principle of megger tester with neat and clean diagram. [10]