

Code No: 155CB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

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) Define controlling torque and deflecting torque. [2]
- b) Draw sketches for range extension of ammeter and voltmeter. [3]
- c) What are instrument transformers? What are their uses? [2]
- d) Define ratio error and phase angle error in potential transformer. [3]
- e) What is tri-vector meter? What are its applications? [2]
- f) Define driving and braking torques of induction type energy meter. [3]
- g) State the conditions for AC bridge balancing. [2]
- h) Draw the circuit diagram for H. V. Schering Bridge and write its uses. [3]
- i) What are true RMS 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 PMMC 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 and describe the range extension of E.S. 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° 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 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]

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- 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. [6+4]

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. [6+4]

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

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- 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]

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OR

- 11.a) Explain the construction, working principle and applications of capacitive transducers.
- b) Explain the methods of measurement of torque on rotating shafts using strain gauges with help of neat sketches. [5+5]

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