II B. TECH II SEMESTER REGULAR EXAMINATIONS, AUGUST 2021
ELECTRICAL MACHINES - II
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 60

Note: Answer **ONE** question from each Unit (**5 × 12 = 60 Marks**)
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UNIT - I

1. a) Explain in detail the constructional feature of squirrel cage three phase induction motor. [6M]

   b) A 10kW, 400V, 3-Phase, 4 pole, 50 Hz delta connected induction motor is running at no load with a line current of 8A an input power of 660watts. At full load, the line current is 18A and the input power is 11.2kW. Stator effective resistance per phase is 1.2Ω and friction and windage loss is 420 watts. For negligible rotor ohmic losses at no load, calculate (i) stator core loss (ii) total ohmic loss of rotor at full load (iii) full load speed (iv) shaft torque and (v) motor efficiency. [6M]

(OR)

2. a) Describe the principle of operation of three phase induction motor. Explain why the rotor is forced to rotate in the direction of rotating magnetic field. [6M]

   b) A 3-phase, 50Hz induction motor has a starting torque which is 1.5 times full load torque and a maximum torque which is 2.8 times full load torque. Neglecting stator resistance and rotational losses and assuming constant rotor resistance, find (i) The slip at full load (ii) The slip at maximum torque (iii) The rotor current at starting in per unit of full load rotor current. [6M]

UNIT – II

3. a) Explain the principle of speed control of a 3-phase induction motor by V/f method and draw the corresponding torque-speed characteristics. [6M]

   b) Two slip ring Induction Motors having 8 & 4 poles respectively are mechanically coupled. (i) Calculate the possible speed when first motor is supplied from a 60Hz supply line. (ii) Calculate the ratio of power shared by the two motors. (iii) If the smallest possible speed is to be attained independently by each machine, compute the frequency of the voltage to be injected in the rotor circuit. [6M]

(OR)

4. a) Describe with construction diagrams the working of the following starters: [6M]
   (a) Auto-transformer starter
   (b) Star-delta starter
   Judge which starter is suitable for medium size induction motor.

   b) For a Three phase induction motor, the rotor ohmic loss at maximum torque is 16 times that at full load torque. The slip at full load torque is 0.03. If the stator resistance and rotational losses are neglected, then calculate (i) The slip at maximum torque (ii) The max. torque in terms of full load torque (iii) The starting torque in terms of full load torque. [6M]

UNIT – III

5. a) Using double field revolving field theory explain the torque-slip characteristics of a single-phase induction motor and prove that it cannot produce starting torque? [6M]

b) Explain the constructional details and principle of operation of a split phase induction motor. List out its industrial applications. [6M]

(OR)

6. a) Explain the equivalent circuit of a single-phase induction motor with neat sketch. [6M]

b) Explain the construction and operation of AC series motor? [6M]

UNIT –IV

7. a) Explain the Two reaction theory of salient pole alternator and draw its phasor diagram for lagging power factor load. [6M]

b) Two 50MVA, 3 Phase alternators operate in parallel. The settings of the governors are such that the rise in speed from full load to no load is 2% in one machine and 3 % in the other, the characteristics being straight lines in both the cases. If each machine is fully loaded when the total load is 100MW, what would be the load on each machine when the total load is 60MW. [6M]

(OR)

8. a) Explain the synchronous impedance method of determining the voltage regulation of an alternator. Comment on the merits and limitations of this method, why this method is considered as pessimistic method? [6M]

b) Derive an expression for finding regulation of salient pole alternator using Two reaction theory. Draw its phasor diagram and explain power angle characteristics. [6M]

UNIT –V

9. a) Explain the operation of synchronous motor and explain why a synchronous motor is not run at other than synchronous speed? 6M]

b) A star connected synchronous motor rated at 187KVA, 2300V, 47A, 50Hz, 187.5rpm has a effective resistance of 1.5Ω and synchronous reactance of $20\ \Omega$ per phase. Determine the internal power developed by the motor when it is operating at rated current and 0.8 power factor leading. [6M]

(OR)

10. a) What are the differences between synchronous motor and induction motor? [6M]

b) A 2000V, 3-phase, 4-pole, Y-connected synchronous motor runs at 1500rpm. The excitation is constant and corresponds to an open circuit voltage of 2000V. The resistance is negligible as compared to a reactance of 3Ω per phase. Determine the power input, power factor and torque developed for an armature current of 200A. [6M]

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