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B. TECH. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)/ B. TECH. AEROSPACE ENGINEERING (BTME/BTAE)
Term-End Examination
June, 2019

BME-006 : MECHATRONICS

Time : 3 Hours   *Maximum Marks : 70*

Note : Attempt any seven questions. All questions carry equal marks. Use of Scientific Calculator is permitted.

1. (a) Identify the sensor, signal conditioner, and display elements in the measurement systems of a mercury-in-glass thermometer.   5

   (b) Explain what is meant by sequential control and illustrate your answer by an example.   5

(A-37) P. T. O.

2. (a) Describe the principle of working of pilot operated valve along with some applications.   5

   (b) A force of 600 N is required to open a process control valve. What area of diaphragm will be needed with a diaphragm actuator to open the valve with a control gauge pressure of 80 kPa ?   5

3. (a) How does a microcontroller differ from a microprocessor ? Explain with respect to specific applications.   5

   (b) How do you classify transducers ? Describe the working of any type of transducer. Also list out some industrial applications of transducers.   5

4. (a) Differentiate between active and passive sensors. What are the requirements for selecting a sensor ?   5

   (b) Describe the components of a continuous sensing system.   5

5. (a) A 6-bit D/A converter gives an output voltage of 15.75 volts for an input of 101010. What is the step size, the full range voltage and the percentage resolution ? 5

(b) Apply the Hurwitz-Routh criterion to determine the stability of the system whose characteristics equation is given by :

5

$$3s^5 - 2s^4 + 2s^3 - 12s - 8 = 0.$$

6. What are the various types of CAMs and followers used in the mechanism of mechanical systems ? Explain in detail with neat sketches and suitable examples. 10

7. (a) Determine the octal, equivalent of $(432267)_{10}$. 5

(b) Subtract $(75)_{16}$ from $(527)_{16}$. 5

8. (a) What are the limitations of two-step (on-off) control and in what situation is such a control system commonly used ? 5

(b) Explain the structure and function of a Programmable Logic Controller. 5

9. (a) Describe the basic principles of stepper-motors and servo-motors.   5

   (b) Differentiate between air-amplifier and intensifier.   5

10. Write short notes on any *five* of the following :

                                        (5×2=10)

   (i) Digital-to-Analog Converter

   (ii) Error Signal

   (iii) Simulation

   (iv) BIT

   (v) Modem

   (vi) Robot

   (vii) Accuracy

   (viii) Sensitivity