Government Engineering College, Dahod
Electrical Engineering Department
Tutorial -1

Sub. Code: 180904 **Semester: VIII**

Sub: Electrical Machine Design-II **Last date of submission: 25/04/15**

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1) 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 =25000A/m. take the rotor peripheral speed as approximately 20 m/s at synchronous speed.

2) Determine the main dimensions, turn per phase, number of slots, conductor section and slot area of a 3-phase, 5 H.P., 400 volts, 50 Hz, 1500 rpm squirrel cage induction motor. The machine is to be started by a star-delta starter. Assume: Average flux density in the air gap = 0.5 Wb/m^2, ampere conductors per meter = 27000, efficiency = 0.8, power factor = 0.8 lagging at full load, winding factor =0.955, current density = 3.5 A/mm^2. Choose main dimensions to give Good overall design

3) Determine the main dimensions of 30 kW, 3 phases, 400 V 50 Hz, 1440 rpm squirrel cage induction motor. Assume following: Full load efficiency: 87%.; Full load power factor: 0.9 lag; Winding factor: 0.955; Specific magnetic loading: 0.5 wb/m^2.; Specific electrical loading 30000 A/m.; Rotor peripheral speed 20 m/sec at synchronous speed.

4) Determine the main dimensions of 20 kW, 3 phases, 400 V 50 Hz, 1450 rpm squirrel cage induction motor. Assume following: Full load efficiency: 85%. ; Full load power factor: 0.89 lag.; Winding factor: 0.955; Specific magnetic loading: 0.45 wb/m^2; Specific electrical loading 28000 A/m.; Rotor peripheral speed 20 m/sec at synchronous speed.

5) Find the main dimensions, no of stator turns, and number of stator slots of a 30 H.P., 440 Volt, 3 phase, 50 Hz , 960 rpm, sq. cage Induction motor using following data: Specific magnetic loading=0.45wb/m^2,Sp.ele.loading = 250 amp.condctors/cm; full load efficiency= 0.86, full load p.f. =0.87. Assume that stator winding is delta connected, for normal running.

6) 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/mm^2.

7) Find the current in the bars and end rings of a cage rotor of a 6 pole, 3 phase, induction motor having 72 stator slots with 15 conductors in each slot. if the stator current per phase is 20A and rotor slots are 55. Hence find the suitable size of the cage bars and end rings.

8) 15 kW, 400 V, 3 phase 50 Hz, 6 pole induction motor has a diameter of 0.3 m and the length of core 0.12 m. 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 0.55 m. 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.

OR

The main dimensions of a 15 kW, 400V, 6 pole, three phase,50 Hz, delta connected three phase induction motor are D = 30 cm and L = 12cm. There are 72 slots in stator each containing 20 conductors. The air gap length is 0.55 mm. The gap contraction factor is 1.2. Assume mmf required for iron parts is 35% of the air gap mmf. Take coil span of 11 slots. Determine magnetizing current per phase.

9) The following data refer to a 75 kW , 50 Hz, 8 pole 500 V , slip ring induction motor with 3 phase star connected stator winding: Turns per phase: Stator 64; Rotor 35.

Resistance per phase: Stator 0.062 Ω; Rotor 0.019 Ω.
Reactance per phase: Stator 0.21Ω; Rotor 0.019Ω.
Magnetizing current = 36 A/phase.
Iron loss = 1500W.
Friction and Windage loss = 750 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.

10) 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:

Turns per phase: Stator 64; Rotor 35.
Resistance per phase: Stator 0.062 Ω; Rotor 0.019 Ω.
Reactance per phase: Stator 0.21Ω; Rotor 0.019Ω.
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.

By
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