

IX. OLD QUESTION PAPERS

Q.P Code: ME2205PC

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NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

II B.Tech II Semester (NR21) Supplementary Examination, January / February 2024

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time : 3 hours

Maximum marks: 70

- Note:**
- This question paper contains two parts, A and B
 - Part A is compulsory which carries 20 marks (10 sub questions are two from each unit carry 2 Marks). Answer all questions in Part A
 - Part B Consists of 5 Units. Answer one question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A **(20 Marks)**
Answer all questions

Q.No	a	Question	M	CO	BL
1)	a	Define measurement and explain its significance in our day-to-day life and in various fields of engineering.	2	1	L1
	b	Distinguish between reproducibility and repeatability.	2	1	L2
	c	Define bi metallic strip.	2	2	L1
	d	Write the application of manometer.	2	2	L1
	e	Discuss the advantages and disadvantages of Ultrasonic flow meters?	2	3	L2
	f	Explain the application of Laser Doppler Anemometer.	2	3	L3
	g	Explain dew point.	2	3	L2
	h	Define load cell.	2	4	L1
	i	Discuss the main applications of servomotors?	2	4	L2
	j	What are first order mechanical systems.	2	4	L1

Part-B **(50 Marks)**
Answer all the Units
All Questions carry equal Marks

Q.No	a	Question	M	CO	BL
UNIT-I					
2)	a	Explain gross, systematic and random errors by citing suitable examples.	5	CO1	L3
	b	Describe the principle of operation of Piezo-electric transducer.	5	CO1	L2
OR					
3)	a	Draw the block diagram representation of a generalized measurement system.	5	CO1	L2
	b	Define displacement. Suggest a suitable transducer for the measurement of a small linear motion. Give reasons to justify your choice.	5	CO1	L3

UNIT-II				
4)	a.	Describe the construction and working of thermocouple.	5	CO2 L2
	b.	List the advantages and disadvantages of McLeod gauge for measurement of vacuum.	5	CO2 L3
OR				
5)	a.	Describe the applications of piezoelectric transducers for measurement of pressure.	5	CO2 L3
	b.	List the advantages and disadvantages of piezoelectric transducers.	5	CO2 L2
UNIT-III				
6)	a.	Describe the working of ultrasonic flow meters.	5	CO3 L2
	b.	Describe the disadvantages of mechanical tachometers.	5	CO3 L3
OR				
7)	a.	Explain the different techniques used for measurement of flow velocity.	5	CO3 L2
	b.	What are mechanical tachometers? Explain with examples.	5	CO3 L3
UNIT-IV				
8)	a.	Explain in detail, the working of Rectangular strain gauge rosettes.	5	CO3 L2
	b.	Explain the method of usage of resistance strain gauges for bending, compressive and tensile strains.	5	CO3 L3
OR				
9)	a.	Explain the construction and working of Elastic force meters for force measurement.	5	CO4 L2
	b.	Describe how relative humidity can be measured by measuring dew point temperature.	5	CO4 L3
UNIT-V				
10)	a.	Compare between open loop and close loop control systems.	5	CO4 L3
	b.	With the help of a neat sketch, explain the functions of each component of generalized feedback control system.	5	CO4 L2
OR				
11)	a.	What is a control system? What are the basic components? Give two examples of control systems.	5	CO4 L2
	b.	Explain a closed loop control system used to control the temperature of water heated by steam.	5	CO4 L3

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Code No: 154BC

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, April/May - 2023

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical 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 sensitivity, resolution, accuracy and dynamic error. [2]
- b) What are systematic errors? Explain them in detail. [3]
- c) State Seebeck effect, Peltier effect and Thomson effect. [2]
- d) Explain the principle and working of McLeod vacuum gauge. [3]
- e) What are microwave level sensors? What is their operating frequency? [2]
- f) What is the principle of seismic instruments? [3]
- g) What are strain gauge Rosettes? What are their applications? [2]
- h) Write the principle and working of dynamometer. [3]
- i) What is first order system? [2]
- j) Define Transfer function. Write the TF of second order mechanical systems. [3]

