B. Tech. (Sem. III) (Mercy Back) Examination, December 2017
Electrical Engg.
3E.5A Electrical Machines - I   rtuonline.com

Time : 3 Hours

Maximum 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 - 1

1   (a)   Explain the operation of a magnetic circuit when AC current is applied to the coil wound on iron core. Draw the B-H curve and obtain the expression for hysteresis.

8

(b)   Determine the permeability of a magnetic material and the factor on which is depend.

8

OR

1   (a)   Explain AC operation of magnetic circuits and derive the energy stored in magnetic field.

8

(b) The area of the hysteresis loop of the given magnetic material is 50 cm² 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.

8

UNIT - II

2 (a) Draw the load characteristics of DC compound generator (cumulative and differential) generators and explain.

8

(b) A 24 kW, 250 V, 1600 rpm separately excited DC generator has armature circuit resistance of 0.1 ohm. The machine is first run at rated speed and the field current is adjusted to give an open circuit voltage of 260 V. Now when the generator is loaded to deliver its rated current, the speed of the driving motor is found to be 1500 rpm. Compute the terminal voltage of the generator under these conditions. Field flux remains unaltered.

8

OR

2 (a) Describe the features of DC series generators and distinguish it from the other type of DC generators. Explain.

8

(b) Explain the process of communication and the methods to improve the communications.

8

UNIT - III

3 (a) (i) What are the advantages of field flux control method over the circuit resistance controlled method employed for the speed control of DC motors ?

(ii) For a DC motor, the field-flux control method is called a constant power drive method. Explain.

8

(b) A DC series motor, running a fan at 1000 rpm, takes 50 A from 250 V mains. The armature plus field resistance is 0.6 ohm. If an additional resistance of 4.4 ohm is inserted in series with the armature circuit, find the motor speed.

8

OR

3 (a) Discuss the Swinburne's test and explain the procedure to predetermine the efficiency of a DC motor.

8

(b) A 10 kW, 240 V, DC shunt motor draw a line current 5.2 A while running at no-load speed of 1200 rpm from a 240 V DC supply. It has an armature resistance of 0.25 ohm and a field resistance of 160 ohm. Estimate the efficiency of the motor when it delivers rated load.

8

UNIT - IV

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

8

(b) Explain the need of parallel operation of single phase transformers. Give the condition to be satisfied for their successful parallel operation.

8

OR

4 (a) Define an auto transformer. Derive the expression showing the saving of copper when a two winding transformer is converted into an autotransformer.

8

(b) A 220 V, 60 Hz single phase transformer has a hysteresis loss of 340 watts and eddy current loss of 120 watts. If the transformer is operated from 230 V, 50 Hz supply mains, then compute its total core loss. Assume Steinmet'z constant equal to 1.6.

8

UNIT - V

5 (a) A 3-phase step down transformer is connected to 6.6 kV mains and takes 100 A. Calculate the secondary line voltage and line current for the (i) Δ/Δ (ii) Y/Y (iii) Δ/Y (iv) Y/Δ connection. The ratio of turn per phase is 12 and neglect no load losses.

8

(b) Explain the open delta connection to carry out 3-phase operation with help of two transformers. State its disadvantages.

8

OR

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) 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