

R18

Code No: 155CB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January - 2025

MEASUREMENTS AND INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

- 1.a) What are the sources of errors in electrical measurement systems? [2]
- b) Draw sketches for range extension Electrostatic voltmeter. [3]
- c) What are instrument transformers? What are their uses? [2]
- d) Define ratio error and phase angle error in current transformer. [3]
- e) What are maximum demand meters? What are their applications? [2]
- f) Define driving and braking torques of induction type energy meter. [3]
- g) Define sensitivity of Wheatstone bridge. [2]
- h) Write the applications of Carey Fosters Bridge and Kelvin's bridge. [3]
- i) What are clamp-on meters and what are their applications? [2]
- j) Write the working principle of strain gauge and define its gauge factor. [3]

PART - B

(50 Marks)

- 2.a) Explain the principle and working of Moving Iron type instruments and derive the expressions for its deflecting and controlling torque.
- b) Explain with a neat sketch the working of attracting disc type electrostatic volt meter. [5+5]

OR

- 3.a) Explain the principle and working of electrometer type volt meter and describe their range extension.
- b) A deflecting electrostatic voltmeter gives full scale deflection of 40 degrees with 9V applied to its terminals. Its capacitance is 10pF at zero deflection and 30 pF at 30 degrees and varies uniformly with deflection. The moment of inertia of moving vanes is $0.02 \times 10^{-6} \text{ kg/m}^2$. Calculate the undamped period of instrument. [5+5]

- 4.a) Describe the principle and operation of D. C. Crompton's potentiometer with a neat diagram and explain how unknown resistance and voltage is measured using it.
- b) Derive the expressions for the ratio and phase angle errors of a current transformer with a neat phasor diagram. [5+5]

OR

5.a) Explain the principle and working of A.C. Potentiometer with a neat diagram and describe its standardization.

b) Explain the construction, principle and working of current transformer. Explain the Wilson compensation method for reduction of errors in current transformers. [5+5]

6.a) Explain the construction, principle and operation of single phase three element electro dynamometer type watt meter and derive its torque equation.

b) If the reactance of the pressure coil circuit of a watt meter is 1 percent of its resistance, calculate the percentage error due to this cause at power factors of 0.8, 0.5 and 0.1 respectively. [5+5]

OR

7.a) Explain with neat sketches the measurement of active and reactive powers in balanced and unbalanced systems.

b) Explain the extension of ranges of watt meters using instrument transformers with help of neat diagrams. [5+5]

8.a) Draw the neat sketch of Kelvin's double bridge for measurement of low resistance and describe its working.

b) Explain with a neat circuit the working of Wein's bridge for measurement of capacitance and frequency of the supply voltage and derive the expression for unknown capacitance and frequency. [5+5]

OR

9.a) Describe the working of Maxwell's inductance capacitance bridge for measurement of unknown inductance and derive the expression for its balance condition. Draw its phasor diagram.

b) Explain with neat diagram for measurement of capacitance and loss angle using Desauty's Bridge. [5+5]

10.a) Explain the classification of transducers with examples and discuss the general characteristics of transducers.

b) Describe with a neat sketch the principle and working of piezoelectric accelerometer and derive the expression for its output. [5+5]

OR

11.a) Explain the construction, working principles and applications of Thermocouple transducers.

b) Explain the methods of measurement of displacement using LVDT and strain gauges with help of neat sketches. [5+5]

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