PART – B

(50 Marks)

- 2.a) Explain the classification of measuring instruments and compare their merits and demerits.
 - b) Explain the principle and working of Hall Effect and photoelectric transducers. [5+5]
- OR**
- 3.a) Discuss various types of errors in measurement systems and explain their methods of elimination/ minimization.
 - b) Explain with neat sketch the measurement of displacement using potentiometer and LVDT and derive the expression for its output. [5+5]
- 4.a) Explain the principle and working of Resistance thermometer with the help of measuring Circuits.
 - b) Explain the construction and working of dead weight tester pressure gauge. [5+5]
- OR**
- 5.a) Explain the principle, construction and working of total radiation pyrometers with sketches.
 - b) Explain the principle and working of hot and cold cathode Ionization gauges for vacuum measurement and mention their ranges of measurement. [5+5]

- 6.a) Explain with sketches the measurement of liquid level using bubble tube and displacer methods.
- b) Explain the methods of measurement of speed by electric tachometers and tachogenerators. [5+5]

OR

- 7.a) Describe with a neat sketch the principle and working of ultrasonic Doppler flow meter.
- b) Explain the theory, principle and working of piezoelectric accelerometer with help of neat diagram. [5+5]

- 8.a) Derive the formula for gauge factor of metallic strain gauge. Describe methods of measurement of torque of a rotating shaft using strain gauges with neat diagrams.
- b) Describe the methods of measurement of humidity using sling hygrometers and Dew point cell. [5+5]

OR

- 9.a) Explain the measurement of force and load using pneumatic, hydraulic and electric load cells.
- b) Explain with neat sketches the working of torsion meters and dynamo meters. [5+5]

- 10.a) What is servomechanism? Describe the features and applications of a servomechanism?
- b) What is a block diagram? Explain the steps involved to get transfer function from the block diagrams? [5+5]

OR

- 11.a) Differentiate between open loop control and closed loop control systems with suitable examples.
- b) Draw a block diagram of a closed loop control system for motor speed control and explain its working. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, August/September - 2022

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 Hours

Max.Marks:75

Answer any five questions
All questions carry equal marks

- 1.a) Distinguish between piezo electric, inductive, capacitance type transducers.
b) Briefly explain the static and dynamic performance characteristics. [8+7]
- 2.a) Explain how displacement can be measured with the help of an inductive and capacitive transducer.
b) What are the sources of error? Explain the methods of elimination error. [8+7]
- 3.a) Explain how pressure is measured using dead weight pressure gauges.
b) Platinum RTD has resistance at 0° C is 100Ω. If the temperature co-efficient of Platinum is $3.391 \times 10^{-3} / ^\circ\text{C}$, then find its resistance at 100° C. [8+7]
- 4.a) Explain the construction and working of McLeod pressure gauge used for low pressure measurement.
b) Explain how measurement of temperature is done using
i) Thermal expansion.
ii) Electrical resistance. [8+7]
- 5.a) With help of a neat diagram explain the working of turbine flow meter.
b) Name the different mechanical tachometers. Sketch and explain the working of centrifugal tachometer. [8+7]
- 6.a) With the help of a neat diagram, explain the construction, working and special features of Laser Doppler anemometer.
b) Explain the working of noncontact type tachometer. What are the applications of this instrument? [8+7]
- 7.a) Briefly discuss about torque measuring methods using strain sensors.
b) What are the hygroscopic materials? Explain the working of any one of the absorption hygrometers? [8+7]
- 8.a) Distinguish the temperature, speed and position control systems with suitable examples.
b) Explain the applications of control systems with respect to governing of speed. [8+7]

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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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JNTUHITECH Papers March 2022

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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 $150 \times 10^6 \text{ mm}^3$ 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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