Student Exam No.:_____

GANPAT UNIVERSITY
B.TECH. SEM. V (ELECTRICAL)
REGULAR EXAMINATION NOV-DEC-2014
2EE 505: 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

Q.1 **(A)** Derive the steps for calculate the starter resistance for DC series motor. **06**

(B) Find the section resistances of a 6 stud field regulator for a DC generator to give the emf limits of 500 to 550 volts in equal steps. The shunt field resistance is 1000 ohms. The magnetization curve is given by the following data: **06**

Field Current, A	0.41	0.43	0.45	0.48	0.51	0.55
EMF, Volts	500	510	520	530	540	550

OR

Q.1 **(A)** Discuss the design steps for Ballast or chokes. **06**

(B) A single phase transformer is required to be designed to give an output of 5 A at 30 V from 230 V, 50 Hz supply. Assume that the efficiency of transformer is 95%. Turns/volt= 4.6, B_m= 1 Wb-m^2. Determine the dimension of central limb, no. of turns and current in both the windings. **06**

Q.2 **(A)** Give complete procedural steps for designing three phase variable choke coil for given supply voltage. **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, 50 Hz. AC supply and to carry a rated current of 10 amps. The length of the airgap varying from 0 to 3 cm. **04**

OR

Q.2 **(A)** Explain the design procedure of a Welding transformer. **06**

(B) The domestic load in residential building comprises of the following 6 lamps of 55W each, 4 fans of 80W each, 1 refrigerator of 300W, 1 heater of 1000W, television of 120W. Calculate (a) the total current taken from the supply at a voltage of 230 volts (b) the energy consumed in a day, if on average only a quarter of the above load persists all the time. **05**

Q.3 **Attempt the following:** **12**

(1) Explain the function and necessity of field regulator in case of DC shunt generator.

(2) Compare the different wiring systems used in domestic installation.

(3) Explain the function and necessity of field regulator in DC shunt generators.

SECTION-II

Q.4 (A) Derive an expression of reluctance of airgap in DC machine. Explain clearly the effects of (a) slotting and (b) ventilating ducts. **07**

(B) Determine the airgap length of a DC machine from the following data: **05**
Gross core length=0.10m, No. of ducts=1, Width of duct=10 mm, Slot pitch=24 mm, Slot width=12 mm, Carter's Coefficient for slots and ducts=0.3, Gap flux density=0.65 T, Field mmf per pole=3800 A, mmf required for iron parts=600 A.

OR

Q.4 (A) What is Carter's fringing curves? Discuss its application. **06**

(B) An electromagnet coil has inner diameter 30 cms, outer diameter 40 cms and coil length 20 cms. The outer surface dissipate 1000 W/m^2. Calculate total mmf of coil if voltage applied is 50 volt. Take space factor= 0.6, resistivity of coil = 0.02 Ω/m/mm^2. **06**

Q.5 (A) Give the steps for designing plunger type of electromagnet for a given value of exciting voltage, required force and stroke. **07**

(B) A coil is wound on a former has outside diameter of 80 mm and inside diameter of 30 mm. The height of the coil is 100 mm. Calculate (i) the winding depth, total winding area and length of mean turn. (ii) space factor and number of turns when conductors bed. **04**

OR

Q.5 (A) Find the front pitch, back pitch, winding pitch and commutator pitch for a simplex wave wound 13 slots, 4-pole d.c armature with 13 commutator segments. Draw winding diagram in developed form. Assume no. of coil side/slot = 2. **07**

(B) Write a short note on types of DC armature winding. **04**

Q.6 **Attempt the following:** **12**

(1) Define space factor applied to magnetic coil design and how it can be calculated in bedded and unbedded conductors.

(2) Compare simplex Lap and Wave winding.

(3) Define following terms:
(1) Field form factor
(2) Stacking factor
(3) Back pitch
(4) Front pitch

END OF PAPER

Best of Luck

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