

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

**Term-End Examination**

**June, 2017**

**00844**

**BIME-016 : MECHATRONICS**

*Time : 3 hours*

*Maximum Marks : 70*

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***Note :** Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. (a) Draw a block diagram of a basic microcontroller and explain the function of each subsystem.
- (b) Identify the sensor, signal conditioner and display elements in the measurement systems of a Bourdon tube pressure gauge. 5+5
2. (a) Identify the various elements that might be present in a control system involving a thermostatically controlled electric heater.
- (b) Explain what is meant by sequential control and illustrate your answer with an example. 5+5

3. (a) Explain the significance of the following information given in the specification of transducers :
- (i) A capacitance fluid pressure transducer.  
Accuracy :  $\pm 1\%$  of displayed reading
  - (ii) Inductive displacement transducer.  
Linearity :  $\pm 1\%$  of rated load
- (b) Describe the basic details of any **one** of the following valves :
- (i) A poppet valve
  - (ii) A shuttle valve 5+5
4. (a) A force of 400 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 70 kPa ?
- (b) What are the limitations of two-step (on-off) control and in which situation is such a control system commonly used ? 5+5
5. (a) Describe the characteristic of proportional plus integral plus derivative control.
- (b) Convert the following binary numbers to decimal numbers :
- (i) 1011
  - (ii) 1000010001 5+5



6. (a) Draw the ladder rungs to represent :  
Two switches that are normally open and both have to be closed for a motor to operate.
- (b) Differentiate between a resolver and an encoder. 5+5
7. (a) Describe the components of a continuous sensing system with a neat block diagram.
- (b) What do you mean by inverse Kinematics ? Briefly explain the importance of path planning. 5+5
8. (a) A 6-bit D/A converter gives an output voltage of 20.25 volts for an input of 110110. What is the step size, the full range voltage, and the percentage resolution ?
- (b) What are the techniques for non-destructive testing employed in ultrasonic testing ? What are its advantages as compared to other methods of non-destructive testing ? Is it applicable for non-ferrous metals ? Why or why not ? 5+5
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