

II B. Tech II Semester Supplementary Examinations, February - 2022**ELECTRICAL MACHINES - II**

(Electrical and Electronics Engineering)

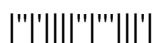
Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unitAll Questions carry **Equal** Marks

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- 1 a) Derive the expression for rotor frequency for an induction motor. [8M]
 b) Draw and explain the equivalent circuit diagram of three-phase induction motor. [7M]
- or
- 2 a) Explain the construction of cage and wound rotor induction machine. [8M]
 b) A 10 kW, 50 Hz, 6-pole three-phase induction motor has a full load slip of 0.04. If its friction and windage losses are 4 % of the output, then compute [7M]
 i) Rotor ohmic loss at full load ii) Full-load electromagnetic torque
 iii) Rotor efficiency.
- 3 a) A three-phase induction motor has a 4-pole, star connected stator winding. The motor runs on a 50 Hz supply with 200 V between lines. The rotor resistance and standstill rotor reactance per phase are 0.1 Ω and 0.9 Ω . The ratio of rotor to stator turns is 0.67. Calculate i) total torque at 4% slip ii) maximum torque iii) speed at maximum torque iv) maximum mechanical power. Neglect stator impedance. [8M]
 b) Explain the various regions of torque–slip characteristics of a three-phase induction motor. [7M]
- or
- 4 a) Describe the operation of a double cage induction motor and also plot its torque-slip characteristics. [7M]
 b) A 440V, three-phase, 4-pole, 50 Hz squirrel cage induction motor develops a maximum torque of 3 times the full-load torque at a speed of 1200 rpm and at rated voltage and frequency. If this motor is now connected to a 400 V, 40 Hz a.c. source compute. i) Magnitude of maximum torque and ii) Speed at which maximum torque would occur. [8M]
- 5 a) Explain the working of the AC series motor. [8M]
 b) Explain the equivalent circuit of a single-phase induction motor. [7M]
- or
- 6 a) Describe the double field revolving theory in single-phase induction motor. [8M]
 b) Explain the working principle of capacitor start and run single-phase induction motor. [7M]
- 7 a) Explain the method of obtaining voltage regulation using the MMF method for a synchronous generator. [7M]
 b) A three-phase, 50 Hz, 2-pole, star connected turbo alternator has 54 slots with 4 conductors per slot. The pitch of the coils is 2 slots less than the pole pitch. If the machine gives 3300 V between lines on open circuit with sinusoidal flux distribution, calculate the useful flux per pole. [8M]

or



- 8 a) Two identical 2000 kVA alternators operate in parallel. The governor of first machine is such that frequency drops uniformly from 50 Hz on no load to 48 Hz on full load. The corresponding uniform speed drop of the second machine is 50 Hz to 47.5 Hz. i) How will the two machines share a load of 3000 kW? ii) What is the maximum load at unity power factor that can be delivered without overloading either machine? [8M]
- b) Derive the expression for synchronizing power and synchronizing torque coefficients and mention their significance. [7M]
- 9 a) Explain the working of synchronous motor with neat sketch. [8M]
- b) A 1000 kVA, 11000 V, three-phase star-connected synchronous motor has an armature resistance and reactance per phase of 3.5Ω and 40Ω respectively. Determine the induced e.m.f. and angle retardation of the rotor when fully loaded at i) unity power factor ii) 0.8 power factor lagging iii) 0.8 power factor leading. [7M]
- or
- 10 a) Is the synchronous motor is self-starting? Explain the starting methods of synchronous motor. [8M]
- b) Derive the expression for power in a synchronous motor. [7M]

