

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions out of remaining **six** questions.
 (3) Assume **suitable** data wherever **required** and state clearly.
 (4) **Figures** to the **right** indicate **full marks**.
 (5) Illustrate answers with sketches wherever required.

1. Answer any **four** : 20
 - (a) Explain the methods of excitation of D.C. Motors
 - (b) Discuss why a Moving Iron Instrument is suitable for both d.c. and a.c. measurements.
 - (c) From the point of view of measurements, how are the resistances classified as ?
 - (d) Explain the principle of operation of a three phase Induction Motor.
 - (e) What are the advantages of Instrument Transformers as compared with shunts and multipliers ?

2. (a) Differentiate between three point and four point starters by showing proper diagrams. 10
 (b) A series motor with an unsaturated field and negligible resistance when running at a certain speed on a given load takes 50A at 460V. If the load torque varies as the cube of the speed, calculate the resistance required to reduce the speed by 25%. 10

3. (a) Draw the circuit diagram of a Schering bridge and derive the condition for balance. Draw the phasor diagram. 12
 (b) Explain the errors which occur in Induction type Watthour meters. 8

4. (a) Explain the starting methods of a three phase Induction Motor. 10
 (b) The power input to the rotor of 440V, 50Hz, 6 pole, 3 phase induction motor is 80kW. The rotor emf makes 100 complete alternations per minute. Calculate— 10
 - (i) Slip
 - (ii) Rotor speed
 - (iii) Mechanical power developed
 - (iv) Rotor copper loss per phase
 - (v) Rotor resistance per phase, if the rotor current is 65 A.

5. (a) Discuss the construction and operation of an electro-dynamometer type of instrument. Show the connections of an electro-dynamometer wattmeter. 12
 (b) A moving coil voltmeter with a resistance of $10\ \Omega$ gives a full scale deflection with a potential difference of 45 mV. The coil has 100 turns, an effective depth of 3 cm and a width of 2.5 cm. The controlling torque exerted by the spring is 49×10^{-6} Nm for full scale deflection. Calculate the flux density in the gap. 8

6. (a) What is a potentiometer ? How can it be used for — 10
 - (i) measurement of unknown voltage
 - (ii) measurement of unknown resistance
 - (iii) Calibration of ammeter.
- (b) Draw the characteristics of a Stepper Motor and explain the working of any one type of Stepper Motor. 10

7. Write short notes on : 20
 - (a) Magnetic materials and their classification
 - (b) Powerfactor meter
 - (c) Principle of operation of an energymeter
 - (d) Rectifier type Instruments.