

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING) / B.Tech. AEROSPACE
ENGINEERING (BTAE)**

Term-End Examination,

December 2019

BME-006 : MECHATRONICS

Time : 3 Hours]

[Maximum Marks : 70

Note : (i) *Answer any seven questions.*

(ii) *All questions carry equal marks.*

(iii) *Use of scientific calculator is permitted.*

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1. a) What is the difference between a thermocouple and a thermistor? 5
b) What is the main advantage of a capacitive proximity switch over the inductive proximity switch? 5
 2. a) Describe the working of any cam-controlled system with the help of a neat diagram. 5
b) Give the advantages and disadvantages of ball screw over power screw. 5
 3. a) Explain the working principle of relay with the help of a neat sketch. 5
b) Draw and explain PLC structure and write the advantages of PLC over microcomputer. 5
 4. a) Differentiate between open-loop and closed-loop control system. 5

(2)

- b) Apply the Routh-Hurwitz criterion to determine the stability of the systems whose characteristic equations are given by : 5
- i) $s^4 + 4s^3 + 2s + 15 = 0$
- ii) $s^5 - 2s^4 + 3s^3 + 5s^2 - 10s - 15 = 0$
5. a) A 6-bit D/A converter gives an output voltage of 12.15 V for an input of 011011. What is the step size, the full range voltage and the percentage resolution? 5
- b) Determine the binary equivalent of $(231)_8$. 5
6. a) Identify the sensor, signal conditioner and display elements in the measurement system of a mercury-in-glass thermometer. 5
- b) Identify the various elements that might be present in a control system involving a thermostatically controlled electric heater. 5
7. a) What are the two types of data transfer techniques used in computer interfacing? List out the main differences between them. 5
- b) What do you mean by inverse kinematics? Briefly explain the importance of path planning. 5
8. Write short notes on **any five** of the following : 5×2=10
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|--------------|--------------------|
| a) Amplifier | b) Accumulator |
| c) Actuators | d) Diode |
| e) Robot | f) Tactile sensing |
| g) Accuracy | h) Modem |

