Total No. of Questions : 8]

SEAT No. :

PC1751

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[6353]-69

T.E. (Electrical Engineering)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

(2019 Pattern) (Semester - II) (303149)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of Calculator is allowed.*

Q1) a) Derive the equation for radial force developed in the transformer under short circuit fault conditions. Explain the options to control the radial force developed in the transformer. **[8]**

b) A 220/110, 1 kVA, 50 Hz single phase transformer has a core with uniform cross section area of 2500 mm^2, an effective core length of 0.4 m and core weight of 8kg. If the core is worked at maximum flux density of 1.2 Wb/m^2 and the corresponding magnetizing force is 200 A/m and the specific core loss is 1.0 Watt/kg. Determine i) transformer no load current when the HV is fed at 220 V and ii) the corresponding magnetizing reactance and the equivalent shunt resistance to represent the core loss. **[9]**

OR

Q2) a) State the assumptions made while deriving the equation for the leakage reactance of transformer, from the same, derive the equation for the leakage reactance of the transformer referred to the primary side. **[10]**

b) Define voltage regulation and explain the significance of voltage regulation. Why voltage regulation increases with increase of load for lagging power factor loads. **[7]**

Q3) a) Explain the factors considering while selecting the specific magnetic loading for the design of three phase induction motor. Also explain the effect of selecting B_{av} higher than the normal value on the design of three phase induction motor. **[9]**

b) Explain the various guidelines for selecting the stator slots. **[9]**

OR

P.T.O.

Q4) a) Determine the main dimensions, number of ventilating radial ducts, number of stator slots and number of turns perphase of a 3.7 kW, 400 V, 3 phase, 4 pole, 50 Hz squirrel cage induction motor to be started by a star delta starter. Workout the winding details. Assume B_{av} = 0.45 Wb/m^2, ac=23000 A/m, efficiency = 0.85 and power factor = 0.84. L/τ ratio 1.5. **[9]**

b) What are the factors those affect the size of rotating machine? Explain in detail. **[9]**

Q5) a) Explain the procedure to calculate the no load current of the three phase induction motor. **[9]**

b) Derive the equation for the end ring current. From the same how the size of end rings can be determined. **[9]**

OR

Q6) a) Give layout of a lap winding for stator of three phase induction motor stator for 24 slots, 4 poles. There are two coil sides per slot. Draw winding diagram for R-phase only. **[9]**

b) A 7.5 HP, 3 phase, 6 pole, 50 Hz, 415 V, star connected induction motor has 54 stator slots each containing 9 conductors. Calculate the values of bar and end ring current . No of rotor bars is 64 and the machine has an efficiency of 0.86 and p.f of 0.85. The rotor mmf may be assume as 85% of stator mmf, also find the bar and the end ring sections if the current density is 5 A/mm^2. **[9]**

Q7) a) Explain the procedure for the calculating the mmf for the magnetic circuit of three phase induction motor. **[8]**

b) 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 no. of stator slots is 72 with 20 conductors/slot. The stator is delta connected. Calculate the value of magnetizing current/phase if the length of air gap is 0.55 mm. The gap contraction factor is 1.2. Assume mmf required for the iron parts to be 35% of the air gap mmf. Assume winding factor 0.95 **[9]**

OR

Q8) a) Write step by step procedure to calculate the loss component of no load current of three phase induction motor. **[8]**

b) Explain in detail the various losses produced in induction motor. **[9]**

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