

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

**Term-End Examination**

00253

**June, 2018**

**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.
- (b) Explain the open-loop and closed-loop control systems with the help of neat diagram. 5+5
  
2. (a) Explain the working and draw the symbols for
  - (i) a pressure relief valve, and
  - (ii) a 2/2 valve which has actuators of a push-button and a spring.
- (b) Describe the principle of working of pilot operated valve. 5+5

3. (a) Draw the ladder rungs to represent two switches which are normally open and both have to be closed for a motor to operate.
- (b) How do you classify transducers ? Also list out some industrial applications of transducers. 5+5
4. (a) Describe the components of a continuous sensing system with a neat block diagram.
- (b) What are the main advantages of a capacitive proximity switch over an inductive proximity switch ? 5+5
5. (a) Explain the construction and principle of working of a Linear Variable Differential Transformer (LVDT). Discuss how the magnitude and the direction of the displacement of the core of a LVDT is detected.
- (b) Differentiate between a pressure relief valve and a pressure reducing valve. 5+5
6. (a) Describe the working of wrist sensors. Also explain their applications.
- (b) Determine the binary equivalent of  $(5AF)_{16}$ . 5+5
7. (a) What are the limitations of two-step (on-off) control and in what situation is such a control system commonly used ?
- (b) Convert the following decimal numbers, 200, 235, and 425 to binary numbers. 5+5

8. (a) A 6-bit D/A converter gives an output voltage of 17.250 volts for an input of 010111. What is the step size, the full range voltage and the percentage resolution ?
- (b) What is an electrical actuation system ? Enumerate the different electrical actuators. 5+5
9. (a) What are the two types of data transfer techniques used in computer interfacing ? List out the main differences between them.
- (b) A DC motor takes an armature current of 110 A at 480 V. The resistance of armature circuit is 0.2  $\Omega$ . The machine has six poles and the armature is lap connected with 864 conductors. The flux per pole is 0.5 Wb.
- Calculate
- (i) the speed, and
- (ii) the gross torque developed by the system. 5+5
10. (a) Describe the characteristics of proportional plus integral plus derivative control.
- (b) Apply the Hurwitz-Routh criterion to determine the stability of the systems whose characteristic equation is given as :

$$s^5 + 10s^4 + 11s^2 - 9s - 10 = 0. \quad 5+5$$