Code No: **R164102D** **R16** **Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, March - 2021

INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Distinguish between speed of response and fidelity. [3]
   b) Distinguish between transducer and Inverse transducer. [2]
   c) List the salient features of Resistance Wire Thermometers. [3]
   d) Define sensitivity of a digital meter. State the significance of a half digit. [2]
   e) Why are the operating voltages of a CRT arranged so that the deflection plates are at nearly ground potential? [2]
   f) Describe the term real time analyzers. [2]

PART–B *(4x14 = 56 Marks)*

2. a) What are limiting errors? What is the significance of limiting errors? [3]
   b) Define the following terms: [4]
   (i) Average value (ii) Arithmetic mean (iii) Deviation and (iv) Standard deviation
   c) A voltmeter having a sensitivity of 1.5kΩ/V is connected across an unknown resistance in series with a milliammeter reading 90 V on 150 V scale. When the milliammeter reads 10 mA, calculate the (i) Apparent resistance of the unknown resistance, (ii) Actual resistance of the unknown resistance, and (iii) Error due to the loading effect of the voltmeter. Neglect the resistance of the milliammeter. [7]

3. a) Explain in detail about the input, transfer and output characteristics to be considered in selecting a transducer for any application. [7]
   b) List and explain the different types of Strain gauges in brief. [7]

4. a) Explain with a neat diagram how low pressures can be measured using Pirani vacuum gauge. [7]
   b) A strain gauge having a resistance of 150Ω and gauge factor of 2.5 is connected in series with a ballast resistance of 150Ω across a 12 V supply. Calculate the difference between the output voltage with no stress applied and a stress of 150 MN/m^2. The modulus of elasticity is 225 GN/m^2. [7]

5. a) Explain with a neat diagram the operation of ramp type digital voltmeter. State limitations of it and how it is overcome. [7]
   b) Explain the operation of Digital Phase angle meter with a neat block diagram. [7]

6. a) Explain with a diagram the operation of a triggered sweep generator. [7]
   b) Derive an expression for vertical deflection of an electron beam in a cathode ray tube and also define Deflection sensitivity and Deflection factor of the CRT. [7]

7. a) Explain heterodyning. State the working principle of a heterodyne wave analyzer with a neat diagram. [7]
   b) Explain with help of a block diagram the operation of a spectrum analyzer. State applications of a spectrum analyzer. [7]

Code No: **R164102D** **R16** **Set No. 2**

IV B.Tech I Semester Regular/Supplementary Examinations, March - 2021

INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) What are the causes of environment errors? [2]
   b) Distinguish between Primary and Secondary transducers. [3]
   c) List the advantages and disadvantages of Photoelectric transducers. [3]
   d) Distinguish the features between the digital instruments and analog instruments. [2]
   e) Explain the function of a trigger circuit in a Cathode ray oscilloscope. [2]
   f) Differentiate between AF wave analyzer and RF wave analyzer. [2]

PART–B *(4x14 = 56 Marks)*

2. a) What do you understand by dynamic characteristics of an instrument? Explain them in detail. [7]
   b) For the following given data, calculate [7]
   (i) Arithmetic mean; (ii) Deviation of each value; (iii) Algebraic sum of the Deviations.
   Given : $x_1 = 49.6$; $x_2 = 50.2$; $x_3 = 50.1$; $x_4 = 49.7$; $x_5 = 49.5$

3. a) List and explain the factors that influence the choice of transducers. [7]
   b) Distinguish between Wire wound potentiometers and Non- wire potentiometers [4]
   c) List the advantages and disadvantages of resistance potentiometers. [3]

4. a) Explain with a neat diagram how dummy gauge is used for temperature compensation in a strain gauge bridge arrangement. [7]
   b) Explain in detail about the Electromagnetic flow meters with a neat diagram and give its advantages and limitations. [7]

5. a) Explain with the help of diagram the working principle of dual slope type digital voltmeter. [7]
   b) Explain Digital frequency meter with a neat block diagram and what changes are required to measure high frequency values. [7]

