SEAT No. :

P751

[5870] – 1055

T.E. (Electrical)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

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

Time: 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8*
2) *Figures to the right side indicate full marks.*
3) *Neat diagram must be drawn whenever necessary.*
4) *Assume suitable data, if necessary.*

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

b) Calculate the percentage regulation at full load 0.8pf lag for a 300kVA, 6600/440v, delta-star, 3 phase, $50H_z$, core type transformer having cylindrical coils of equal length with the following data. Height of coils=4.7 cm, thickness of HV coil=1.6 cm, thickness of LV coil=2.5 cm, insulation between LV&HV coils=1.4 cm, Mean diameter of the coils=27 cm, volt/ turns=7.9 V, full load copper loss=3.75Kw **[8]**

c) State & explain the measures to overcome the mechanical forces under short circuit conditions **[4]**

OR

Q2) a) Discuss mechanical forces developed under short circuit condition in a transformer. **[6]**

b) Draw and explain generalized flow chart for design of transformer. **[6]**

c) State the assumptions made while calculating leakage reactance of transformer. **[6]**

Q3) a) Discuss the various factors to be considered for selection specific magnetic loading (B_{av}) and specific electric loading (ac). **[10]**

b) What are the various types of AC windings for three phase induction motor? Explain in brief any two. **[7]**

OR

Q4) a) Derive the output equation of a 3 phase induction motor in terms of its specific loadings. Also indicate the significance of terms involved. **[7]**

b) Estimate the main dimensions for 3φ, 50Hz, 10kW, 400V, 4 pole squirrel cage induction motor. Assume full load efficiency of 0.85, full load power factor of 0.9 and winding factor 0.96. The specific magnetic loading is 0.6 wb/m² and the specific electric loading=22000A/m. Take rotor peripheral speed as 25 m/s at synchronous speed. **[10]**

Q5) a) Explain the factors should be considered when estimating the length of air gap of three phase induction motor. Why the air gaps should be as Small as possible? **[10]**

b) Discuss the design of wound rotor w.r.t the following **[8]**

    i) no. of rotor slots

    ii) no.of rotor turns

    iii) area of rotor conductors

    iv) rotor windings.

OR

Q6) a) Discuss the various factors which decide selection of number of stator slots in case of 3 phase induction motor **[8]**

b) A 15KW, 3ϕ, 50Hz, 400V, 4 pole, star connected squirrel cage induction motor has 60 slots, each containing 7 conductors. The rotor slot's are 50. Assume full load efficiency as 0.85 full load Power factor as 0.9 and rotor mmf is 80% of stator mmf. Calculate the value of bar and end ring current. Also find the area of each bar and each end ring, if current density is 5A/mm^2 **[10]**

Q7) a) Derive the equation for No Load Current of 3ϕ induction motor. **[10]**

b) Draw and explain generalized flow chart for design of three phase induction motor. **[7]**

OR

Q8) a) State and explain with neat sketches different types of leakage fluxes in an induction motor and estimate slot leakage reactance in an induction motor. **[10]**

b) Explain the effect of ducts on the calculation of magnetizing current of 3ϕ induction motor. **[7]**

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