QP Code:ES1T07-1 **(Pages: 3)**

Reg No : ..... Name : .....

MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM

(Govt. Aided Autonomous Institution)

First Semester B.Tech. Degree (SAY) Examination, February, 2026

Course Code: B24ES1T07

Course Name: Fundamentals of Electrical Engineering

Max. Marks: 100 Duration:3 Hours

PART - A: 30 Marks (10 Qns x 3 Marks)

Answer all questions

1. Recall Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).
2. Explain the difference between series and parallel circuits in simple terms.
3. Explain the construction of a DC generator with neat diagram.
4. Explain the various losses in a dc generator.
5. The impedance of an R-L series circuit is 25+ j60 Ω. When the supply frequency is increased from 50 Hz to 150 Hz, what will be the value of impedance?
6. Define frequency, time period and average value of an alternating quantity.
7. Illustrate the emf equation of a transformer ?
8. Illustrate the condition for maximum efficiency of a transformer?
9. How does the number of poles in a BLDC motor affect its performance characteristics.
10. Discuss three advantages of connecting Alternators in parallel.

PART - B: 70 Marks (5 Qns x 14 Marks)

Answer any one question from each module

Module 1

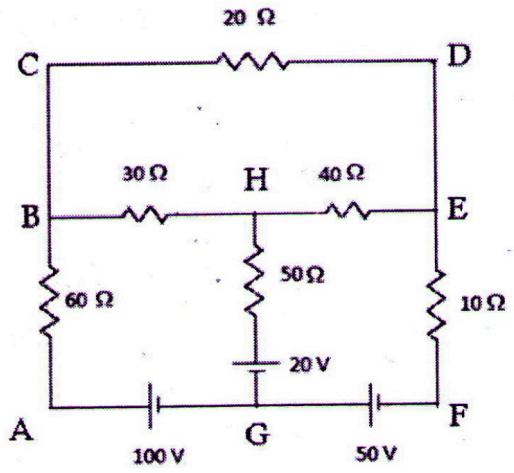
11. a. What is an electric current? (4 marks)

    b. Two wires of same length and of same metal, have resistance of 25 and 36 ohms

respectively. What are the relative diameters of the wires? (10 marks)

OR

12. Use mesh analysis to calculate the current in each branch of the circuit in Figure:



Module 2

13. a. A 4 pole DC series motor has wave connected winding with 600 conductors. Total resistance of motor is 0.8 Ω. When fed from 250V dc source the motor supplies a load of 10kW and takes 50A with a flux per pole of 3mwb. For this operating condition determine the developed torque and shaft torque. (8 marks)

b. Illustrate the various types of dc motors with the help of neat sketches and relevant circuit equations. (6 marks)

OR

14. a. A four-pole motor is fed at 440V and takes an armature current of 50A. The resistance of the armature circuit is 0.28Ω. The armature winding is wave connected with 888 conductors and useful flux per pole is 0.023wb. Calculate the back emf and speed. (10 marks)

b. Explain the principle and operation of DC motor. (4 marks)

Module 3

15. Three inductive coils, each of resistance of 18 ohm and an inductance of 0.04 H are connected to a 3 phase, 415V, 50 Hz supply. Calculate for both star and delta connections (i) phase current (ii) line current (iii) total power absorbed.

OR

16. Two coils A and B have 12000 turns and 14000 turns respectively. 80% of the flux produced by coil A links with coil B. A current of 6A in coil A produces 0.05mWb in

coil A while the same current in coil B produces 0.085mwb in coil B. Calculate Mutual inductance and Coefficient of coupling.

Module 4

17. a. A three phase squirrel cage induction motor has a starting current of seven times the full load current and full load slip of 5%. (8 Marks)

(i) If an auto transformer is used for reduced voltage starting to provide 1.5 per unit starting torque, what would be the auto transformer ratio(%).

(ii) If a star-delta starter is used to start this induction motor, what would be the per unit starting torque.

(iii) If a starting torque of 0.5 per unit is required, what would the per unit starting current.

b. Explain why single phase induction motors are not self-starting. (6 Marks)

OR

18. a. An 8 pole, three phase induction motor is supplied from 50 Hz, a.c. supply. On full load, the frequency of induced EMF in the rotor is 2 Hz. Calculate the full load slip and the corresponding speed.

(6 Marks)

b. If a voltmeter when connected to the rotor of an induction motor gives 150 oscillations per minute and stator frequency is 50 Hz. Calculate the slip of induction motor. (6 Marks)

c. A 50 Hz, 3 phase slip ring induction motor, has 6 poles on stator and 4 poles on rotor. Will the machine will run ? If run, What will be the speed? (2 Marks)

Module 5

19. a. Define voltage regulation in an alternator and Discuss the reasons for change in terminal voltage from no load to full load of an alternator. (6 marks)

b. An alternator supplies a load of 400 kW at 6.6 kV with a power factor of 0.85 lagging. The armature resistance is negligible, and the synchronous reactance is 3Ω per phase. Find the voltage regulation of the alternator. (8 marks)

OR

20. a. Calculate synchronous speed of a 6 pole alternator woking at 50 Hz, with a terminal voltage of 400 V. (4 marks)

b. Compare the different types of rotors in an alternator with neat figures. (10 marks)

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