GUJARAT TECHNOLOGICAL UNIVERSITY
BE- Vth SEMESTER–EXAMINATION – MAY/JUNE - 2012
Subject code: 150904                        Date: 05/06/2012
Subject Name: Elements of Electrical Design
Time: 02:30 pm – 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) Give comparison of simplex lap and simplex wave winding. 07
      (b) Find the front pitch; back pitch and winding pitch also draw the
      winding table for the following simplex lap windings.
      (1) 18 slots, 6 poles, 2 coil side/slot
      (2) 24 slots, 4 poles, 2 coil side/slot.

Q.2 (a) A 250 V, 37KW, dc shunt motor has to exert a maximum torque of
        150% of full load torque during the starting period. The resistance of
        armature circuit is 0.2 $\Omega$ and full load efficiency is 84%. The no. of
        studs is 8. Determine:
        (1) The upper and lower limit of current during starting
        (2) The resistances of each section.
      (b) Explain with neat sketch power and control circuit of Direct On Line
      Starter. 07

OR

(b) Give design steps for small 1- $\Phi$ transformer. 07

Q.3 (a) Explain the following terms:
        (1) Field form factor
        (2) Carter’s coefficient
        (3) Stacking factor
        (4) Gap contraction factor
      (b) Determine the air gap length of a dc machine from the following
      particulars: Gross length of core=0.12 m, no. of ducts=1 and 10 mm
      wide, slot pitch==25 mm, slot width = 10 mm, Carter’s coefficient for
      slots and ducts =0.32, gap density at pole centre=0.7 wb/m$^2$, field mmf
      per pole =3900A, mmf required for iron parts of magnetic circuit =800A

OR

Q.3 (a) Name various types of lifting electromagnets commonly used in
       practice and give comparison between them.
      (b) Prove that the maximum mmf that can be produced by an exciting coil,
       with given overall dimensions, temperature rise, cooling coefficient and
       space factor is independent of the exciting voltage.

Q.4 (a) Which are the types of wiring system? Explain any three of them in
       brief.
(b) A small office of size 6 m X 6 m is required to be provided with electrical connections in PVC wiring system suitable for 230V, 50 Hz, 1-Φ ac supply. The details of electrical points to be installed are given below.

Room:1 -- 1 fluorescent lamp, 1 ceiling fan, and 1 plug socket outlet
Room:2 -- 2 fluorescent lamp, 2 ceiling fan, 1 plug socket outlet
Verandah: -- 1 ceiling fan, 1 lamp

Do the following:
(1) Mark the location of electrical points and draw the installation plan.
(2) Estimate the load and decide the no. of sub-circuits.
(3) Calculate the length of PVC conduit.
(4) Draw the wiring diagram.

OR

Q.4 (a) Explain the following:
(1) Load factor
(2) Diversity factor
(3) Luminous flux
(4) Illumination

Q.4 (b) It is required to provide an illumination of 120 lumens /m² in a factory hall 30 m X 10 m. Assume that the depreciation factor is 0.8, co-efficient of utilization =0.5, waste light factor =1.2 and efficiency of lamp is 15 lumens. Calculate the no. of lamps and show their disposition.

Q.5 (a) What are the functions of welding transformer? Give the steps for designing reactor for welding transformer.
(b) Give the design steps for single phase variable chock coil.

OR

Q.5 (a) Write a short note on field regulator.
(b) Explain a typical 3-Φ, 4 -wire supply system.

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