3E1645

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B. Tech. III - Sem. (Back) Exam., Dec. - 2018

Electrical Engineering

3EE5A Electrical Machines – I

EE, EX

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*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

Q.1 (a) 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. [10]

(b) Define field energy and co-energy. Prove that field energy and co-energy in a linear magnetic system are given by identical expressions. [6]

OR

Q.1 (a) A Toroid coil having 500 turns, average radius 10 cm and cross sectional radius of 2cm. If the relative permeability is 1500, find the current required to establish a flux density of 0.5 T. [8]

(b) Write short notes on – [8]

(i) Magnetic flux and flux density

(ii) Reluctance

(iii) Permeance

(iv) Magnetic field intensity

UNIT- II

Q.2 Explain commutation Process. How we can improve the commutation by different method in DC generator? What are the causes of sparking at the Commutator Surface? [16]

OR

Q.2 (a) Explain armature reaction in DC generator with its effect. [8]

(b) Draw characteristics of shunt, series and compound DC generators. [8]

UNIT- III

Q.3 (a) Explain Swinburne's methods of testing of DC Machines. [8]

(b) What are the various starting method of DC motor? Explain any one method. [8]

OR

Q.3 (a) What is the significance of back e.m.f in DC motor? Derive the torque equation of DC motor. [8]

(b) Explain the method of controlling the speed of DC motor below and above the rated speed. Justify the statement that the DC series motors are never started at No load. [8]

UNIT- IV

Q.4 (a) Explain the process of finding efficiency of transformer by Sumpner's test. [8]

(b) Draw and explain the idea of a welding transformer. [8]

OR

Q.4 (a) Develop an equivalent circuit for the practical transformer. [8]

(b) A single phase transformer working at unity power factor has efficiency of 90% at both half load and at full load of 500w. Determine- [8]

(i) Iron loss and Copper loss

(ii) Maximum efficiency

UNIT- V

Q.5 (a) Explain Scott-connection for 3-phase to 2-phase conversion. [8]

(b) Explain excitation Phenomenon in transformer. [8]

OR

Q.5 Write short notes on- [4×4=16]

(a) Open delta connection

(b) Tertiary winding

(c) Parallel operation of 3-phase transformer

(d) Harmonics in 3-phase transformer
