

**B.Tech. MECHANICAL ENGINEERING  
(BTMEVI)**

**Term-End Examination**

**December, 2012**

**BIME-016 : 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) What is a sensor ? Explain active and passive sensors. Also list out the basic requirements of sensors. **2x5=10**  
(b) How do you classify transducers ? Describe the working of transducer of any one type. Also list out some industrial applications of transducers.
  
2. (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 ? **2x5=10**  
(b) Show the binary addition and subtraction of 175 (decimal) and 225 (decimal).
  
3. (a) What is a proximity switch ? Describe in detail, all its industrial applications. **2x5=10**  
(b) Describe four different sensing modes for photoelectric sensors.

4. (a) Explain the working principles of a relay with the help of a schematic diagram.  $2 \times 5 = 10$
- (b) Draw and explain the PLC structure. Also write the advantages of PLC over micro computer.
5. (a) What are the two types of data transfer techniques used in computer interfacing? List out the main differences between them.  $2 \times 5 = 10$
- (b) Describe and compare the characteristics of proportional plus integral plus derivative control.
6. (a) What are the advantages of hydraulic actuators over mechanical actuators.  $2 \times 5 = 10$
- (b) With the help of a neat sketch describe how the hydraulic system can be used to amplify force.
7. (a) Define the term "process control". Explain with a block diagram the process control system.  $2 \times 5 = 10$
- (b) Discuss functions of feedback systems used in process control. Describe the difference between open loop and closed loop control.

8. (a) Identify the sensor, conditioner, and display elements in the following measuring instrument : 2x5=10
- (i) a mercury - in - glass thermometer, and
  - (ii) a bourdon pressure gauge.
- (b) Identify the various elements that might be present in a control system involving thermostatically controlled electric heater.
9. (a) Explain what is meant by sequential control and illustrate your answer with a suitable example. 2x5=10
- (b) Discuss the scope and advantages of NDT with the help of suitable examples.
10. Write short notes on *any four* of the following :
- (a) Dye penetrant testing 4x2½=10
  - (b) Fuzzy logic
  - (c) Microprocessor
  - (d) Radiography
  - (e) Acoustic emission
  - (f) Electrical actuators
-