VIII. Unit wise Question Bank

Unit-I

Part – A (Short Answer Questions)				
S.No.	Question	BT	CO	PO
1	What is meant by measurement?	L1	CO1	1,2,3,4
2	What is direct comparision method?	L1	CO1	1,2,3,4
3	Give two examples for primary and secondary measurement	L1	CO1	1,2,3,4
4	Define a measuring instrument.	L1	CO1	1,2,3,4
5	What is Speed of response.	L1	CO1	1,2,3,4
6	Define sensitivity	L2	CO1	1,2,3,4
7	What is systematic and random error	L1	CO1	1,2,3,4
8	List five factors that are to be considered while selecting an instrument.	L1	CO1	1,2,3,4
9	Compare a primary transducer to secondary transducer.	L2	CO1	1,2,3,4
10	Define the term transducer	L2	CO1	1,2,3,4
Part – B (Long Answer Questions)				
11		Sketch and explain with a block diagram of generalized measurement system and its elements with an example.	L2	CO1	1,2,3,4
12	a)	Explain the following terms: i) Range ii) span iii) Drift and iv) Calibration			
	b)	Explain the terms sensitivity and readability	L2	CO1	1,2,3,4
13	a)	Describe the principle of inductive transducers and explain about electromagnetic and eddy-current active inductance transducers with neat sketch	L2	CO1	1,2,3,4
	b)	Describe about the primary, secondary and tertiary measurements with neat schematic diagrams of a suitable examples	L2	CO1	1,2,3,4
14		Classify the various errors and explain them in details.	L2	CO1	1,2,3,4
15		Explain with neat sketch of Linear Variable Differential Transformer (LVDT) for displacement measurement.	L3	CO1	1,2,3,4
16	a)	Explain the various sources of error in measuring instruments?	L3	CO1	1,2,3,4
	b)	Explain the dynamic performance characteristics of measuring instruments	L3	CO1	1,2,3,4

Unit-II

Part – A (Short Answer Questions)

S.No.	Question	BT	CO	PO
1	Define Temperature.	L1	CO2	1,2,3,4
2	What is a thermocouple?	L1	CO2	1,2,3,4
3	What are pyrometers?	L1	CO2	1,2,3,4
4	State limitations of total radiation pyrometer	L1	CO2	1,2,3,4
5	What are the limitstions of a thermistor?	L1	CO2	1,2,3,4
6	What is dynamic or impact pressure.?	L2	CO2	1,2,3,4
7	Differentiate between Atmospheric pressure and absolute pressure.	L1	CO2	1,2,3,4
8	Differentiate between gauge pressure and vaccum pressure	L1	CO2	1,2,3,4
9	List few applications of pressure measurement	L2	CO2	1,2,3,4
10	Differentiate between static pressure and stagnation pressure	L2	CO2	1,2,3,4

Part – B (Long Answer Questions)

		Question	BT	CO	PO
11	a)	Explain the working of a helix bimetallic thermometer	L2	CO2	1,2,3,4
	b)	Explain the working of a spiral bimetallic thermometer		CO2	
12	a)	What are RTDs? On what basic principle do they work? Explain with diagram one of the RTDs.	L2	CO2	1,2,3,4
13	a)	State and explain three laws of thermocouples.	L2	CO2	1,2,3,4
	b)	Explain how a thermocouple is used to measure temperature	L2	CO2	1,2,3,4
14		How is dead weight tester used to calibrate pressure measuring devices.	L2	CO2	1,2,3,4
15	a)	Explain the working of a bourdon tube pressure gauge.		CO2	
	b)	Explain the Mcleod vaccum gauges used for pressure measurement and its limitations.	L3		1,2,3,4
16	a)	Explain the bellows gauge used to measure gauge pressure.	L3	CO2	1,2,3,4
	b)	Explain the bellows arrangement used to measure differential pressure.	L3	CO2	1,2,3,4

Unit-III

Part – A (Short Answer Questions)

S.No.	Question	BT	CO	PO
1	State any one linear velocity transducer.	L1	CO3	1,2,3,4
2	State any three mechanical tachometers used to measure angular velocity.	L1	CO3	1,2,3,4
3	State the basic principle behind tachogenerators	L1	CO3	1,2,3,4
4	List the various contactless electrical tachometers	L1	CO3	1,2,3,4
5	What are the secondary or rate meters?	L1	CO3	1,2,3,4
6	Where are magnetic flow meters used?	L2	CO3	1,2,3,4
7	What is an ultrasonic flow meter?	L1	CO3	1,2,3,4
8	What is liquid level?	L1	CO3	1,2,3,4
10	On what basic principle does an obstruction meter work	L2	CO3	1,2,3,4

Part – B (Long Answer Questions)

