

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

Term-End Examination

00386

June, 2015

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. Explain the principle of operation of an ultrasonic range sensor with the help of a neat diagram. 10

2. Describe the architecture of a PLC with a suitable diagram. 10

3. (a) Identify the sensor, signal conditioner and display elements in the measurement systems of
 - (i) a mercury glass thermometer, and
 - (ii) a Bourdon.

- (b) Explain the difference between open and closed-loop control systems with the help of a neat diagram. 5+5

4. Compare and contrast the control system for the domestic central heating system involving bi-metallic thermostat and that involving a microprocessor.

10

5. (a) What is the resolution of an analogue-to-digital converter with a word length of 12 bits and an analogue signal input range of 100 V ?

(b) A sensor gives a maximum analogue output of 5 volts. What word length is required for an analogue-to-digital converter if there is to be a resolution of 10 mV ?

5+5

6. (a) Describe and compare the characteristics of a

(i) proportional control,

(ii) proportional plus integral control,

(iii) proportional plus integral plus derivative control.

(b) A stepper motor has step angles of 2 degrees. If it has to rotate at 200 rpm, what pulse rate should be given to the motor ?

5+5

7. (a) A 6-bit D/A converter gives an output voltage of 10.125 volts for an input of 011011. What is the step size, the full range voltage and the percentage resolution ?

(b) What is the binary equivalent of hex 7AF4 ? Convert that binary number into equivalent decimal and octal numbers.

5+5

8. What do you understand by the sensors ? How are the sensors classified ? Explain in detail any two types of sensors used in an automobile parts manufacturing company. 10
9. (a) What are the major guidelines for the selection of a sensor ?
- (b) Convert the following decimal numbers 200, 235 and 425 to binary numbers. 5+5
10. Write short notes on any *four* of the following : $4 \times 2 \frac{1}{2} = 10$
- (a) Dye Penetrant Testing
- (b) Fuzzy Logic
- (c) Microprocessor
- (d) Microcontroller
- (e) Radiography
- (f) Acoustic Emission
-