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**BTECH**  
**(SEM IV) THEORY EXAMINATION 2023-24**  
**SENSOR AND INSTRUMENTATION**

TIME: 3 HRS

M.MARKS: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Q no.	Question	Marks	CO
a.	Define sensors and transducers.	02	1
b.	Classify sensors based on their principle of operation.	02	1
c.	What is thermal imaging?	02	2
d.	Define Thermistor, Thermocouple, and RTD	02	2
e.	Enlist data types used in virtual instrumentation.	02	3
f.	Why is software-based instrumentation essential for industrial automation?	02	3
g.	What is the difference between Analog and Digital IO?	02	4
h.	How are Data Sockets used for networked communication in data acquisition?	02	4
i.	Give few applications of smart sensors in automobiles.	02	5
j.	How do smart sensors communicate with external systems?	02	5

## SECTION B

2. Attempt any three of the following:

3 x 10 = 30

a.	Discuss the working of an LVDT-based diaphragm for pressure measurement.	10	1
b.	Explain the working principle of a Hall effect sensor for position sensing	10	2
c.	What are graphical programming techniques in virtual instrumentation? Describe the concept and advantages of virtual instrumentation.	10	3
d.	Explain the basic block diagram of data acquisition systems.	10	4
e.	Describe the general structure of smart sensors and their components.	10	5

## SECTION C

3. Attempt any one part of the following:

1 x 10 = 10

a.	Describe the measurement of displacement using a Potentiometer.	10	1
b.	How does a strain gauge measure force? A strain gauge has a gauge factor of 2.5 and is subjected to a force that causes a strain of 0.001. Calculate the change in resistance of the strain gauge if its initial resistance is 120 $\Omega$ .	10	1

4. Attempt any one part of the following:

1 x 10 = 10

a.	Discuss the working principles of Ultrasonic and Laser flow sensors.	10	2
b.	Explain the operation of Ultrasonic and Capacitive sensors for level measurement.	10	2

5. Attempt any one part of the following:

1 x 10 = 10

a.	Explain the use of WHILE and FOR loops in graphical programming.	10	3
b.	Define arrays, clusters, and graphs in the context of virtual instrumentation.	10	3

6. Attempt any one part of the following:

1 x 10 = 10

a.	Explain the operation of sigma-delta ADC.	10	4
b.	Discuss R-2R Ladder DAC with its advantages and applications. You have an 8-bit R-2R ladder DAC with a reference voltage of 3.3V. Calculate the output voltage for a digital input code of 00111010	10	4

7. Attempt any one part of the following:

1 x 10 = 10

a.	What are the characteristics of smart sensors?	10	5
b.	Discuss the role of smart sensors in automobile engine control.	10	5