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SE-8279

B. E. - III (Sem. - V) (Electrical) Examination

May / June – 2011

Elements of Electrical Design

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (SEM. - 5) (ELECTRICAL)**

Name of the Subject :

☛ **ELEMENTS OF ELECTRICAL DESIGN**

☛ Subject Code No. : **8 2 7 9** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Answer **all** questions.

(3) Figures to the **right** indicate marks.

(4) Supplement your answers with neat sketches and mention assumptions made clearly.

1 (a) Do as directed : (any **five**) **10**

(i) Explain leakage flux and leakage reactance.

(ii) Define field form factor.

(iii) What is the function of motor starter ?

(iv) Define stacking factor.

(v) Explain gap contraction factor for duct.

(vi) Write the force equation for Flat faced armature type of electromagnet.

(b) Compare different types of portative electromagnets. **5**

(c) Write True or False : **5**

(i) Index number of electromagnet can be defined as the ratio F/S.

(ii) Effective axial length of the m/c is reduced owing to the presence of ducts.

(iii) For n number of studs in a starter the number of resistance section is $n+1$.

(iv) Field form factor is the ratio of average mass density to maximum current density.

(v) Eddy current loss is proportional to the square of thickness.

2 (a) Define 'Real' and 'Apparent' flux densities in the tooth of d.c. machine armature. Also derive the relation between them. 8

(b) Calculate the mmf required for the airgap of a m/c having core length = 0.32 m including 4 ducts of 10 mm each, pole arc = 0.19 m, slot pitch = 65.4 mm, slot opening = 5 mm, airgap 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. 7

OR

(b) Calculate the steps in a 4 section Rotor resistance starter for a 3-ϕ slip ring induction motor from the following data.
Full load slip is 2.5%
Maximum starting current = Full load current
Rotor resistance per phase = 0.02 Ω.

3 Attempt any **three** : 15

(i) Derive an expression for the eddy current loss in a thin lamination and show that it depends upon the thickness of lamination and resistivity of material.

(ii) Obtain the basic equation required in the design of Plunger type of Electromagnet.

(iii) A d.c. crane magnet is built to dissipate about 5 kW at a supply voltage of 100 V. The winding space is 0.2×0.2 m^2. Taking a winding space factor of 0.6 and a specific resistance of 0.022 Ω/mm/mm^2, calculate the number of turns in the magnet, the cross-section of the conductor used and the total mmf. The length of mean turn is 2m.

(iv) Deduce an expression for mmf required for airgap of a slotted armature.

4 (a) Do as directed : (any **five**) 10

(i) Draw different types of stampings used for making core of mall transformer.

(ii) Write the equation of window area required for 1-ϕ transformer.

(iii) Write different types of weldings.

(iv) Explain distribution factor in ac armature winding.

(v) Write the equation for inductance for gapped core inductor.

(vi) What is the function of series reactor in welding transformer ?

(b) Discuss the design procedure for core and windings of a small transformer. **5**

(c) What are the requirements and characteristics of welding transformer ? **5**

5 (a) Write complete procedurial steps for designing single phase variable chock coil for given supply voltage, airgap variation and current variation. **8**

(b) Design a series reactor for 10 kVA, 230/50 volt, 50 Hz single phase arc welding transformer. **7**

OR

(b) Discuss the various types of load by giving suitable example. **7**

6 (a) Discuss different design considerations of electrical installation in small industries. **8**

(b) Explain various factors which should be considered in the design of lighting scheme. **7**

OR

(b) Develop a double layer, simplex lap winding for 12 slots, 4 pole armature of D.C. m/c with one coil side/ slot/layer.
