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**BTECH**  
**(SEM III) THEORY EXAMINATION 2023-24**  
**SENSOR & INSTRUMENTATION**

TIME: 3HRS

M.MARKS: 70

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

**SECTION A**

**1. Attempt all questions in brief.**

**2 x 7 = 14**

| Q no. | Question   | Marks | CO |
|-------|--|-------|----|
| a.    | Define sensors and transducers.  | 2     | 1  |
| b.    | Discuss the use of a strain gauge in force measurement.                      | 2     | 1  |
| c.    | Explain the operation of a thermistor.                                       | 2     | 2  |
| d.    | Why is there a need for software-based instruments in industrial automation? | 2     | 3  |
| e.    | Compare successive approximation and sigma-delta ADCs.                       | 2     | 4  |
| f.    | Explain the working principle of a successive approximation ADC.             | 2     | 4  |
| g.    | Define self-calibration in the context of smart sensors.                     | 2     | 5  |

**SECTION B**

**2. Attempt any three of the following:**

**7 x 3 = 21**

|    |  |   |   |
|----|--|---|---|
| a. | Discuss the selection criteria for sensors in industrial applications.               | 7 | 1 |
| b. | Describe the working principle of a thermocouple and its advantages and limitations. | 7 | 2 |
| c. | Define virtual instrumentation and explain its graphical programming techniques.     | 7 | 3 |
| d. | Describe the operation of counters and timers in data acquisition systems.           | 7 | 4 |
| e. | Explain the characteristics of smart sensors   | 7 | 5 |

**SECTION C**

**3. Attempt any one part of the following:**

**7 x 1 = 7**

|    |  |   |   |
|----|--|---|---|
| a. | Describe the working principle and construction of an LVDT. How is it used for displacement measurement? | 7 | 1 |
| b. | Discuss the working principle and application of piezoelectric sensors in pressure measurement.          | 7 | 1 |

**4. Attempt any one part of the following:**

**7 x 1 = 7**

|    |   |   |   |
|----|---|---|---|
| a. | Describe the principles and applications of ultrasonic and laser flow sensors.  | 7 | 2 |
| b. | Describe the working principle of Hall effect sensors for position measurement. | 7 | 2 |

**5. Attempt any one part of the following:**

**7 x 1 = 7**

|    |  |   |   |
|----|--|---|---|
| a. | Explain the concept of WHILE and FOR loops in graphical programming.                         | 7 | 3 |
| b. | Discuss the structures such as Case, Sequence, and Formula nodes in virtual instrumentation. | 7 | 3 |



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Printed Page: 2 of 2

Subject Code: BOE305

Roll No:

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**M.MARKS: 70**

**6. Attempt any one part of the following:**

**7 x 1 = 7**

|    |   |   |   |
|----|---|---|---|
| a. | Discuss the basic block diagram of a data acquisition system. | 7 | 4 |
| b. | Explain the operation of an R-2R ladder DAC.                  | 7 | 4 |

**7. Attempt any one part of the following:**

**7 x 1 = 7**

|    |   |   |   |
|----|---|---|---|
| a. | Describe the general structure of smart sensors and their components.                               | 7 | 5 |
| b. | Discuss the applications of smart sensors in automatic robot control and automobile engine control. | 7 | 5 |

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