

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

**Note:** Attempt five questions in all, selecting one question each from section A, B, C and D. Section-E is compulsory.

**Section A**

1. i) Draw and explain the construction and working principle of permanent magnet moving coil instruments. Compare PMMC with Moving Iron indicating instruments. (12)

OR

- ii) A moving coil ammeter has a fixed shunt of  $0.02\Omega$ . With a coil of resistance  $1000\Omega$  and a potential difference of  $500\text{mV}$  across it, full scale deflection obtained, (a) To what shunted current does this correspond? (b) Calculate the value of resistance to give full deflection when shunt current is  $10\text{A}$ ? (12)

**Section B**

2. i) Describe the construction and working principle of two element energy meter. Also enumerate different industrial tariffs for consumer loads? (12)

OR

- ii) What is Phantom Loading? Find the error expressed as percentage of correct reading from the test figures given below.

Specification of integrating energy meter= $0.12\text{rev/kWh}$ , P.T. ratio =  $22000/110\text{V}$ , C.T. ratio= $500/5\text{ A}$ , Line Voltage =  $100\text{V}$ , Current= $5.25\text{A}$ , Power Factor =1, Time to complete 40 revolutions = 61 Sec.

**Section C**

3. i) How is Self Inductance measured using Maxwell Bridge? List the advantages and disadvantages of Maxwell Bridge. Why is this bridge only used for low Q coils? (12)

OR

- ii) Describe the working of low voltage Schering Bridge. Derive the equation for capacitance and dissipation factor. Draw the phasor diagram of bridge under condition of balance. (12)

**Section D**

4. i) Draw block diagram of Ramp Type Digital Voltmeter. Explain its working principle. (12)

OR

- ii) What is Synchroscope? How it is useful in Power System Network? Draw the connection diagram of phase sequence indicator. (12)

**Section E (Compulsory)**

5. Solve all the following

- a) Which type of errors occur in ammeter and voltmeter? Why swamping resistance is needed? (2)
- b) Find the multiplying power of a shunt of  $200\Omega$ , resistance used with galvanometer of  $1000\Omega$  resistance. (2)

- c) In the induction type of meter, maximum torque is produced when phase angle between two fluxes is..... (2)
- d) What is the cause of creeping in a single phase induction type energy meter? (2)
- e) Which AC bridge can be used for measurement of frequency? (2)
- f) Derive the torque equation of Moving Iron instrument at equilibrium. (2)