Code No: **RT41025** **R13** **Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017

INSTRUMENTATION

(Common to Electrical and Electronics Engineering and Mechanical 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 THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) How do random errors differ from systematic errors? [3]
   b) Differentiate between electrical and mechanical transducer. [3]
   c) List out the advantages and disadvantages of DC tachometer. [4]
   d) Explain the principle of successive approximation DVM. [4]
   e) How is CRO superior to ordinary measuring instruments? [4]
   f) What is meant by spectrum analyzer? Why RF spectrum analyzers are more important than AF ones? [4]

PART–B *(3x16 = 48 Marks)*

2. a) Distinguish between static and dynamic characteristics of an instrument. [8]
   b) What are the main causes of environmental errors? Discuss the corrective measures employed to eliminate these undesirable effects. [8]

3. a) What is an electrical transducer? Discuss its primary role and therefore its characteristics. [8]
   b) A strain gauge has a gauge factor of 4. If the strain gauge is attached to a metal bar that stretches from 0.25 m to 0.255 m when strained. What is the percentage change in resistance? If the unstrained value of gauge is 120 Ω. What is resistance value of gauge after application of strain? [8]

4. a) Derive the expression for gauge sensitivity of a strain gauge. [8]
   b) Explain the working of strain gauge type of torque transducer. [8]

5. a) Describe with neat sketch, the working of digital phase angle meter. [8]
   b) A $3\frac{1}{2}$ digit voltmeter is used for measuring voltage (i) Find the resolution of the instrument (ii) How would n voltage of 14.53 V be displayed on 10 V scale? (iii) How would a reading of 14.53 V be displayed on 100 V scale? [8]

6. a) Explain about the vertical amplifiers. [8]
   b) Discuss the advantages and disadvantages of analog and digital type of oscilloscope. [8]

7. a) Explain different methods used for measurement of unknown components using Q-meter. [8]
   b) Explain about RMS voltmeter with neat diagram. [8]

Code No: **RT41025** **R13** **Set No. 2**

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017

INSTRUMENTATION

(Common to Electrical and Electronics Engineering and Mechanical 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 THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Enumerate the factors that influence the accuracy of a system. [3]
   b) How does a piezoelectric transducer work? What are the common materials used for it? [4]
   c) List out the advantages of strain gauge type torque transducer. [3]
   d) What is the difference between 3-digit and $3\frac{1}{2}$ digit digital meter? [4]
   e) What are the limitations of oscilloscope? [4]
   f) What is wave analyzer? How good frequency stability is achieved in a wave analyzer? [4]

PART–B *(3x16 = 48 Marks)*

2. a) What are the various errors in measurements? Explain these errors in brief by giving suitable examples. Discuss the means adopted to minimize these errors. [12]
   b) Explain the concept of pulse code modulation. [4]

3. a) What is an LVDT? Explain its principle of working and discuss its merits and demerits. [8]
   b) A capacitive transducer of two parallel plates of overlapping area 6×10^{-4} m^2 is immersed in water. The capacitance C has been found to be 10.5 pF. Determine the separation between the plates and the sensitivity of the transducer in pF/m. Given ε_r for water =81; ε_0 =8.854×10^{-12} F/m. [8]

4. a) Explain with neat schematic the working of AC tachometer and its limitations. [8]
   b) Describe with neat sketch, the working of electromagnetic flow meter. Explain its advantages. [8]

5. a) Explain with neat block diagram of integrating type digital voltmeter. [8]
   b) A $4\frac{1}{2}$ digital voltmeter is used for voltage measurement (i) Find its resolution (ii) How would 12.98 V be displayed on 10 V range? (iii) How would 0.6973 be displayed on 1 V range? (iv) How would 0.6973 be displayed on 10 V range? [8]

6. a) Discuss about the horizontal amplifier with neat block diagram. [8]
   b) Explain about the transient recorder with neat schematic diagram. [8]

7. a) With a neat block diagram, explain a heterodyne wave analyzer and its applications. [10]
   b) What do you mean by harmonic distortion and explain any one method for measuring it. [6]

