18C13

B. Tech. EXAMINATION, 2020

(Third Semester)

(C Scheme) (Main & Re-appear)

(EE)

EE205C

ELECTRICAL MACHINES-I

Time : 2½ Hours]   [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks.

1. (a) Define and explain the following :

   (i) Biot-Savart Law

   (ii) Reluctance

   (iii) Inductance.

   (b) Describe and explain the magnetic field produced by a current carrying coil through air gap and through a combination of iron and air with neat diagram.

2. Describe energy stored in a magnetic field. Explain Force as a partial derivative of stored energy with respect to position of a moving element and Torque as a partial derivative of stored energy with respect to angular position of rotating element.

3. (a) The armature current of a series motor is 60 A on full load. If the load is adjusted

to that this current decreases to 40 A, find the new torque expressed as a percentage of full load torque. The flux for a current of 40 A is 70% of that when the current is 60 A.

(b) Explain working of DC motor and derive its torque equation.

4. State and explain working and construction of DC Generator with neat diagrams.

5. (a) Explain different types of braking in DC shunt motors.

(b) A four pole, 250 V, DC series motor has a wave wound armature with 496 conductors. Caclulate : (a) the gross torque (b) the speed (c) the output torque and (d) the efficiency, if the motor current is 50 A.

The value of flux per pole under these conditions is 22 mWb and the corresponding iron, friction and windage losses total 810 W, armature resistance = 0.19 Ω, field resistance = 0.14 Ω.

6. (a) A 10 kVa, 2000/400 V, 1-phase transformer has resistance and leakage reactance as follows :

R_1 = 5.2 Ω, X_1 = 12.5 Ω, R_2 = 0.2 Ω, X_2 = 0.5 Ω.

Determine the value of secondary terminal voltage when the transformer is operating with rated primary voltage the secondary current at its rated value with power factor 0.8 lag. The no load curent can be neglected. Draw the phasor diagram.

(b) Differentiate between core type and shell type transformers.

7. (a) What is an auto transformer ? State its merits and demerits over two winding transformer.

(b) Explain the need and applications of three to two phase, three to six phase conversions.

8. (a) Describe different methods of cooling of a three phase transformer.

(b) Explain parallel operation of three phase transformers.