

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

Term-End Examination

00400

June, 2016

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. Assume missing data, if any.*

1. (a) Describe the working of any cam-controlled system.

(b) Discuss with a neat diagram how a hydraulic system can be used to amplify force.

5+5

2. (a) A 6-bit D/A converter gives an output voltage of 14.175 volts for an input of 011011. Determine the step size, the full range voltage, and the percentage resolution of the converter.

- (b) What is the binary equivalent of hex 74F4 ?
Convert that binary number into
equivalent decimal and octal numbers. 5+5
3. (a) Identify the sensor, signal conditioner and
display elements in the measurement
systems of
- (i) a mercury-in-glass thermometer, and
 - (ii) a Bourdon pressure gauge.
- (b) Explain the difference between open-loop
and closed-loop control systems. 5+5
4. (a) Explain the significance of the following
information given in the specification of
transducers :
- (i) A piezoelectric accelerometer
Non-linearity : $\pm 0.5\%$ of full range
 - (ii) A capacitive linear displacement
transducer
Non-linearity and hysteresis : $\pm 0.01\%$
of full range
- (b) Identify the various elements that might be
present in a control system involving a
thermostatically controlled electric
heater. 5+5

5. (a) Explain the function of a programmable logic controller.
- (b) What is the difference between a thermo-couple and a thermistor ? 5+5
6. (a) Describe four different sensing modes for photoelectric sensors.
- (b) Discuss the basic details of
- (i) a poppet valve, and
- (ii) a shuttle valve. 5+5
7. (a) What is the non-linearity error, as a percentage of full range, produced when a 1 k Ω potentiometer has a load of 10 k Ω and is at one-third of its maximum displacement ?
- (b) A pneumatic system is operated at a pressure of 1000 kPa. What diameter cylinder will be required to move a load requiring a force of 12 kN ? 5+5
8. (a) Explain the principle of a pilot-operated valve.
- (b) What are the major guidelines for the selection of a sensor ? 5+5

9. (a) Explain in brief the methods for range sensing with the help of a neat diagram.
- (b) Describe the working of the following pumps with diagrams :
- (i) Gear pump
 - (ii) Vane pump 5+5
10. (a) Compare microcomputer and microprocessor.
- (b) What are the advantages of hydraulic system over mechanical system ? 5+5
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