Roll No. : _____

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3E1484

B. Tech. (Sem. III) (Main & Back) Examination, January - 2013
Electrical Engg.
3EE4 Electrical Machines - I

Time : **3** Hours]

[Total Marks : **80**
[Min. Passing Marks : **24**

*Attempt any **five** questions, selecting **one** question from each unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. _____ Nil _____

2. _____ Nil _____

UNIT - I

1 (a) Draw a schematic diagram indicating flow of energy in the conversion of mechanical energy to electrical energy.

6

(b) Define leakage flux. Explain that how does it take part in electromagnetic energy conversion process via the magnetic field.

6

(c) The area of the hysteresis loop of the given magnetic material is 50 cm^2 with the two axes scaled as 1 cm = 20 AT and 1 cm = 50 m Wb, for 50 Hz frequency find the total hysteresis loss.

4

OR

1 Describe the principle of energy conversion. Show that the reaction of coupling magnetic field on the electrical or mechanical system is essential for the electro-mechanical energy conversion.

16

UNIT - II

2   (a)   List and explain the factors involved in the voltage build up of short generator.

                                                                             4

       (b)   Explain the role/purpose of the dummy coils in the DC machine winding.

                                                                             2

       (c)   In a 110 V compound generator, the armature shunt and series winding resistances are $.06\,\Omega$, $25\,\Omega$ and $.04\,\Omega$ respectively. The load consists of 200 lamps each rated 55 W, 110 V corrected on parallel. Find the total emf and armature current, when the machine is connected for :

           (i)   Long shunt

           (ii)   Short shunt

             Ignore the armature reaction and brush drop.

                                                                             10

OR

2   (a)   Derive the expression for generated emf in a dc generator.

                                                                             8

       (b)   An B pole dc generator has 500 armature conductory and has a useful fluw per pole of .065 web. What will be the emf generated if it is lap connected and runs at 1000 rpm ? What most be the speed at which it is to be driven to produce the same emf if it is wave wound ?

                                                                              8

UNIT - III

3   (a)   How do hysteresis, eddy current friction and windage losses depend upon the motor speed.

                                                                             8

(b) A 3 kW series motor runs normally at 800 RPM on a 240 V supply taking 16A; the field coils are connected in series. Estimate the speed and the current taken by the motor, if the coils are reconnected in two parallel groups of two in series. The load torque increases on the square of the speed.

8

OR

3 Explain the Hopkinson's method of testing of the dc machines. Differentiate this method with the Swinburne's method of testing of the dc machines. Can the Swinburnes method of testing of the dc machine be applied on dc series machine ? Explain whiever is the answer.

16

UNIT - IV

4 In what way a practical transformer differs from an ideal transformer ? Develop on equivalent circuit for the practical transformer.

16

OR

4 (a) Explain the process of finding the efficiency of a transformer by sumpner's text. rtuonline.com

8

(b) A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full load of 500 W. Determine :

(i) Iron loss

(ii) Full load copper loss

(iii) Efficiency at 75% of full load

(iv) Maximum efficiency.

8

UNIT - V

5 (a) With the help of circuit and phasor diagram explain the 3 phase to 6 phase transformation using double star transformation method. What are their relative merits and demerits ?

8

(b) Write short note on open delta connection.

8

OR

5 (a) Compare Bank of three single phase transformers and three phase core type transformer.

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(b) Explain scott connection for 3 phase to 2 phase conversion and show that the primary neutral divides the teaser primary winding in the ratio 2:1.

8

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