

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

Term-End Examination

June, 2014

BIME-016 : MECHATRONICS

Time : 3 hours

Maximum Marks : 70

Note : Answer any five questions. All questions carry equal marks. Use of scientific calculator is permitted.

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| 1. | (a) Compare and contrast a close loop and open loop system. Is it possible to convert an open loop system into a close loop system ? Explain. | 7 |
| | (b) Briefly explain the mechatronic sub-system design considerations. | 7 |
| 2. | (a) A load-cell (Using a strain-guage) is devised to measure force with a digital display and computer interface. Explain with the help of a block diagram all essential elements of this system. | 7 |
| | (b) Briefly explain the static characteristic of transducers. | 7 |
| 3. | A load cell, formed of a hollow steel cylinder is loaded axially. The four strain guages are so connected as to enhance the signal and to compensate for temperature variation. The load cell has a cross-sectional area of 2.5 cm^2 . The Young's modulus of steel is $2.25 \times 10^{11} \text{ N/m}^2$, strain guage resistance is 1000Ω , guage factor is 2%. The current in each strain guage is limited to 20 mA. Find : | 14 |

- (a) The Bridge Supply Voltage
- (b) Current in the detector arm if this consist of a micro ammeter of resistance 500, when the load cell is subjected to a force of 10^5 N.
4. (a) Describe with the help of neat sketch the construction and working of : 7
- (i) A Shuttle valve
- (ii) Pappet valve
- (b) Explain the characteristics application and function of ball screw mechanism. 7
5. An automatic beverage plant packages 950 ml of soft drink in bottles. Suggest a metering system which can be used to serve the purpose. Explain with the help of a neat diagram its basic elements and its operation. 14
6. (a) Discuss principle of operation of an ultrasonic flow detector. List all the features for which ultrasonic technique is not suitable. 7
- (b) Briefly explain the steps that are involved in the dye penetrant testing. 7
7. Write short notes on **any three** of the following : 14
- (a) Sequential Controllers
- (b) Dynamic Characteristics
- (c) Pyro-electric Sensors
- (d) Summing Amplifier
- (e) Visual Inspection