Student Exam No:-_____

GANPAT UNIVERSITY
B. TECH SEM-VI (ELECTRICAL)
REGULAR EXAMINATION APRIL-JUNE-2017
2EE601: - ELEMENTS OF ELECTRICAL DESIGN

Time: 3 Hours **Total Marks: -60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.
(4) Make suitable assumptions wherever necessary.

SECTION-I

Que-1 (A) Discuss design procedure of single phase small transformer with necessary equations. **[05]**

(B) An E-I pair of laminations is used to construct a small single phase transformer with the following standard dimensions. A=20 mm,B=60 mm,C=50 mm,D=E=10 mm, the lamination thickness is 0.33 mm. If the transformer is to be operated at 230 volts,50 hertz, single phase ac supply with the maximum flux density 1.0 Wb//m^2. Calculate the number of primary winding turns if the gross area of the central limb is 400 mm^2. Assume stacking factor 0.95 **[05]**

OR

Que-1 (A) Show that section resistances of three phase slip ring induction motor starter in geometric progression. **[04]**

(B) Design a suitable 8 section starter for a 15 kW, 220 volts, 1000 rpm d.c. shunt motor. Given: Max torque = Full load torque. Armature resistance 0.45 ohm. Efficiency = 86%. Also determine the speeds at which notching takes place. **[06]**

Que- 2 (A) Design a 10KVA, 230/50 V, 50Hz single phase arc welding transformer.[Assume K=0.6, B_m=1.3T, Ki=0.9, δ=2.5 A/mm^2, Kw =0.4, H_w/W_w =3, δ_p =2.5 A/mm^2, δ_s =2.7 A/mm^2] **[05]**

(B) Draw the winding diagram in developed from for simplex lap wound 24 slot, 4 pole DC machine with 24 commutated segments. **[05]**

OR

Que- 2 (A) Explain importance of field regulator in case of d.c. shunt motor and generator. **[04]**

(B) Estimate the number of resistance sections and the resistance of each section of a starter for a 7.46 KW, 440 V, d.c. series motor from the following data. **[06]**
Starting current varies from 1.5 to 2 times full load current, Full load efficiency = 80 %, Motor circuit resistance = 1.6 ohm, Assume flux increases by 10 % as the current rises from 1 to 1.5 times the rated full load current.

Que-3 **Attempt the following questions.**

(A) Find the section resistance of a 6 stud field regulator for a d.c. generator to give the emf limits of 500 to 550 volts in equal steps. The shunt field resistance is 1000 ohm. The magnetization curve is given by the following data. **[04]**

Field current, A	0.41	0.43	0.45	0.48	0.51	0.55
Emf, V	500	510	520	530	540	550

(B) What is choke coil ?. Explain V-I characteristic of a welding transformer. **[04]**

(C) Explain the significance of equalizer connection and dummy coils in armature winding **[02]**

SECTION-II

Que-4 (A) Define real and apparent flux densities in the tooth of a d.c. machine armature. Explain difference between them and also derive relation between them. **[05]**

(B) Determine the air gap length of a d.c. machine from the following data: Gross core length=0.10 m, Number of ducts=1, Width of duct=10 mm, Slot pitch=24 mm, Slot width=12 mm, Carter's coefficient foe slots and ducts=0.3, Gap flux density at pole center=0.65 T, Field mmf per pole= 3800 AT, Mmf required for iron parts of magnetic circuit=600 AT. **[05]**

OR

Que-4 (A) Derive the specific slot permeance of parallel side slot with diagram. **[05]**

(B) Define and clearly explain the terms w.r.t. magnetic circuit: (i) Gap contraction factor for slots and ducts (ii) Stacking factor (iii) Field form factor (iv)Carter's gap coefficient (v) leakage coefficient. **[05]**

Que- 5 (A) What is Index number of electromagnets? Explain four basic equations used in flat faced armature type circular magnet design. **[05]**

(B) Calculate the number of turns and area of pole face of electromagnet to lift a mass of 250kg from a distance of 10 mm. Assume flux density in air gap as 1.2 tesla. The mmf required for the iron parts may be assumed as 20% of air gap mmf and the current in the exciting coil should not exceed 5 amperes. **[05]**

OR

Que- 5 (A) Give complete procedural steps for designing Horse shoe type of electromagnet for a given supply voltage, required force and stroke. **[05]**

(B) A single room of size 4 m x 3m. the room is to be provided with lamp, fan, tube light and one 5 A 3-pin socket outlet. Each of the points is controlled with their respective switches installed in one switch board. Assume PVC wiring system. No main switch is to be provided as the entry of the sub circuit is from the nearby room. Answer the following question.(i) Mark the suitable location of the electrical points in a room and draw the installation plan (ii) Draw wiring and schematic diagram (iii) Calculate the length of phase, neutral and earth wire required. **[05]**

Que-6 **Attempt the following questions.**

(A) What is an electromagnet? Mention some of the important uses of electromagnets. **[02]**

(B) Derive the equation of magnetic pull or force applied to electromagnet. **[04]**

(C) Explain general rules for Internal wiring system. **[04]**

END OF PAPER