

Student Exam No:- _____

GANPAT UNIVERSITY
B.TECH SEM-V (ELECTRICAL)
REGULAR EXAMINATION DEC 2013
2EE505:-ELEMENTS OF ELECTRICAL DESIGN

Time: 3 Hours

Total Marks:-70

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

SECTION-I

- Que-1 (A) Derive the steps for calculate the starter resistance for D.C shunt motor. [06]
(B) Find the section resistance of 6 stud field regulator for generator to give limit of 250 and 275 voltages in equal steps. The Shunt field resistance is 500 ohm. The magnetizing curve is given by following data: [06]

Field Current, A	0.4	0.425	0.45	0.48	0.51	0.55
EMF, Volts	250	255	260	265	270	275

- OR
Que-1 (A) Discuss design procedure of small single phase transformer. [06]
(B) A single phase transformer is required to be designed to give an output of 4 A at 24 V, from 230 V, 50 Hz a.c. supply. You may assume the efficiency of transformer to be 94%, turns/volt = 4.6, $B_m = 1 \text{ wb/m}^2$. Determine the dimension of central limb, no. of turns and currents in both windings. [06]

- Que-2 (A) Give the design steps for single phase variable chock coil. [07]
(B) Determine the critical value of the flux density and the mmf requirement in a variable airgap choke coil to operate at 240 volts, 50hz. Ac supply and to carry a rated current of 10 amps. The length of the airgap varying from 0 to 50mm. [04]

- OR
Que-2 (A) What are the functions of welding transformer? Give the steps for designing reactor for welding transformer. [06]
(B) A bungalow has following load connected in it. [05]
12 tube lights with conventional chokes, 7 fans, a 165 liter refrigerator, a T.V. set, A computer, 2 A.C.s of 1 ton each, 1 h.p. water pump. Average daily consumption of tube lights are for 4 hours, fans 6 hours, T.V. 5 hours, A.C.s 6 hours, pump 2 hours, computer 8 hours and refrigerator 24 hours. Estimate the monthly electricity bill of the bungalow if energy cost is Rs. 5 per unit.

- Que-3 Attempt Following Questions [12]
(A) Compare the different systems of wiring used in domestic installation.
(B) Explain the importance of air gap length for variable choke coil. What will be the value of inductance and current at zero air gap length?
(C) What are the factors that should be considered while selecting the types of wiring system?

SECTION-II

- Que-4 (A) What is Carter's coefficient? How does it help in estimation of mmf in case of a slotted armature? What are the expressions to be used for estimation? [06]
- (B) A salient pole dc machine has a core length including four ducts of 10 mm width 0.32m, Pole arc 0.19 m, slot pitch 65.4 mm, slot opening 5 mm, air gap length 5 mm, and a flux per pole 0.052 Wb. Assume Carter's coefficient of 0.18 and 0.28 for opening/gap ratio of 1 and 2 respectively, calculate the mmf required for the air gap. [06]

OR

- Que-4 (A) Define real and apparent flux densities in the tooth of d.c. machine armature and give the difference between them. Also derive the relation between them. [06]
- (B) An electromagnet coil has an outer diameter of 0.6 m and an internal diameter of 0.3 m. its height is 0.25 m. the outer cylindrical surface of the coil can dissipate 1200 watt/ m². Calculate the total mmf of the coil if voltage applied across the coil is 100 Volt. Assume space factor =0.6, Resistivity = 0.02 ohm-m/mm². [06]

- Que- 5 (A) Give complete procedural steps for designing Horse shoe type of electromagnet for a given supply voltage, required force and stroke. [07]
- (B) Calculate the specimen iron loss in a specimen of alloy steel for a maximum flux density on 4.2 wb/m² and a frequency of 50Hz, using 0.45 mm thick sheets. The resistivity of alloy steel is 0.3×10^{-6} ohm-m. The density is 7.8×10^3 kg/m³. Hysteresis loss in each cycle is 400J/m³. [04]

OR

- Que- 5 (A) Calculate the front pitch, back pitch and winding pitch for a simplex lap wound 18 slots, 6 pole d.c armature. Make the winding table and draw the winding diagram in developed form. Also draw the sequence diagram to show the position of brushes. Assume 2 coil sides/slot. [07]
- (B) Write short answer (1) difference between lap and wave winding (2) dummy coil in context of dc winding (3) equalizer connection in context of dc winding. [04]

- Que-6 **Attempt Following Questions** [12]
- (A) What is fractional slot winding? Discuss its advantages.
- (B) Define and clearly explain the terms:
(1) Gap contraction factor for slots and ducts
(2) Stacking factor
(3) Field form Factor
- (C) What is an electromagnet? Differentiate types of Electromagnets and Mention important use of Electromagnet.

END OF PAPER

Best of Luck