Total No. of Questions : 8]

SEAT No. :

PB3809

[Total No. of Pages : 2

[6262]-70

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 Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
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) Derive the equation for magnetizing current in terms of magnetizing volt-amperes, and no load current for three phase transformers. **[8]**

b) Explain the significance voltage regulation in transformers. By making changes in the design of transformers, explain how it can be controlled to standard values of voltage regulation. **[9]**

OR

Q2) a) With the help of neat figures, Explain the mechanical forces developed by leakage fluxes and their effect in the transformers. Also explain how to limit these forces developed in the design stage of transformer. **[8]**

b) A 500 kVA, 11000/433 V, 50 Hz, three phase delta-star, core type transformer has 500 turns on h.v. winding. The height of the winding is 0.6 m and the length of mean turn 1.3 m. calculate the instantaneous radial force on the h.v. winding if the short circuit occurs at the terminals of l.v. winding with h.v. energized. The leakage impedance id 5 %. The doubling effect multiplier as 1.8. Also calculate force at full load. **[9]**

Q3) a) Derive the output equation for AC machines. From the same kVA input equation for the three phase induction motor. **[9]**

b) Determine the main dimensions of three phase, 70 h.p., 415 V, star connected, 6- pole, 50- Hz induction motor for which the specific electric and specific magnetic loadings are 32000 A/m and 0.51 wb/m^2 respectively. The motor has power factor of 0.91 and efficiency of 90 per cent. Assume pole pitch equal to core length. **[9]**

OR

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Q4) a) Explain the factors considered while selecting the values of specific electric loading in the design of three phase induction motor. **[9]**

b) Draw the winding diagram for any one phase for a 4-pole, 24 slots, three phase mush connected stator of induction motor. **[9]**

Q5) a) Explain the factors affecting length of air gap of three phase induction motor. **[9]**

b) Explain the rules that are considered for selecting the rotor slots. **[5]**

c) List the methods used to reduce the harmonic torques produced in three phase induction motor. **[4]**

OR

Q6) a) Derive the equation for the end-ring current with usual symbols and their units. **[9]**

b) A 10 h.p., three phase, 4-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 currents. The number of rotor bars is 64. The machine efficiency 85 % and power factor is 0.85. Assume the rotor mmf as 85% of stator mmf. If the current density is 5 A/mm^2, determine the bar and end-ring size. **[9]**

Q7) a) Explain the effect of length of air-gap on magnetizing current and no-load current of three phase induction motor. What are the components of total mmf of magnetizing circuit of three phase induction motor? **[8]**

b) Discuss the various losses taking place in various parts of the three phase induction motor. **[9]**

OR

Q8) a) With suitable sketches, explain the various leakage fluxes produced in the three phase induction motor. **[8]**

b) Explain the advantages of digital computers in the design of electrical machines. Plot Explain the flowchart for calculating the main dimensions of three phase induction motor. **[9]**