

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – WINTER • 2014

Subject Code: 180904**Date: 27-11-0214****Subject Name: Electrical Machine Design-II****Time: 02:30 pm - 05:00 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** The following data refer to a 100 hp , 50 Hz, 8 pole 500 V , slip ring induction motor with 3 phase star connected stator winding: **14**
Turns per phase: Stator 64; Rotor 35.
Resistance per phase: Stator 0.062 Ω ; Rotor 0.019 Ω .
Reactance per phase: Stator 0.21 Ω ; Rotor 0.019 Ω .
Magnetizing current 35 A/phase.
Iron loss 1495W.
Friction and Windage loss 760 W.
Draw circle diagram and determine The line current, efficiency, power factor and slip at full load and half load conditions. Also find Maximum output and pull out torque.
- Q.2 (a)** Discuss the advantages achieved on selecting larger air gap in a three phase induction motor. **07**
- (b)** Determine the main dimensions of 20 kW, 3 phases, 400 V 50 Hz, 1450 rpm squirrel cage induction motor. Assume following: **07**
Full load efficiency: 85%.
Full load power factor: 0.89 lag.
Winding factor: 0.955.
Specific magnetic loading: 0.45 wb/m².
Specific electrical loading 28000 A/m.
Rotor peripheral speed 20 m/sec at synchronous speed.
- OR**
- (b)** An 11 kW, 3phase, 6 pole, 50 Hz, 220 V star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.85. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the bar and the end ring sections if the current density is 5 A/mm². **07**
- Q.3 (a)** Discuss how the magnetizing current can be estimated from the design data in a three phase induction motor. **07**
- (b)** Discuss the steps for rotor design of a single phase induction motor. **07**
- OR**
- Q.3 (a)** Explain the calculations for leakage reactance of single phase motors. **07**
- (b)** What is dispersion co efficient applied to induction motors? Discuss its effect on maximum power factor. **07**

- Q.4 (a)** Explain the factors to be considered while selecting number of armature slots in the design of a synchronous machine. **07**
- (b)** Determine main dimensions and turns per phase of a 2 MVA, 11 kV 50 Hz 24 pole three phase star connected alternator. Assume average gap density of 0.55 wb/m², ac = 30000, winding factor 0.955. Use L/τ ratio of 1.25. **07**
- OR**
- Q.4 (a)** Explain the design of salient pole rotor in a synchronous machine. **07**
- (b)** An alternator rated for 490 KVA, 3.3 kv, 10 poles , 3 phase , 50 Hz, Delta connected has 182 turns per phase, Determine length of air gap. **07**
- Given:
- $B_{av} = 0.54$ weber/m²
- Pole arc to pole pitch ratio = 0.66
- SCR = 1.2
- Gap contraction factor = 1.15
- Winding factor = 0.95
- Mmf for airgap is 80% of number load field mmf
- Field form factor = 0.68.
- Q.5 (a)** Discuss algorithm and prepare a flow chart for design of main dimensions of a low speed alternator. **07**
- (b)** Write short note on “Influence of short circuit ratio on performance of synchronous machine.” **07**
- OR**
- Q.5 (a)** Write short note on “damper winding in synchronous machines.” **07**
- (b)** Briefly answer following: **07**
- (1) What are the advantages of bar winding with multiturn coils?
- (2) Why the stator winding of all synchronous generators is usually star connected with neutral earthed?
- (3) What are the advantages of circular poles?
