

R15

Code No: 125AM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Electronics and Communication 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) A set of independent current measurements were recorded as 10.03,10.10,10.11,10.08. Calculate the range of an error. [2]
- b) Explain the difference between Accuracy and precision. [3]
- c) What is harmonic distortion? [2]
- d) What are the specifications of Video Signal Generators? [3]
- e) What is the function of an electron gun? [2]
- f) List the front panel controls of CRO. [3]
- g) What is the principle of operation of Thermocouples? [2]
- h) State the applications of Synchros. [3]
- i) Draw the circuit diagram of Wheatstone bridge. [2]
- j) State different methods to measure pressure. [3]

PART - B

(50 Marks)

- 2.a) What are the different type of errors possible in measurements. Suggest methods to reduce their effect.
- b) An $820\ \Omega$ resistance with an accuracy of $\pm 10\%$ carries a current of 10 mA. The current was measured by an analog ammeter on a 25mA range with an accuracy of $\pm 2\%$ of full scale. Calculate the power dissipated in the resistor and determine the accuracy of the result. [5+5]

OR

- 3.a) Sketch the circuit diagram for a multi range voltmeter using.
(i) Individual multipliers resistors (ii) series-connected multiplier resistors.
- b) A PMMC instrument with FSD of $100\ \mu\text{A}$ and a coil resistance of $1\text{K}\ \Omega$ is to converted into a voltmeter. Determine the required multiplier resistance if the voltmeter is to measure 50V at full scale. Also calculate the applied voltage when the instrument indicates 0.8, 0.5 and 0.2 of FSD. [5+5]

- 4.a) State the applications of a spectrum analyzer.
b) How do you differentiate between a wave analyzer and a distortion analyzer? [5+5]

OR

- 5.a) Explain the principle of working of Harmonic Analyzer.
b) Compare the selectivity characteristics of the Spectrum Analyzer and Heterodyne Wave Analyzer. [5+5]

- 6.a) With reference to an oscilloscope, explain the following.

- i) Delayed mode operation of sweep circuit.
ii) Necessity of delay line in the signal path.
iii) Beam switching and dual channel operation.

- b) Explain the operation of a sampling oscilloscope with a neat block schematic diagram. What is its advantage over the conventional oscilloscope? [5+5]

OR

- 7.a) Explain the measurement of frequency, time and phase difference using CRO.
b) An electro statically deflected CRT has plates which are 2.5 cm long and 0.5 cm apart, and the distance from their centre to the screen is 20 cm. The electron beam is accelerated by a potential difference of 2500 volts and is projected centrally between the plates. Calculate the deflecting voltage required to cause the beam to strike a deflecting voltage and find the corresponding deflection of the screen. [5+5]

- 8.a) Derive gauge factor due to change in dimensions of a strain gauge element when it is subjected to tensile force.

- b) Calculate the gauge factor S , if a 1.5 mm diameter conductor that is 24 mm long changes length by 1 mm and diameter by 0.02 mm under a compression force. [5+5]

OR

- 9.a) Explain how LVDT is used to measure linear displacement.

- b) Show that a parallel plate capacitor serves as the most suitable transducer for measurement of linear and angular displacements. [5+5]

- 10.a) Draw the Maxwell's bridge circuit and derive the expression for the unknown elements.

- b) A bridge has 2000Ω in one arm and its opposite arm has a capacitor of value $0.5\mu\text{F}$. The arm to the right of resistor arm is having 1000Ω in shunt with $0.5\mu\text{F}$. The arm opposite to this arm is connected with the unknown component. Find the value of the component and its dissipation factor. [5+5]

OR

- 11.a) Explain the measurement of humidity by transducers.

- b) Name the components of analog data acquisition system and write the function of the components. [5+5]