Total No. of Questions : 8]

SEAT No. :

PD4272

[Total No. of Pages : 3

[6403]-69

T.E. (Electrical)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

(2019 Pattern) (Semester - VI) (303149)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the procedure to estimate the no load current of a three phase transformer. **[6]**

b) Explain the mechanical forces developed under short circuit condition in a transformer. **[6]**

c) A 600 KVA, 6600/400 V, 50Hz, three phase core type transformer has: Width of LV winding = 3 cm , Width of HV winding = 3 cm , width of duct between LV and HV =2 cm, height of HV and LV windings = 40cm, length of mean turns = 1.5 m, HV winding turns = 220, $\mu o = 4\pi \times 10^{-7}$ H/m. Estimate the leakage reactance of the transformer referred to the HV side. **[6]**

OR

Q2) a) Explain the procedure for the calculation of core losses in the three phase transformer. **[6]**

b) Draw the generalized flow chart of computer aided design of a transformer **[6]**

c) A 6600 V, 60 Hz, single phase transformer has a core of sheet steel. The net cross sectional area is $22.6 \times 10^{-3} m^2$. The mean length is 2.23m. There are four lap joints and each joint takes one fourth times as much reactive mmf as it is required per meter of core. Flux density is 1.1 Wb/m^2. Find the number of turns on the 6600 V winding and the no load current. Assume the amplitude factor as 1.52, mmf/m = 232 A /m, specific loss = 1.76 W/ kg and density = 7.5×10^3 Kg/m^3. **[6]**

P.T.O.

Q3) a) Find the main dimensions of a three phase, 10 KW, 400 V, 50 Hz, 4 pole squirrel cage induction motor. Assume the following data : efficiency = 0.85 power factor = 0.86, specific magnetic loading = 0.4 wb/m^2, specific electric loading = 20,000 A/m , winding factor = 0.955 and rotor peripheral speed = 20 m/sec. **[10]**

b) Explain the constructional features of a three phase induction motor. **[7]**

OR

Q4) a) Determine the main dimensions of a 250 H.P three phase, 50 Hz, 400 V, 1410 rpm ,4 pole, slip ring Induction motor. Assume the following data: efficiency = 0.9, power factor = 0.9, specific magnetic loading = 0.5 wb/m^2, specific electric loading = 30,000 A/m , winding factor = 0.955, ratio of core length to core pitch = 1.2. The motor is delta connected. **[10]**

b) Derive the output equation of a three phase induction motor and also state the significance of the terms involved. **[7]**

Q5) a) Derive the expression for end ring current in induction motor. **[10]**

b) Discuss the various constraints in the selection of suitable combination of stator and rotor slots. **[8]**

OR

Q6) a) A 11 KW, three phase, 6 pole, 220 V, star connected induction motor has 54 stator slots , each having 9 conductors . Calculate the values of bar and end ring current and also the bar and end ring sections if the number of rotor bars is 64, efficiency = 0.86, power factor = 0.85 , rotor mmf = 85% of stator mmf, current density = 5 A/mm^2. **[10]**

b) Discuss the various factors which affect the choice of length of air gap for a three phase induction motor. Why generally the air gap should be as small as possible. **[8]**

Q7) a) With the help of neat sketches explain the different types of leakage fluxes in an induction motor. (any two) **[5]**

b) A 75 KW, 3300 V,50 Hz, 8 pole ,three phase ,star connected induction motor has magnetizing current which is equal to 35% of full load current. Calculate the value of stator turn sper phase if the mmf required for flux density at 60º from pole axis 500 A , winding factor = 0.95 , efficiency = 0.94, power factor = 0.86. **[5]**

c) Explain the procedure to find out MMF required for air gap, stator teeth, stator core of an induction motor. **[7]**

OR

Q8) a) Draw the generalized flow chart of computer aided design of three phase induction motor. **[5]**

b) State and explain the various losses that occur in a three phase induction motor. **[5]**

c) Explain the procedure to calculate the magnetizing current of an induction motor. **[7]**

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