

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA

Even Mid Semester Examination for Academic Session 2024-25

COURSE NAME: B. Tech

SEMESTER: 4th

BRANCH NAME: Electrical Engineering (SEC-A & B)

SUBJECT NAME: Measurement and Instrumentation

FULL MARKS: 30

TIME: 90 Minutes

Answer All Questions.

The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions. [2 × 3]

- a) Write down the advantages of Moving Iron (MI) Instrument over Permanent Magnet Moving Coil (PMMC) instrument.
- b) State the four intrinsic constants of Galvanometer.
- c) Explain the balanced condition in bridge circuit with appropriate diagram.

Q2. [4+4]

- a) Explain the working of PMMC instrument with the help of neat sketch.
- b) And also discuss how a PMMC instrument enlists as a linear instrument.

OR

The inductance of a MI ammeter is given by $L = (12 + 5\theta - 2\theta^2)\mu H$ where θ is the angular deflection in radian from zero position.

- a) Find the spring constant
- b) The angular deflection in radian for a current 10A if the deflection for current of 5A is 30° .

Q3. [4+4]

- a) Explain the theory behind the energy meter that the number of revolutions in time t is proportional to the energy supplied with a neat phasor.
- b) Prove that the $\text{true power} = \frac{\cos\phi}{\cos\beta \cdot \cos(\phi - \beta)} \times \text{actual wattmeter reading}$ for an electro-dynamometer type wattmeter. Where $\cos\phi$ = power factor of the circuit, $\beta = \tan^{-1} \frac{WL}{R}$, L, R are inductance and resistance of pressure coil respectively.

OR

- a) General principle and performance equations of Vibration Galvanometer
- b) A moving coil instrument has a resistance of $5\ \Omega$ and gives a full-scale deflection of 10 mV. Show how the instrument may be used to measure (i) voltage up to 50 V, and (ii) current up to 10 A.

Q4. [4+4]

- a) Explain with the help of a Phasor diagram, how unknown inductance can be measured using Maxwell's inductance-capacitance bridge.
- b) In the AC bridge circuit, the supply voltage is 20 V at 500 Hz. Arm AB is $0.25\ \mu F$ pure capacitance; arm BD is $400\ \Omega$ pure resistances and arm AC has a $120\ \Omega$ resistance in parallel with a $0.15\ \mu F$ capacitor. Find resistance and inductance or capacitance of the arm CD considering it as a series circuit. The detector is across B and C.

OR

- a) Explain the working of two wattmeter method for delta connected balanced load with neat phasor diagram.
- b) In 3-phase circuit, two wattmeters used to measure power indicate 1200W and 600W respectively. Find the power factor of the circuit: (i) when both wattmeter readings are positive. (ii) When the latter is obtained by reversing the current coil connection.