NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B,Tech.

SEM: III - THEORY EXAMINATION (2022 - 2023)

Subject: Sensors and its Applications

Time: 3 Hours   Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

<div align="center">SECTION A   20</div>

1. Attempt all parts:-

1-a.   Change in output of sensor with change in input is_____. (CO1)   1

         (a) Precision

         (b) Sensitivity

         (c) Accuracy

         (d) None of these

1-b.   The magnetic sensor is also known as (CO1)   1

         (a) Magnifier

         (b) Electrometer

         (c) Magnetic Field

         (d) Magnetometer

1-c.   Which type of sensors are used to generate information in object grasping and obstacle avoidance. (CO2)   1

         (a) Hall Effect sensor

         (b) Proximity sensor

(c) Light sensor

(d) Optical sensors

1-d.   _____ require both magnetic north and south pole to operate and release them. (CO2)   1

(a) Unipolar Hall Sensor

(b) Bipolar Hall Sensor

(c) Both (A) and (B)

(d) None

1-e.   _____ is the key for traditional instruments. (CO3)   1

(a) Software

(b) Hardware

(c) Hybrid

(d) None

1-f.   Array may be (CO3)   1

(a) one dimensional

(b) two dimensional

(c) multi dimensional

(d) All of the above

1-g.   Multiplexer is a _____ which takes several inputs and gives a single output. (CO4)   1

(a) Data Logging

(b) Data selector

(c) Display device

(d) Graphic recorder

1-h.   The error in the D/A converter output may be due to (CO4)   1

(a) Errors in the values of resistors used

(b) Monotonocity

(c) Small Resolution

(d) Its higher D/A speed

1-i.   Output of smart sensors will be _____.(CO5)   1

(a) Analog

(b) Digital

(c) Analog and Digital

(d) None

1-j.   What does "AI" stand for? (CO5)   1

        (a) Artificial Intelligence

        (b) Artificial Intellect

        (c) Automatic intellect

        (d) Automatic intelligence

2. Attempt all parts:-

2.a.   Define the following (a) Sensor, (b) Instrument. (CO1)   2

2.b.   Discuss the principle behind the use of LASER in flow measurement.(CO2)   2

2.c.   What is array shell? Also write down the difference between cluster and graphs. (CO3)   2

2.d.   Define the sample mode and hold mode. (CO4)   2

2.e.   Why do we use communication interface in smart sensors? (CO5)   2

<div align="center">SECTION B   30</div>

3. Answer any <u>five</u> of the following:-

3-a.   Explain the working of optical encoder with neat diagram. (CO1)   6

3-b.   Discuss the advantages and disadvantages of sound sensor with its operations and applications. (CO1)   6

3-c.   Explain reference junction compensation in thermocouple. Why does it is necessary? (CO2)   6

3-d.   Explain the working principle of J type and K type thermocouple. (CO2)   6

3-e.   Explain the operation of software based Virtual Instruments. (CO3)   6

3.f.   Define the following term with respect to performance characteristics of ADC: (a) Resolution, (b) dynamic range, (c) conversion time, (d) settling time. (CO4)   6

3.g.   Explain the operation of smart sensor. How does it different from normal sensor? Explain. (CO5)   6

<div align="center">SECTION C   50</div>

4. Answer any <u>one</u> of the following:-

4-a.   A piezoelectric crystal having the dimensions of 2.5 mm X 2.5 mm X 1 mm and a voltage sensitivity of 0.05 V-m is used for force measurement. Calculate the force if the voltage developed is 100V. (CO1)   10

4-b.   Explain the measurement of pressure using LVDT based diaphragm & piezoelectric sensor with the help of neat diagram. (CO1)   10

5. Answer any <u>one</u> of the following:-

5-a.   What is thermocouple? Explain its laws, principle, construction and working. (CO2)   10

5-b.   Explain the working of Hall effect sensor for position measurement.(CO2)   10

6. Answer any <u>one</u> of the following:-

6-a.   Explain the concept of WHILE and for loop. Also discuss the need of software based   10
        instruments for industrial automation. (CO3)

6-b.   List out the various functions available in structure. Explain all in brief. (CO3)   10

7. Answer any <u>one</u> of the following:-

7-a.   Enlist the types of DAQ system? Differentiate between analog and digital type DAQ. (CO4)   10

7-b.   Explain the working of following DAC: (a) Weighted Resistor and (b) R-2RLadder. (CO4)   10

8. Answer any <u>one</u> of the following:-

8-a.   Draw the general structure of smart sensors along with its components. Also explain the self   10
        calibration, self-testing & self-communicating characteristic of smart sensors. (CO5)

8-b.   Explain the following sensor for Automobile Engine Control: MAP sensor, Oxygen Sensor,   10
        Throttle Position Sensor, Crankshaft Position Sensor and Engine Coolant Temperature
        Sensor. (CO5)