Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VIII • EXAMINATION – SUMMER 2013

Subject Code: X80902 **Date: 13-05-2013**

Subject Name: Electrical Machine Design – I & II

Time: 10.30 pm - 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Derive the output power equation of a DC machine for designing main dimension of it. [7]

Q.1 (b) Find the main dimensions of a 50 kW, 4 pole, 250 V, 600 rpm, DC shunt generator from the given data: Ratio of pole arc to pole pitch = 0.67, B_{avg} = 0.6 Wb/m^2
ac= 3000 amp-cond/m, F.L. Voltage drop = 8 Volt, Shunt field current = 2.5 amp
Square pole shape. [7]

Q.2 (a) Explain the steps for designing number of armature conductors and check the number of conductors after design in case of DC machine. [7]

Q.2 (b) Explain the Design procedure for shunt field winding of DC machine. [7]

OR

Q.2 (b) Derive and conclude the Ampere Turns equation for different parts of DC machine. [7]

Q.3 (a) Determine the dimensions of the core and yoke for a 100KVA, 50Hz, 1-ph, core type transformer. A square core is used with distance between adjacent limbs equal to 1.6 times the width of laminations. Assume voltage per turn to be 14 volts, maximum flux density 1.1 Wb/m^2, window space factor 0.32 and current density 3A/mm^2. Take stacking factor = 0.9, flux density in yoke to be 80% of flux density in core. [7]

Q.3 (b) How can the HV and LV winding of transformer be designed? Explain in detail. [7]

OR

Q.3 (a) Explain the design procedure for cooling system of the transformer. [7]

Q.3 (b) Write a note on dry type transformer and explain the manufacturing aspects of it. [7]

Q.4 (a) Explain the points to be considered while selecting the number of stator slots in 3-ph induction motor. [7]

Q.4 (b) Explain the steps to design rotor of a single phase induction motor. [7]

OR

Q.4 (a) Explain the points to be considered while selecting the number of armature slots in case of synchronous machine. [7]

Q.4 (b) Estimate the kVA rating of a 3-phase 50 Hz high speed 2 pole turbo alternator having uniformly distributed winding from the following data: specific magnetic loading = 0.5 Wb/m^2, specific electic loading = 530 amp.conductors/cm, peripheral speed limit = 140 m/sec, Core length = 1.6. [7]

Q.5 (a) Write a short note on Dispersion coefficient for Induction Motor. [7]

Q.5 (b) What factors are influenced because of the specific electric loading in case of synchronous machine? [7]

OR

Q.5 (a) What factors are influenced because of the specific magnetic loading in case of synchronous machine? [7]

Q.5 (b) Find the main dimensions of a 3-ph alternator from the given data: B_{av} = 0.62 Wb/m^2, ac = 40000 AC/m, ν = 79 mps, MVA rating = 12 MVA, voltage = 13750, f = 50 Hz, N_s = 1500 rpm and connection in stator – star. [7]

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