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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

SUMMER TERM END TERM EXAMINATION - AUGUST 2024

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| **Semester: V** | **Date :05-08-2024** |
| **Course Code: EEE3016** | **Time:** **1.00pm to 4.00pm** |
| **Course Name:** **Sensors, Actuators and Control** | **Max Marks :100** |
| **Program: B.TECH-ISE** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 4M=20M** | | | |
| 1 | The **Thermistor** is a solid state temperature sensing device which acts a bit like an electrical resistor but is temperature sensitive. Define the self heating effect of a thermistor. | (CO 1) | [Knowledge] |
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| 2 | The resistance wire of the Resistive Temperature Detector (RTD) is mostly made up of platinum, nickel, or copper. List the features of these materials that made them suitable to use as a resistive element in RTD. | (CO 1) | [Knowledge] |
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| 3 | Capacitive and inductive sensors are two very common non-contacting sensors which are used to detect the presence of an object.  List the differences between Capacitive and Inductive proximity sensors. | (CO 2) | [Knowledge] |
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| 4 | List the advantages of LVDT | (CO 2) | [Knowledge] |
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| 5 | List different types of actuators used in robotic applications | (CO 3) | [Knowledge] |
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| 6 | List the guidelines to Select Actuators for Robotic applications | (CO 3) | [Knowledge] |
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| 7 | List any 2 advantages and 2 disadvantages of chemical sensors | (CO 4) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** | | | |
| 8 | A manufacturing industry need a sensor for the remote monitoring of its plant temperature. The temperature has to be monitored continuously and is to be used for temperature control. Identify a sensor which is having a linear characteristic for this industry. With neat circuit diagram explain its working. | (CO 1) | [Comprehension] |
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| 9 | Capacitive pressure sensor can be used for measuring gas or liquid pressures in jet engines, car tiers, the human body and many other places. It can also be used as tactile sensors in robotic applications. With neat sketch explain the principle and working of capacitive pressure sensor | (CO 1) | [Comprehension] |
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| 10 | A noncontact sensor is required to use in a metal detector. The device should be suitable to use in outdoor and non-hygienic conditions and it should be compact. Identify the suitable sensor and with neat sketch explain its construction and working principle. | (CO 2) | [Comprehension] |
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| 11 | Due to the rise of e-commerce, material handling industry has been experiencing significant changes The demand for Autonomous Mobile Robot (AMR) for material handling is rapidly increasing. One of the main challenges in autonomous operation in an unstructured environment is gapless perception. Identify a sensor that can be mounted on the robots to avoid collisions and ensure safe operation. With neat sketch explain the construction and working principle of the same. | (CO 2 ) | [Comprehension] |
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| 12 | An automobile industry required a linear electric actuator for its robotic control system to perform a forward and backward movement. Suggest a suitable actuator for the same. The actuator should be capable of creating short and quick motion. With neat sketch explain the principle and working of the sensor | (CO 3 ) | [Comprehension] |
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| 13 | Identify a micro sensor that can be used as a trigger to activate airbags in automobilesin an event of collision. The Sensor should also sense the excessive vibration of the vehicle. With neat sketch explain the principle and working of the sensor | (CO 4 ) | [Comprehension] |
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| 14 | Identify a micro actuator that can be used in the device to generate audio sound waves. The device should be biocompatible, suitable for sensing also. With neat sketch explain its construction and working | (CO 4 ) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 15M=30M** | | | |
| 15 | 1. The resistance of platinum resistance thermometer varies with the temperature. This property  is used for measuring the temperature. The resistance of a platinum wire of a platinum resistance thermometer at the ice point is 5Ω, and at steam point is 5.4Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 6.2Ω. Find the temperature of the hot bath. 2. List the advantages and disadvantages of platinum resistance thermometer. | (CO1) | [Application] |
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| 16 | The thermisto**r** is a solid state temperature sensing device which acts a bit like an electrical resistor but is temperature sensitive.  The working principle of a thermistor is that its resistance is dependent on its temperature. A 10kΩ NTC thermistor has a “β” value of 3455 between the temperature range of 25 degree Celcius and 100degree Celcius. Calculate its resistive value at 25degree Celcius and again at 100degree Celcius. | (CO2) | [Application] |
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| 17 | 1. The capacitor microphone can be very linear in operation and can provide very good quality audio signals without the need for elaborate constructional techniques. With neat sketch explain the working of capacitive microphone 2. A resistance thermometer which measures temperature by measuring the change in the resistance of the conductor has a resistance of 50Ω at 20°C. When the device is immersed in a vessel containing melting Indium, it’s resistance increases to 76.8Ω. Find the melting point of Indium. Use α = 3.92 x 10-3 °C-1 | (CO3) | [Application] |
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