MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM

(Government Aided Autonomous Engineering college)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Second Sessional Examination October 2026

B24EE2T02: ELECTRICAL MACHINES I
S3 EEE

Max. Marks :40 Time : 1.5 Hours

Answer all questions

PART A (3 x 4=12 Marks)

1. Explain the significance of back emf in a DC motor. **(3 Marks) [CO3]**
2. A 20 kW, 250 V DC shunt machine has armature and field resistance of 0.1 Ω and 125 Ω respectively. Calculate the total armature power developed when running as a motor taking 20 kW input. **(3 Marks) [CO3]**
3. Derive the EMF equation of a transformer and also obtain voltage transformation ratio. **(3 Marks) [CO4]**
4. A transformer takes a current of 0.6 A and absorbs 64 W when primary is connected to normal supply of 200 V, 50 Hz; the secondary being on open circuit. Find the magnetising and iron loss currents . **(3 Marks) [CO4]**

PART B (2 x 14=28 Marks)

5. (a) Explain the different speed control methods of DC shunt and series motors in detail. **(6 marks) [CO3]**

   (b) A 230V DC shunt motor, takes an armature current of 3.33A at rated voltage and at a no-load speed of 1000 rpm. The resistances of the armature circuit and field circuit are respectively 0.3 Ω and 160 Ω. The line current at full load and rated voltage is 40A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no-load flux by 4%. **(8 marks) [CO3]**
6. (a) An Ideal 25 kVA transformer has 500 turns on the primary winding and 400 turns on the secondary winding. The primary is connected to 3000 V 50 Hz supply. Calculate (i) primary and secondary current on full load (ii) secondary EMF (iii) maximum core flux. **(6 marks) [CO4]**

   (b) Draw and explain the phasor diagram of a single phase practical transformer supplying at (i) lagging power factor load and (ii) leading power factor load. **(8 marks) [CO4]**

Students will be able to
CO 3: Describe the principle of operation of DC motors, test DC machines to assess its performance, and select appropriate motor types for different applications.
CO 4: Construct the phasor diagram and equivalent circuit of single-phase transformers and investigate the conditions for parallel operation of transformers