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Subject Code:- AEC0304

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - APRIL 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.

SECTION A

20

1. Attempt all parts:-

- 1-a. Humidity sensors are divided into two types depending on output. (CO1) 1
- (a) TRUE
- (b) FALSE
- 1-b. The operation of Gas analyzer is based on the difference in _____ among gases. (CO1) 1
- (a) Capative Conductivity
- (b) Electrical Conductivity
- (c) Hydraulic Conductivity
- (d) Heat Conductivity
- 1-c. Thermocouple is a device used for the measurement of (CO2) 1
- (a) Low temperature
- (b) Medium temperature
- (c) High temperature
- (d) Pressure measurement

- 1-d. T – type thermocouple is made of _____ (CO2) 1
- (a) Iron - Constantan
 - (b) Copper - Constantan
 - (c) Platinum - Rhodium
 - (d) Chromel - Alumel
- 1-e. If possible, a sequence structure should be replaced with a(n): (CO3) 1
- (a) Event Structure
 - (b) For Loop
 - (c) State Machine
 - (d) While Loop
- 1-f. Who invented LABVIEW? (CO3) 1
- (a) Grublerowen
 - (b) Jeff Kodosky
 - (c) Philip Vaughan
 - (d) Robert Abalakovorkbench
- 1-g. A 10-bit D/A converter given a maximum output of 10.23V. The resolution is (CO4) 1
- (a) 10 mV
 - (b) 20 mV
 - (c) 15 mV
 - (d) 25 mV
- 1-h. What is stand alone data acquisition systems often called? (CO4) 1
- (a) Data Blogger
 - (b) Data selector
 - (c) Data Logger
 - (d) Digital Blogger
- 1-i. _____ function of the common sensor requires periodic inspection and calibration, to ensure that it is in normal use accurate enough. (CO5) 1
- (a) Self-test
 - (b) self calibration
 - (c) self diagnosis
 - (d) All of the above
- 1-j. Data recorders acquire data from _____ (CO5) 1

- (a) Transducers
- (b) Sensors
- (c) Both Transducers and Sensors
- (d) None

2. Attempt all parts:-

- | | | |
|------|---|---|
| 2.a. | Name the different type of sensors used in Agriculture. (CO1) | 2 |
| 2.b. | Discuss the doppler effect. (CO2) | 2 |
| 2.c. | Define For loop. (CO3) | 2 |
| 2.d. | What is timer? (CO4) | 2 |
| 2.e. | What do you mean by signal conditioner and processing unit? (CO5) | 2 |

SECTION B

30

3. Answer any five of the following:-

- | | | |
|------|--|---|
| 3-a. | A displacement transducer with a shaft stroke 3cm is applied to the circuit. The total resistance of the potentiometer is 5K-ohm. The applied voltage is 5V. When the wiper is 0.9cm from starting point, what is the value of output voltage? (CO1) | 6 |
| 3-b. | Explain the different types of LVDT with its advantages and disadvantages. (CO1) | 6 |
| 3-c. | A chromel – Alumel thermocouple is assumed to have nearly linear operating range upto 1100°C with an emf of 45.14mV at this temperature and the reference junction being 0°C. The thermocouple is exposed to a temperature of 840°C. A potentiometer is used as the cold junction and its temperature is 25°C. Calculate the emf indicated by the potentiometer. (CO2) | 6 |
| 3-d. | Describe the Capacitive proximity sensor with its applications. (CO2) | 6 |
| 3.e. | How to create an array on the block diagram with indexing and array constants? (CO3) | 6 |
| 3.f. | In a R-2R ladder type 4-bit DAC, find the output voltage when LSB, switch S1 is closed and other switches S2, S3 and S4 are grounded. Take Vref = 16 volts. (CO4) | 6 |
| 3.g. | Draw the sensor structure with self-testing or self-calibration. (CO5) | 6 |

SECTION C

50

4. Answer any one of the following:-

- | | | |
|------|--|----|
| 4-a. | What is Infra-red sensor? Discuss the working principle of infra-red sensor with its applications. (CO1) | 10 |
|------|--|----|

4-b. Explain the specifications of the transducer in detail. (CO1) 10

5. Answer any one of the following:-

5-a. A Thermistor has a resistance of 3980 ohms at the ice point 0°C and 794 ohms at 50°C. The resistance temperature relationship is $R_T = aR_0 \exp(b/T)$ (CO2) 10

i. Find a and b.

ii. Find the value of resistance at Absolute temperature 100°C and 40°C.

5-b. With the help of neat sketch, explain the working of Ultrasonic flow meter with its applications. (CO2) 10

6. Answer any one of the following:-

6-a. Define the concept of For loop and While loop with example. (CO3) 10

6-b. Define: Module, Local variables, Global Variables, Property Node and Formula Node. (CO3) 10

7. Answer any one of the following:-

7-a. What is counter? Discuss the operations of synchronous and asynchronous counter with advantages and disadvantages. (CO4) 10

7-b. Explain applications of 555 timer in detail. (CO4) 10

8. Answer any one of the following:-

8-a. Write the need of smart sensors in automatic robotic control? (CO5) 10

8-b. Which combinational and sequential circuits are used for smart sensors? Explain them in detail. (CO5) 10