

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 180904****Subject Name: Electrical Machine Design – II****Date: 16/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the factors affecting the selection of Air gap of three phase Induction Motor **07**
- (b) Find the main dimensions of 15 kW, 3 phases, 400 V 50 Hz, 2810 rpm squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9 lag. Assume winding factor 0.955 specific magnetic loading 0.5 Wb/m^2 , specific electric loading $=25000 \text{ A/m}$. take the rotor peripheral speed as approximately 20m/s at synchronous speed. **07**
- Q.2** (a) Define SCR of a synchronous machine. Discuss the importance of SCR in the design of synchronous machine. **07**
- (b) Determine the main dimensions for a 1000 KVA, 50 Hz, 3 phases, 375 r.p.m. alternators. The average air gap flux density is 0.55 Wb/m^2 and the ampere conductors per meter are 28000, winding factor 0.955. Take ratio of core length to pole pitch equals to 2. Check that simple bolted on pole construction can be used, if run away speed is 1.8 times the synchronous speed and the maximum permissible peripheral speed for the bolted on pole construction is 50 m/s. **07**
- OR**
- (b) Explain Design procedure for stator of single phase Induction Motor. **07**
- Q.3** (a) Explain the effect of Harmonic Induction Torque and Harmonic synchronous Torque on the performance of three phases Induction Motor. **07**
- (b) 15 kW, 400 V 3 phase 50 Hz, 6 pole induction motor has a diameter of 0.3m and the length of core 0.12m. The number of slots is 72 with 20 conductors per slot. The stator is delta connected. Calculate the value of magnetizing current per phase if the length of air gap is 0.55m. The gap contraction factor is 1.2. Assume the mmf required for the iron parts to be 35 percent of the air gap mmf . Take coil span = 11 slots. Winding factor 0.955. **07**
- OR**
- Q.3** (a) Discuss design consideration of High Voltage Machine. **04**
- (b) Explain methods of Improving starting torque of Induction Motor. **06**
- (c) Explain design difference between low speed and high speed machine. **04**
- Q.4** (a) Explain evaluation of Direct and Quadrature axis reactance of Alternator. **07**
- (b) The field coil of a salient pole alternator are wound with a single layer winding of bare copper strip 30 mm deep with separating insulation of 0.15mm thick. Determine a suitable winding length, number of turns and thickness of conductor to develop mmf of 12000 A with a potential difference of 5 V per coil and with a loss of 1200 W/m^2 of total coil surface. The mean length of turn is 1.2 m. The resistivity of copper is 0.021 ohm/m and mm^2 . **07**

OR

- Q.4 (a)** What is dispersion coefficient? Show its effect on maximum power factor and overload capacity of three phases Induction Motor. **07**
- (b)** Draw flow chart and write algorithm steps for design of submersible motors. **07**
- Q.5 (a)** Explain factors affecting specific electric loading and specific magnetic loading of alternator. **07**
- (b)** 11kW 3 phase 6 pole 50 Hz 220V star connected induction motor has 54 slots each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine efficiency of 0.86 and a power factor of 0.85. The rotor mmf may be assumed of 85 percent of stator mmf. If current density is 5 A/mm² find area of rotor bar and area of end ring. **07**
- OR**
- Q.5 (a)** Explain hunting in Synchronous machine. **04**
- (b)** Prove that the out put of single phase machine is two third of that of a three phase machine. **06**
- (c)** Explain (1) peripheral speed (2) Run away speed. **04**