		Question	BT	CO	PO
11	a)	With a neat diagram explain the working principle of stroboscope tachometers.	L2	CO3	1,2,3,4
	b)	With a neat diagram explain the working principle of Photoelectric tachometers.		CO3	
12	a)	With a neat sketch explain the working principle of piezo electric accelerometer.			
	b)	With a neat sketch explain the working principle of reed type vibrometer.	L2	CO3	1,2,3,4
13	a)	With a neat sketch explain the working principle of magnetic flow meter.	L2	CO3	1,2,3,4
	b)	With a neat sketch explain the working principle of Rotameter.	L2	CO3	1,2,3,4
14		With a neat sketch explain the working principle of Ultrasonic flow meter using travel time difference method. And also explain its advantages and disadvantages.	L2	CO3	1,2,3,4
15		With a neat diagram explain any two types of direct liquid level measurement.	L3	CO3	1,2,3,4
16		With a neat diagram explain any two types of indirect liquid level measurement.	L3	CO3	1,2,3,4

UNIT IV

Part – A (Short Answer Questions)

S.No.	Question	BT	CO	PO
1	What are strain gauges?	L1	CO4	1,2,3,4
2	What is piezo-resistivity?	L1	CO4	1,2,3,4
3	What is a bonded strain gauge?	L1	CO4	1,2,3,4
4	What is dry air, moist air and saturated air?	L1	CO4	1,2,3,4
5	What is dry bulb and wet bulb temperature?	L1	CO4	1,2,3,4
6	Give one application of finding dew point temperature.	L2	CO4	1,2,3,4
7	Write the basic principle on which a strain gauge load cell works.	L1	CO4	1,2,3,4
8	Write the principle of measuring torque using slotted discs.	L1	CO4	1,2,3,4
9	What are driving dynamometers?	L2	CO4	1,2,3,4
10	What are transmission dynamometers?	L2	CO4	1,2,3,4

Part – B (Long Answer Questions)

11	a)	With a neat diagram explain unbounded strain gauges. And also write its advantages and limitation.	L2	CO4	1,2,3,4
	b)	With a neat diagram explain fine wire strain gauges. And also write its advantages and limitation.		CO4	
12	a)	Briefly discuss on the surface preparations and bonding techniques for mounting bonded strain gauges.		CO4	
	b)	List the essential charecterstics required for backing material of bonded strain gauges.	L2		1,2,3,4
13	a)	With a neat diagram explain elastic force meter. And also write its advantages and limitation.	L2	CO4	1,2,3,4
	b)	With a neat diagram explain strain gauge load cell. And also write its advantages and limitation.	L2	CO4	1,2,3,4
14	a)	With a neat diagram explain electrical torsion meter. And also write its advantages and limitation.	L2	CO4	1,2,3,4
	b)	With a neat diagram explain strain gauge torsion meters. And also write its advantages and limitation.		CO4	
15	a)	With a neat diagram explain working principle of mechanical dynamometer. And also write its advantages and limitation.	L3	CO4	1,2,3,4
	b)	With a neat diagram explain working principle of hydraulic friction dynamometer. And also write its advantages and limitation.		CO4	
16	a)	With a neat diagram explain working principle of sling psychrometer. And also write its advantages and limitation.	L3	CO4	1,2,3,4
	b)	With a neat diagram explain working principle of absorption hygrometer. And also write its advantages and limitation.		CO4	

UNIT V

Part – A (Short Answer Questions)

S.No.	Question	BT	CO	PO
1	What is control system?	L1	CO5	1,2,3,4
2	Define the terms in controlled media and controlled variable.	L1	CO5	1,2,3,4
3	What are error detectors?	L1	CO5	1,2,3,4
4	Explain the meaning of control action. List the common modes of control.	L1	CO5	1,2,3,4
5	List the basic elements of a feed back control system	L1	CO5	1,2,3,4
6	What is a servo mechanism?	L2	CO5	1,2,3,4
7	What are the basic elements of a mechanical system?	L1	CO5	1,2,3,4
8	What are pneumatic system?	L1	CO5	1,2,3,4
9	List the standard test signal.	L2	CO5	1,2,3,4
10	What is meant by order of the system?	L2	CO5	1,2,3,4

Part – B (Long Answer Questions)

		Question	BT	CO	PO
11	a)	Briefly discuss on AC and DC servomotors.	L2	CO5	1,2,3,4
	b)	With a neat sketch diffrentiate feed-back and non feed back control system.		CO5	
12	a)	Describe, with block diagram, the following closed loop systems (i) Automobile Steering System (ii) Biological control system	L2	CO5	1,2,3,4
13	a)	Draw the schematics and block diagram of a system representing boiler fitted with speed governor	L2	CO5	1,2,3,4
	b)	Explain how multiposition is different from two position control	L2	CO5	1,2,3,4
14	a)	With a neat block diagram explain closed loop steam boiler system.	L2	CO5	1,2,3,4
	b)	Briefly explain photo electric controls		CO5	
15	a)	Differentiate Open and closed loop control systems with a suitable example	L3	CO5	1,2,3,4
16	a)	Write short note on the transfer function.	L3	CO5	1,2,3,4

IX.   OLD QUESTION PAPERS

Q.P Code: ME2205PC   Hall Ticket No.:

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		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		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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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 tacho generators. [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 0^0 C is 100Ω. If the temperature co-efficient of Platinum is $3\,3.91 \times 10^{-3}$ $/^0$ C, then find its resistance at 100^0 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

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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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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

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 150×10^6 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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