

**Enrolment No.**\_\_\_\_\_

- 14.** In system international, unit of mutual inductance is  
(a) henry (b)  $VsA^{-1}$  (c) Wb (d) both (a) and (b)
- Q.2** (a) Define: (1) Magnetic flux density (2) Self-inductance and (3) Induced EMF. **03**  
 (b) Explain with usual expression Faraday's and Lenz's law. **04**  
 (c) Derive expression for induced voltages in a moving conductor placed in a magnetic field. **07**
- OR**
- (c) What is fringing and leakage flux? What are the effects of fringing and leakage flux on calculations of various parameters of magnetic circuits? **07**
- Q.3** (a) Distinguish between singly-excited and doubly-excited systems. **03**  
 (b) Define: Magnetization. Explain the methods of analysis of ferromagnetic circuits. **04**  
 (c) A 500 V dc shunt motor takes a 4 A on no load. The armature resistance including that of brushes is  $0.2\ \Omega$  and the field current is 1 A. Estimate the output and the efficiency when the input current is (a) 20 A, and (b) 100A. **07**
- OR**
- Q.3** (a) Explain the working principle of DC motor. **03**  
 (b) Draw and explain magnetization characteristics of DC generator. **04**  
 (c) Define field energy and coenergy. Prove that field energy and coenergy in a linear magnetic system are given by identical expressions. **07**
- Q.4** (a) Explain various power stages in 3 phase induction motor using suitable power flow diagram. **03**  
 (b) Explain method of starting of 3 phase synchronous motor. **04**  
 (c) A 500 V, 6-pole, 50 Hz, 3-phase induction motor develops 20 kW inclusive of mechanical losses when running at 995 r.p.m., the p.f. being 0.87. Calculate (a) the slip, (b) the rotor copper loss, (c) the total input if the stator loss is 1500 W, (d) line current, and (e) the rotor current frequency. **07**
- OR**
- Q.4** (a) What are the disadvantages of a single phase induction motor when compared with a 3 phase induction motor? **03**  
 (b) A 3-phase, 50 Hz, 4-pole induction motor has a slip of 4%. Calculate: (a) speed of the motor; (b) frequency of rotor emf. If the rotor has a resistance of  $1\ \Omega$  and standstill reactance of  $4\ \Omega$ , calculate the power factor (i) at standstill, and (ii) at a speed of 1400 r.p.m. **04**  
 (c) Explain construction and working principle of 3 phase Induction Motor. **07**
- Q.5** (a) State the advantages of servomotors over large industrial motors. **03**  
 (b) Write a short note on reluctance motor. **04**  
 (c) List out the starting methods of single phase induction motor. Explain the shaded pole motor with its application. **07**
- OR**
- Q.5** (a) What are the main advantages and disadvantages of hybrid stepper motors? **03**  
 (b) What types of permanent magnet materials are used for PMDC motors? State their properties and applications. **04**  
 (c) List various types of stepper motors and explain variable reluctance stepper motor. **07**

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