**R15/R13/R09**

**Code No: 127EA/117EA/57025**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech IV Year I Semester Examinations, March - 2021**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(R15 – Mechanical Engineering; R13 - Mechanical Engineering;**
**R09 - Mechanical Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Answer any Five Questions**
**All Questions Carry Equal Marks**
**- - -**

1.a) What are the different types of measurements?
b) What are different types of errors found in measuring instruments? Also, explain the steps to be taken to minimize or avoid these errors. [7+8]

2.a) Explain how the Transducing takes place in photoelectric transducer.
b) Explain working principle of thermistor and compare with the RTD. [7+8]

3.a) Describe pressure measurement using Mcleod gauge.
b) What are the advantages and disadvantages of Bellows gauges over thermal conductivity gauges? [7+8]

4.a) Describe the measurement of liquid level using ultrasonic type level gauge.
b) Explain the construction and working of a turbine flow meter with the help of a diagram. [7+8]

5.a) Explain the working of a non-contact type of tachometer.
b) Explain the working of vibrometer and accelerometer. [7+8]

6.a) What is gauge factor? Explain its importance in measurement of strain gauges.
b) How is temperature compensation made in strain gauges? Explain the working of bonded strain gauges. [7+8]

7.a) Discuss about measurement of humidity using absorption psychrometer.
b) Explain the principle involved in load cells. [7+8]

8.a) What are the basic elements of control system? Explain hydraulic control systems.
b) Explain the advantages of closed loop system over open loop system. [8+7]

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**Code No: 154BC** **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year II Semester Examinations, March - 2022**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Mechanical Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**
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1.a) Explain the working of ionization transducer for the measurement of displacement.
b) Explain briefly the static and dynamic characteristics of measuring instruments. [7+8]

2.a) Describe the elements present in the generalized measuring system block with the suitable examples.
b) By employing LVDT explain how displacement is measured with relevant diagram. [8+7]

3.a) State law of thermocouples. How are the laws useful in construction of thermocouple thermometers?
b) Explain the working of ionization pressure gauge with a neat sketch. [8+7]

4.a) A McLeod gauge is available with bulb and measuring capillary volume of $150 \times 10^6$ $mm^2$ and a capillary of diameter 0.3 mm. Calculate the gauge reading for a pressure of 30 μm.
b) Explain various arrangements of manometers for pressure measurement. [6+9]

5.a) Explain the working principle involved in seismic instrument.
b) A seismic accelerometer sensing displacement has an undamped frequency of 20 Hz and a damping ratio of 0.7. Calculate i) its damped frequency ii) the amplitude ratio and phase angle between the motion of the seismic mass and the applied vibration if the latter is a sinusoidal displacement at a frequency of 30Hz and 1kHz. [8+7]

6.a) Write short notes on cryogenic fuel level indicator.
b) Why rotameter is called variable area flow meter? Describe its construction and working with a neat sketch. [7+8]

7.a) Explain the working of Load Cells and enumerate its applications.
b) Discuss in detail the working of any one type of dynamometers used for force measurement. [8+7]

8.a) Describe a typical closed loop control system that can be used to control the temperature of water being heated by steam.
b) What is servomechanism? Describe the features of a servomechanism? [8+7]

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**Code No: 154BC** **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year II Semester Examinations, November/December - 2020**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Mechanical Engineering)**

**Time: 2 Hours** **Max. Marks: 75**

**Answer any Five Questions**
**All Questions Carry Equal Marks**
- - -

1.a) Classify theory and construction of various transducers.
b) What do you mean by static calibration? Give the steps which are necessary in performing a calibration. [7+8]

2. Categorize different types of errors in measurements and measuring instruments? Explain them. [15]

3. Describe the construction and working of a Bourdon tube. Describe the C type, spiral type and helical type bourdon gauges with neat diagrams. [15]

4.a) Explain the working of ionization pressure gauge with a neat sketch.
b) What are the different laws involved in thermocouples? Explain the working principle of thermocouple in measurement of temperature. [7+8]

5.a) Explain the working principle of operation of turbine flowmeter with neat sketch and also list out its advantages and disadvantages.
b) Explain the construction and working of a vibrating reed tachometer for measuring speed. [8+7]

6.a) Explain the working principle of operation of hot wire anemometer with neat sketch.
b) Explain about cryogenic fuel level indicators. [8+7]

7.a) Explain the principle on which working of resistance strain gauge with neat sketch.
b) What is meant by load cell? How the load cells are used for the measurement of force in a member. [7+8]

8. Distinguish the temperature, speed and position control systems with suitable examples. [15]

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**Code No: 154BC** **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year II Semester Examinations, July/August - 2021**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Mechanical Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**
**- - -**

1.a) Explain with a neat schematic the functions of various elements of a generalized measurement system.
b) Explain the sources of errors in measurement systems and discuss their classification and elimination. [7+8]

2.a) Describe the principle, construction and working of Inductive and capacitive transducers with neat sketches.
b) Explain the theory, construction, working and applications of piezoelectric transducers. [8+7]

3.a) Explain the construction and working of expansion type bimetallic strip and discuss various sources of errors in it and suggest methods for their elimination.
b) State the laws of thermoelectricity and describe with a neat sketch the construction and working of Industrial thermocouple thermometer. [7+8]