Code No: **RT41025** **R13** **Set No. 3**

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017

INSTRUMENTATION

(Common to Electrical and Electronics Engineering and Mechanical 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 THREE questions from Part-B

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PART–A *(22 Marks)*

1. a) What is the difference between periodic and aperiodic signal? [3]
   b) Explain how thermistor can be used for temperature measurement. [3]
   c) What are the limitations of electromagnetic flow meter? [4]
   d) What are the advantages of a digital voltmeter? [4]
   e) Enlist the applications of CRO. [4]
   f) How does a spectrum analyzer functionally differ from a wave analyzer? [4]

PART–B *(3x16 = 48 Marks)*

2. a) How do you classify the systematic errors? Explain with suitable examples. Discuss the measures taken to minimize these errors. [12]
   b) Explain the concept of pulse modulation. [4]

3. a) Why selection of a transducer is important? Give the points to be considered in determining a transducer suitability for a specific measurement. [8]
   b) An LVDT is employed for measuring the deflection of a bellows. The sensitivity of the LVDT is 60 V/mm. The bellows is deflected by 0.15 mm by a pressure of 1.2×10^{6}N/m^2. Determine the sensitivity of the LVDT in V per N/m^2 and the pressure when the output voltage is 4.5 V. [8]

4. a) What are the devices are used for the measurement of temperature? Explain any one of them. [9]
   b) Explain the difference between velocity and angular velocity measurements. [7]

5. a) Discuss the working of ramp type digital voltmeter with neat sketch. Also write its applications. [8]
   b) What is the resolution of a $4\frac{1}{2}$ digital display? How would 15.84 V be displayed on a 10 V range and 0.5243 Von 1 V and 10 V ranges? [8]

6. a) Describe how the following measurements can be made with the use of a CRO (i) frequency (ii) phase angle [10]
   b) Explain the functioning of a time base generator in a CRO [6]

7. a) Explain the working of wave analyzers used for audio frequency and megahertz ranges. [10]
   b) Describe the engineering applications of wave analyzer. [6]

Code No: **RT41025** **R13** **Set No. 4**

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017

INSTRUMENTATION

(Common to Electrical and Electronics Engineering and Mechanical 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 THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) Define (i) Speed of response (ii) Measuring lag (iii) Fidelity [3]
   b) What are the basic requirements of a transducer operation? [3]
   c) List out the disadvantages of liquid level measurement by resistive method. [4]
   d) Enumerate the advantages of successive approximation DVM. [4]
   e) Determine the velocity of the electron beam in an oscilloscope when the voltage applied to its accelerating anode is 2000 V. [4]
   f) What is harmonic distortion? What do you understand by total harmonic distortion? [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain the following main static characteristics (i) Accuracy (ii) Sensitivity (iii) Reproducibility (iv) Drift (v) Static error (vi) Dead zone [12]
   b) What are the three main reasons to arise the instrumental errors? [4]

3. a) State the requirements of a resistance strain gauge for its optimum working. Define gauge factor and derive its expression with usual notations [8]
   b) A platinum resistance thermometer has a resistance of 125 Ω at 20^0C. Determine its resistance at 80^0C. The temperature coefficient of resistance of platinum at 20^0C is 0.004 Ω/Ω/^{0}C. If the resistance of the thermometer is found to be 210 Ω, determine the temperature. [8]

4. a) What are the devices used for liquid level measurements? Explain any one method. [8]
   b) Explain the pressure measurement using resistive transducers. [8]

5. a) Draw and explain the circuit of a digital frequency meter. What are the different methods used for high frequency determination? [10]
   b) Explain about the digital voltmeter with respect to analog voltmeter. [6]

6. a) Describe the basic circuitry of a typical cathode ray oscilloscope with neat block diagram. [10]
   b) What is a sampling oscilloscope? What are its various applications? [6]

7. a) Describe how phase angle measurements are carried out by using vector impedance meter. [14]
   b) What are the factors which affect the measurement accuracy of Q-meter? [2]