6. a) Explain with a neat diagram the operation of a continuous sweep generator. List the drawbacks of a continuous sweep generator. [7]
   b) Compare passive probes with active probes. State the advantages of using a probe. [4]
   c) State the function of attenuators in CRO. [3]

7. Write short notes on the following: [14]
   i) Distortion analyzer.
   ii) Vector Impedance meter

Code No: **R164102D** **R16** **Set No. 3**

IV B.Tech I Semester Regular/Supplementary Examinations, March - 2021

INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Define the following terms: [3]
   i) resolution, ii) sensitivity and iii) expected value.
   b) List the advantages of Electrical Transducers [2]
   c) What does hot wire Anemometer do and where it is used [2]
   d) State the advantages of a digital voltmeter over an analog meter. [2]
   e) How is an electron beam focused onto a fine spot on the face of the CRT? [2]
   f) Differentiate between wave analyzer and spectrum analyzer [3]

PART–B *(4x14 = 56 Marks)*

2. a) Explain in detail about instrumental errors and how they are different from gross errors? [7]
   b) A voltmeter reading 75 V on its 100 V range and an ammeter reading 100 mA on its 150 mA range are used to determine the power dissipated in a resistor. Both these instruments are guaranteed to be accurate within ±1.5% at full scale deflection. Determine the limiting error of the power. [7]

3. a) Show that for a strain gauge, the gauge factor is equal to the summation of per unit change in length, per unit change in area and per unit change in resistivity. [7]
   b) Explain in detail about the thermistors along with its construction and applications of it. [7]

4. a) Distinguish between Moving coil type velocity transducer and Seismic tape velocity transducer. [7]
   b) Explain the working of Digital type Photoelectric tachometer with a neat sketch. [7]

5. a) Explain with a neat block diagram the operation of a microprocessor based Digital voltmeter. State its advantages over other type of Digital voltmeters. [7]
   b) Explain the principle of operation of a Digital frequency meter with a neat basic circuit. [7]

6. a) List the various controls on the front panel of a CRO. State the function of various controls on the front panel of a CRO. [7]
   b) Explain the functionalities of a Digital data logger with a neat diagram. [7]

7. a) Explain with a diagram the operation of a basic wave analyzer. [7]
   b) Explain the meaning of distortion factor. Explain how these distortion factors can be measured. [7]

Code No: **R164102D** **R16** **Set No. 4**

IV B.Tech I Semester Regular/Supplementary Examinations, March - 2021

INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Define the following terms: [3]
   i) accuracy, ii) precision and iii) errors.
   b) Give the broad definition of a transducer [2]
   c) List the uses of Strain gauges [3]
   d) State the advantages of a dual slope digital voltmeter over a ramp type digital voltmeter. [2]
   e) State the function of a delay line used in the vertical section of an oscilloscope. [2]
   f) Define a wave analyzer. List different types of wave analyzers. [2]

PART–B *(4x14 = 56 Marks)*

2. a) What do you understand by static characteristics? List and explain the different static characteristics. [7]
   b) The expected value of the current through a resistor is 40 mA. However the measurement yields a current value of 37 mA. Calculate [7]
   (i) absolute error (ii) % error (iii) relative accuracy (iv) % accuracy

3. a) Explain in detail about the Resistive transducers and distinguish between a Linear Potentiometer and a rotary potentiometer. [7]
   b) Explain in detail about the working of Linear variable differential transformer with the corresponding circuits of operation and relevant output voltages. [7]

4. a) Explain with a neat diagram how the pressure measurement can be done using Bourdon tube and LVDT. [7]
   b) Explain the principle of measurement of Strain gauge torque meter with a neat diagram. [7]

5. a) State and explain the operating and performance characteristics of a digital voltmeter. [7]
   b) A 3½ digit voltmeter is used for voltage measurements. [7]
   (i) Find its resolution
   (ii) How would 15.28 V be displayed on a 10 V range?
   (iii) How would 0.5678 be displayed on 1 V and 10 V ranges.

6. a) Draw the basic block diagram of an oscilloscope and state the functions of each block. [7]
   b) Explain how frequency and phase can be measured by a CRO using lissajous figures. [7]

7. Write short notes on the following: [14]
   i) AF wave analyzer.
   ii) Q - Meter