4.a) Explain the measurement of pressure using liquid column manometers and Bourdon tube pressure gauges with neat sketches.
b) Explain the principle, construction and working of thermal conductivity and Ionization type vacuum gauges with help of neat diagrams. Mention their ranges of measurement. [7+8]

5.a) Explain the methods for measurement of liquid level in open vessels and pressurised vessels with typical sketches.
b) Explain the construction and principle of working of Hot wire anemometer with a neat Sketch. [7+8]

6.a) Explain with neat sketches the working of electric tachometer type and stroboscopic type speed measurement techniques.
b) Describe the theory of general purpose accelerometers and explain the construction and working of Piezoelectric accelerometer. [8+7]

7.a) Explain the principle and working of strain gauges and derive the expression for gauge factor. Describe the use of strain gauge for measuring torque with a neat sketch.
b) Explain with neat sketch the measurement of force using hydraulic and pneumatic load cells. [8+7]

8.a) Explain with help of block diagrams the working of open loop and closed loop control systems and compare their performance.
b) What is transfer function of a measurement system? Derive the transfer function of a second order mechanical system for unit step input with a typical example. [7+8]

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**Code No: 154BC** **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year II Semester (Special) Examinations, January/February - 2021**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Mechanical Engineering)**

**Time: 2 Hours** **Max. Marks: 75**

**Answer any Five Questions**
**All Questions Carry Equal Marks**
**- - -**

1. What is the basic principle of measurement? Explain the functional descriptions of measuring instruments. [15]

2. Build how displacement can be measured with the help of an inductive transducer. Give the essential features of construction of these types of electrical transducer. [15]

3.a) What are Thermistor? What are their advantages?
b) Analyze about McLeod pressure gauge. [7+8]

4. Distinguish how a differential manometer differ from a simple manometer? Explain any one differential manometer briefly with a neat diagram. [15]

5. Explain the working of magnetic flow meter with neat sketch. [15]

6. Explain the working principle of piezo electric accelerometer. [15]

7. What are the various types of stress measurement? Derive the expression for Gauge factor. [15]

8.a) What is a servo mechanism? Explain.
b) Briefly explain the different types of control systems. [8+7]

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**Code No: 154BC** **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech II Year II Semester Examinations, August/September - 2021**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Mechanical Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**
**- - -**

1. Explain the static and dynamic characteristics of measurement systems with help of typical examples and sketches. [15]

2. Explain the principle, construction and working of piezoelectric and photoelectric type transducers. [15]

3. Describe the construction and working principle of resistance thermometer and draw the measurement circuit using RTD and explain its working. [15]

4. Explain with neat diagrams, the principle and working of McLeod gauge, and Hot cathode ionization gauges for vacuum measurement. [15]

5. Derive the expression for flow rate of fluids through area flow meter and describe the construction, installation and working of Rotameter. [15]

6. Explain the working of drag cup and electric tachometer type speed measurement techniques. [15]

7. What is a Strain gauge Rosette? Explain the measurement of torque of rotating shaft using strain gauge rosettes with a neat diagram. [15]

8. Draw the block diagram of closed loop control system for speed and position control system and explain its working. [15]

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**Code No: 137DN** **R16**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech IV Year I Semester Examinations, December - 2019**
**INSTRUMENTATION AND CONTROL SYSTEMS**
**(Common to ME, AME)**

**Time: 3 Hours** **Max. Marks: 75**

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.



## PART – A

**(25 Marks)**

1.a) Define hysteresis. [2]
b) What are the functions of a transducer? [3]
c) What materials are used for thermocouples? [2]
d) What are the limitations of bulk modulus pressure gauges? [3]
e) List the disadvantages of bubbler level indicator. [2]
f) Can a piezoelectric accelerometer be used to check constant acceleration? Justify your answer. [3]
g) List the parameters to be considered for the selection of metallic strain gauges. [2]
h) What are the limitations of elastic force meters. [3]
i) Give the classification of control systems. [2]
j) Define and explain transfer function. [3]

## PART – B

**(50 Marks)**

2. Discuss in detail about the dynamic performance characteristics of measuring instruments. [10]

OR

3.a) Compare and contrast various displacement measuring principles.
b) What is calibration? Discuss the need for calibration. [5+5]

4.a) Explain the principles of working of bimetallic strip.
b) Describe a dead weight pressure gauge and explain its working. [5+5]

OR

5.a) Discuss in detail about the use of changes in chemical phase for assessing the temperature of a material.
b) Explain the working of thermal conductivity gauges. [5+5]

6.a) Suggest and explain a method for the measurement of level if the liquid is corrosive or explosive.
b) Describe the basic concept of seismic instrument. [5+5]

OR

7.a) Explain the principle of operation of electromagnetic flow meter. Discuss its merits.
b) Listout the advantages and applications of non-contact type stroboscope. [5+5]

8.a) Explain the working of hydraulic load cells.
b) Describe a sling psychrometer and explain the working. [5+5]

OR

9. Define gauge factor of a resistance strain gauge. Derive an equation for the same. Give the assumptions made and limitations. [10]

10. With the help of suitable line diagrams explain the working of position control system. [10]

OR

11.a) Establish an expression for the value of transfer function for a spring-mass damper system and a rotational mechanical system.
b) Explain the applications of servomechanism. [4+6]

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