

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

**Term-End Examination**

**December, 2015**

**BME-006 : 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. Assume missing data, if any.*

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1. (a) Describe the different Registers of Intel 8086 Microprocessor.  
(b) Explain the construction and working principle of Brush type and Brush-less type D.C. motors. 5+5
  
2. (a) What are the limitations of the two-step (on-off) control and in what situation is such a control system commonly used ?  
(b) Explain how a sequential valve can be used to initiate an operation only when another operation has been completed. 5+5

3. (a) Differentiate between a resolver and an encoder.
- (b) What is the main advantage of a capacitive proximity switch over the inductive proximity switch ? 5+5
4. (a) A first-order system has a time constant of 4 sec and a steady state transfer function of 6. What is the form of the differential equation for this system ?
- (b) A mercury-in-glass thermometer has a time constant of 10 sec. If it is suddenly taken from being at 20°C and plunged into hot water at 80°C, what will be the temperature indicated by the thermometer after (i) 10 sec, and (ii) 20 sec ? 5+5
5. (a) What will be the change in resistance of an electrical resistance strain gauge with a gauge factor of 2.1 and resistance 50  $\Omega$ , if it is subject to a strain of 0.001 ?
- (b) Suggest a sensor that could be used, as part of a control system, to determine the difference in levels between liquids in two containers. The output is to provide an electrical signal for the control system. 5+5

6. (a) A 6-bit D/A converter gives an output voltage of 7.875 volts for an input of 010101. What is the step size, the full range voltage, and the percentage resolution ?
- (b) Show the binary addition and subtraction of 275 (decimal) and 425 (decimal). 5+5
7. (a) Describe the components of a continuous sensing system with a neat block diagram.
- (b) Briefly explain the desired qualities of a hydraulic oil. 5+5
8. (a) What do you mean by inverse kinematics ? Briefly explain the importance of path planning.
- (b) How can a transistor be used as a switch ? Explain with the help of a neat diagram. 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) Describe and compare the characteristics of proportional plus integral plus derivative control. 5+5

10. (a) Briefly explain the principle of operation of photoelectric sensors and fluid flow switch with a neat diagram.
- (b) What is GRAFCET ? What are the advantages of GRAFCET over ladder logic ?

5+5

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