(Please write your Exam Roll No.) *Exam Roll No*

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2025

Paper Code: EEC-210 ***Subject: Electrical Machines-II***

Time: 3 Hours ***Maximum Marks:60***

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Write short and precise answers of the following: **[4x5=20]**

a) Derive the expressions of frequency of EMF generated in an alternator.

b) What are the benefits of stationary armature and rotating field in synchronous generators?

c) Are the stator and rotor of a 3-phase induction motor electrically connected? If not, how does the current flows in armature conductors?

d) A 3-phase induction motor is running at a slip of 4% when the input power to the stator is 90 kW. Find the rotor copper loss, if the stator copper loss is 2 kW.

e) What is the damper winding; and why it is used in synchronous motors?

f) State the names of the various methods of starting of a 1-phase induction motor.

UNIT-I

Q2 a) What is voltage regulation of an alternator? How it is determined by the synchronous impedance method? **[5]**

b) A 3-phase star connected synchronous generator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.5 Wb. Calculate the voltage generated, if the winding factor if 0.96. **[5]**

OR

Q3 What is armature reaction in an alternator? Explain with phasor diagrams its effect on terminal voltage of an alternator at: **[10]**

i) Unity power factor

ii) Zero lagging power factor

iii) Zero leading power factor

UNIT-II

Q4 a) Explain and neatly draw the equivalent circuit of a 3-phase induction motor. **[5]**

b) A 50 Hz, 440 V, 3-phase, 4-pole induction motor develops half the rated torque at 1490 rpm. With the applied voltage magnitude remaining at the rated value, what should be its frequency, if the motor has to develop the same torque at 1600 rpm? Neglect the stator and rotor winding resistances, leakage reactance and iron losses. **[5]**

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OR

Q5 a) Describe with neat diagram the star-delta method of starting the 3-phase induction motors. **[5]**

b) A 50 KVA, 400 V, 3-phase, 50 Hz squirrel cage induction motor has full load slip of 5%. Its standstill impedance is 0.866 ohm/phase. It is started using a tapped auto-transformer. If the maximum allowable supply current at the time of starting is 100 A, calculate the ratio of starting torque to full load torque. **[5]**

UNIT-III

Q6 a) State the principle of operation of a synchronous motor. Describe the squirrel cage winding method of its starting. **[5]**

b] A 3-phase synchronous motor of 8 kW has a synchronous reactance 8 ohm per phase. Find minimum current and corresponding induced EMF for full load condition. The efficiency of the machine is 0.8. Neglect the armature resistance. **[5]**

OR

Q7 a] Describe the effect of varying excitation on armature current and power factor of a 3-phase synchronous motor, **[5]**

b] Derive the expressions of power developed in a 3-phase synchronous motor. **[5]**

UNIT-IV

Q8 Explain the double revolving field theory and show that a 1-phase induction motor is not self starting. Draw the torque-slip curves based on this theory. ***[10]***

OR

Q9 Write short notes on:

i) Universal motor **[5]**

ii) Induction generator **[5]**

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