Student Exam No._____

GANPAT UNIVERSITY

B. TECH. SEMESTER: V (ELECTRICAL)

REGULAR EXAMINATION NOV – DEC 2015

2EE 505: ELEMENTS OF ELECTRICAL DESIGN

Time: 3 Hours **Total Marks: 70**

Instruction:
1. This question paper has two sections. Attempt each section in separate answer book.
2. Figures to the right indicates full marks.
3. Be precise and to the point in answering the descriptive questions.

Section - I

Que. – 1 **(A)** Derive the expression for total specific slot permeance for parallel sided slots. **06**

(B) Calculate the apparent flux density at a section of teeth of an armature of a D.C. machine from the following data at that section. **06**
Slot pitch = 20 mm
Slot width = tooth width = 10 mm
Length of armature core including 4 ducts each 8 mm = 35 cm
Stacking factor = 0.9
Real flux density at that section = 2.2 T for which the mmf is 65000 A/m.

OR

Que. – 1 **(A)** Derive an expression of reluctance of air gap in D.C. machine. Explain clearly the effects of (a) slotting and (b) ventilating ducts. **06**

(B) Calculate the mmf required for the air gap of a machine having core length = 0.32 m including 4 ducts of 100 mm each, pole arc = 0.19 m; slot pitch = 5 mm; air gap length = 5 mm; flux per pole = 52 mWb. Given Carter's coefficient is 0.18 for opening/gap = 1 and is 0.28 for opening/gap = 2. **06**

Que. – 2 **(A)** Name the various types of lifting magnets commonly used in practice & give the comparison between them. **06**

(B) A plunger type magnet has to lift a mass of 200 kg from a distance of 5 mm. The area of pole face is 5×10^{-3} m^2. Find the current required if the exciting coil has 3000 turns. Assume that the mmf required for mmf parts = 10% of air gap mmf. Neglect fringing. **05**

OR

Que. – 2 **(A)** Draw the winding diagram in developed form for a simplex lap wound 24 slots, 4 pole D.C. armature with 24 commutator segments. Also draw the sequence diagram to show the position of brushes. **07**

(B) Define:(i)coil span (ii) back pitch (iii)front pitch (iv)integral slot winding. **04**

Que. – 3 **Attempt the following:** **12**

(A) Derive the equation of magnetic force or pull between two poles and also discuss index number of electromagnet.

(B) Name the main components of armature leakage flux & also explain any four in detail.

(C) Compare simplex lap and wave winding.

Section – II

Que. – 4 (A) A 250 V, D.C. shunt motor with a normal speed of 600 rpm, takes shunt field current of 2 A when running light. If the speed of motor is to be raised to 1200 rpm in the increments of 150 rpm, find the resistance sections of a shunt field regulator. The O.C.C. of a motor at 600 rpm is as under. **06**

Field Current (A)	0.5	1.0	1.5	2.0	2.5
EMF (V)	80	150	210	250	275

(B) Explain the function and necessity of field regulator in case of D.C. shunt generator. **06**

OR

Que. – 4 (A) Derive the steps for calculate the starter resistance for D.C shunt motor. **06**

(B) Find the resistance of each section of a rotor resistance starter of a slip ring induction motor having a rotor resistance of 0.02 Ω per phase and a full load slip of 3%. Use 9 studs. Assume maximum starting current=Full load current. Also determine the slip at various studs. **06**

Que. – 5 (A) Discuss the design steps for Ballast or chokes. **06**

(B) Design a single phase small transformer having an output of 3 A at 12 V. The primary is connected to 230 V, 50 Hz A.C. supply. Take T_e=9. **05**

OR

Que. – 5 (A) What are the requirements for designing the welding transformer? Explain V-I characteristics of a welding transformer. **06**

(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. **05**

Que. – 6 Attempt the following: **12**

(A) What is electric load? By giving examples classify different types of load.

(B) Describe the different systems of wiring used for domestic installations.

(C) A building is being supplied with power at a 230 V. The load consists of 200 fluorescent tubes of 40 W each and 60 fans of 70 W each. Find (i) the total load in kW and (ii) the current taken by the load.

END OF PAPER