

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2160911

Date: 26/10/2016

Subject Name: Computer Aided Analysis and Design for Electrical Engg.

Time: 02:30 PM to 05:00 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) Describe standard ratings of electrical machines and ventilation scheme in static machine. **07**

(b) Explain various objective parameters for optimization in an electrical machine and selection of optimal design. **07**

Q.2 (a) Explain FEM technique and elemental coefficient matrix. **07**

(b) Write the Flowchart for computer-aided optimal design of DC machine. **07**

OR

(b) Explain Global coefficient matrix, skin and proximity effect in conductors. **07**

Q.3 (a) Describe the design procedure for inductive chokes **07**

(b) Write Flowchart and program for No. of turns, size of Copper and final dimensions of HV winding of 1 phase shell type power transformer.(KVA= 125, HV= 3300, LV= 440, f = 50, pf = 0.85, axspc = 20.875, ala = 14.5688, T1= 270, bw= 120, Lmt2= 1.367, I1 = 37.88 Input data, tst1= 1.6 Assumptions) **07**

OR

Q.3 (a) Design a suitable 8 section starter for a 14.92 kW, 250V,1000rpm DC shunt motor from the following data: **07**

Maximum starting torque= Full load torque

Armature circuit resistance=0.4 ohm

Full load efficiency=0.85.

(b) Write Flowchart and program for Windings copper Losses, total losses, Efficiency, Reactances and % Regulation of 1 phase shell type power transformer. (ac12 = 0.012 Specification, pcu1= 709.4, pcu2 = 767.9, KVA = 125, Pi = 646.1, pf = 0.85, Lmt1= 1.3673, Lmt2 = 1.3673, I1 = 37.9, T1 = 270, f = 50, Et = 12.2984, rsp2 = 81, axL1 = 51, axL2 = 41 Input Data) **07**

Q.4 (a) Calculate the dimensions of Magnetic frame consisting of Core, window and Yoke. Calculate Flux densities in those parts and Iron losses of a 800 KVA, 6600/ 440 V, 50 Hz, 3 Phase, Delta/Star, Core Type, ON cooled Power Transformer. limit temp-rise to 50 deg-C.(Data - k = 0.6, ki = 0.92, K = 0.6, Bm = 1.5, cdav = 2.6, L/ D= 2.8, WpKgC = 1.6, WpKgY = 1.009). **07**

(b) Write Flowchart and program for design of Shunt field and series field windings of DC machine.(ti = 10, dcu = 1.6, cdse = 2.2 Assumptions V = 600, P = 6, Wp = 219, Lp = 285, df = 47.1, ATO = 6635, Hfc =171. 86, ATf = 7806, Ia = 836.33 Input Data) **07**

OR

- Q.4 (a)** Calculate for design of Commutator and brushes of 500KW, 600V lap wound DC machine.(Data - $D_{cbD} = 0.66$, $D = 800$, $N = 700$, $Z = 672$, $P = 6$, $I_a = 836.33$, $c_{db} = 6 \text{ A/cm}^2$, $T_b = 10$, $W_b = 20$, $H_b = 32$, $V_b = 2\text{V}$, Brush Friction Coefft = 0.2 and Brush pressure on Commutator = 13000 N/m^2) **07**
- (b)** Write Flowchart and program for design of Commutator and brushes of DC machine.($D_{cbD} = 0.66$, $D = 800$, $N = 700$, $Z = 672$, $P = 6$, $I_a = 836.33$ Input data $c_{db} = 6$, $T_b = 10$, $W_b = 20$, $H_b = 32$, $V_b = 2$, Assumptions) **07**
- Q.5 (a)** Calculate Amp-Turns and No load current of a 800 KVA, 6600/ 440 V, 50 Hz, 3 Phase, Delta/Star, Core Type, ON cooled Power Transformer. limit temp-rise to 50 deg-C.(Data - $B_m = 1.5$, $a_{tC} = 150$, $B_y = 1.3043$, $a_{tY} = 109.6$, $L = 0.59$, $W = 1.1$, $E_t = 10.57$, $P_i = 1.4725$) **07**
- (b)** Calculate No. of turns, size of Copper and final dimensions of LV winding of a 800 KVA, 6600/ 440 V, 50 Hz, 3 Phase, Delta/Star, Core Type, ON cooled Power Transformer. limit temp-rise to 50 deg-C.(Data - $T_2 = 24$, $L = 0.59$, $I_2 = 1049.7$, $d = 0.23$, $T_{2r} = 2$, $stP = 12$, $N_{stA} = 3$, $stT = 3$, Oil duct between Core and LV coil 1 = 5mm, Ins. cylinder between core and LV coil 1 = 3 mm and Oil duct between Insulating Cylinder and LV coil2 = 5mm) **07**

OR

- Q.5 (a)** Calculate Armature main dimensions and flux/pole of 500KW, 600V lap wound DC machine.(Data - No. of ventilating ducts (n_v) = 4, Width of ventilating ducts (b_v) = 10mm, Pole arc /Pole pitch (P_{AbPP}) = 0.7, Pole Arc = Arme Core Length (L), Slots/pole (SpP) = 14, Iron factor (k_i) = 0.9, Volage drop on FL = 3% Value of Specific magnetic loading (B_{av}) = 0.66 T and Specific electric loading (q) = 36500 ac/m, $P = 6$, $N = 700$) **07**
- (b)** Write Flowchart and program for design of Inter-pole/Compensating winding and Overall performance of DC machine.($L = 300$, $Z_s = 8$, $pitC = 4.9368$, $T_b = 10$, $D = 800$, $D_c = 528$, $L_g = 4.8439$, $H_p = 254$, $h_{ca} = 15$, $H_w = 3$, $HL = 1$, $InsH_s = 3.2$, $w_{ca} = 1.9$, $W_s = 11$, $L_{fr} = 621.711$, $I_a = 836.33$, $AT_f = 7806$, $P = 6$, $KW = 500$, $P_{cua} = 10858$, $P_{se} = 565.1$, $BCL = 1673$, $P_{sh} = 1468$, $P_i = 5408$, $BFL = 1449$, $W_c = 443.5$, $W_t = 99.2$, $W_{cua} = 154$, $W_{ccom} = 1345$, $W_{csh} = 303.6$, $W_{cse} = 49.5$, $W_{mp} = 123.6$, $W_{yoke} = 138.3$ Input data, $cdip1 = 2.3$ Assumption) **07**
