Q. Code: 966691

B.E./B.TECH. Degree Examination, December 2020

Third Semester

EE18303 – ELECTRICAL MACHINES - I

(Regulation 2018)

Time: Three hours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. An Air gap is usually inserted in magnetic circuits to
   (a) Increase m.m.f
   (b) Increase the flux
   (c) Prevent Saturation
   (d) None of the above
2. A transformer has negative voltage regulation when its load power factor is
   (a) Zero (b) Unity (c) Lagging (d) Leading
3. The developed electromagnetic force and/or torque in electromechanical energy conversion system act in a direction that tends
   (a) to increase the stored energy at constant flux.
   (b) to decrease the stored energy at constant flux.
   (c) to decrease the co-energy at constant mmf.
   (d) to decrease the stored energy at constant mmf.
4. Which of the following application requires high starting torque motor?
   (a) Lathe machine (b) Centrifugal pump (c) Locomotive (d) Air blower
5. A coil of 1500 turns carrying a current of 5 amps produces a flux of 2.5mWb. Find the self-inductance of the coil.
6. State the causes of stray losses.
7. Prove that energy and co-energy in a linear magnetic system are given by same expression.
8. Specify the role of Interpoles in DC machines.

PART B - (4 X16 = 64 marks)

09. (a) (i) Discuss AC operation of magnetic circuits. **(8)**

(ii) An air cored solenoid of mean diameter 5 cm is 80 cm long. It is wound with 1200 turns. Calculate the inductance. If the current flowing in the coil on the solenoid is changed from 5A to -5A in 0.03 Seconds, find the emf induced in the coil. **(8)**

(OR)

(b) Analyze the different types of magnetic circuits. **(16)**

10. (a) Explain the operation of transformer with necessary vector diagrams **(16)**

(i) On no load

(ii) On load with unity and leading power factors.

(OR)

(b) (i) Derive an expression for saving of copper when an auto transformer is used. **(8)**

(ii) A 500 kVA transformer has an iron loss of 500 W and full load copper loss of 600 W. Calculate the efficiency at $3/4^{th}$ full load and 0.8 power factor. Also calculate the maximum efficiency at that power factor. **(8)**

11. (a) Derive an expression for the mechanical force of field origin in a typical attracted armature relay. **(16)**

(OR)

(b) Find an expression for magnetic force developed in a multiple excited system. **(16)**

12. (a) (i) Explain the different methods of excitation of a DC generators with suitable diagrams. **(8)**

(ii) An 8 pole DC shunt generator with 778 wave connected armature conductors and running at 500 rpm. Supplying a load of 12.5 ohm resistance at terminal voltage of 250 V. The armature resistance is 0.24 ohm and the field resistance is 250 ohm. Find the armature current, the induced emf and flux per pole **(8)**

(OR)

(b) Discuss the various methods of speed control of DC shunt motor. And briefly explain them with the help of neat diagram. **(16)**