

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Supplementary Examination June 2022 (2015 Scheme)

**Course Code: ME407****Course Name: MECHATRONICS**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any three full questions, each carries 10 marks.*

Marks

- |   |   |      |
|---|---|------|
| 1 | a) What is the working principle of RTD? List out its advantages and disadvantages  | (5)  |
|   | b) Explain the working of eddy current proximity sensor   | (5)  |
| 2 | Compare the encoder wheel layout of binary code absolute encoder and grey code absolute encoder with 45° resolution. Mention the binary to grey code conversion using tabular format. | (10) |
| 3 | Explain the working of pressure-limiting valve and pressure sequence valve with a neat sketch. Draw the symbol for the same.  | (10) |
| 4 | a) Discuss the use of diaphragm actuator in process control valves.   | (5)  |
|   | b) Illustrate the working of an accumulator in hydraulic power supply.  | (3)  |
|   | c) Sketch the following valve bodies used in process control valves.<br>(i) Single-seated, normally open (ii) Single-seated, normally closed  | (2)  |

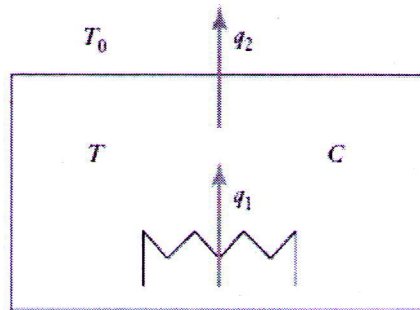
**PART B***Answer any three full questions, each carries 10 marks.*

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|---|---|------|
| 5 | An airbag deployment system in automobile utilizes change in capacitance or piezoresistivity to sense a crash. Suggest the configuration and working of MEMS device used in the system. | (10) |
| 6 | a) What are the different shapes of Slideways that are commonly used? What are their advantages & Disadvantages?  | (6)  |
|   | b) Differentiate between an open loop and closed loop control system  | (4)  |
| 7 | a) Illustrate the process of bulk micromachining and surface micromachining.  | (5)  |
|   | b) Distinguish between positive and negative resist. Include sketches.  | (5)  |
| 8 | Explain the internal architecture of PLC with a neat sketch. Mention the three features of PLC which are specific to their use as controller.   | (10) |

## PART C

*Answer any four full questions, each carries 10 marks.*

- 9 The figure below shows a thermal system consisting of an electric fire in a room: (10)  
The fire emits heat at the rate  $q_1$  and the room loses heat at the rate  $q_2$ . Develop a mathematical model which describes the change in room temperature with reference to time. Assume that the air in the room is at a uniform temperature  $T$  and that there is no heat storage in the walls of the room. Assume any missing parameters.



- 10 a) Explain any one method used for speed control with feedback in brush-type DC motors. (5)  
b) Compare the working of three phase induction motor and three phase synchronous motor. (5)
- 11 Discuss the working of mechatronics system-based automobile engine management system with the help of a neat sketch and block diagram. (10)
- 12 a) Explain the three functions of robotic vision system. (6)  
b) Explain the thresholding technique in image processing. (4)
- 13 a) Explain the physical system and working of a pick and place robot with a neat sketch. (5)  
b) Illustrate the working of a vidicon camera. (5)
- 14 a) Explain the direct time delay measurement and indirect amplitude modulation technique used in light based range finders. (5)  
b) Describe the working of any one type of a force sensor. (5)

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