

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 710806N**Date: 08-01-2014****Subject Name: Mechanical Engineering for Mechatronics****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Explain with neat sketch the basic elements of the control system of an engine management system. **07**

(b) Define mechatronics. Explain various modules of mechatronics system. **07**

Q.2 (a) What is proximity sensors? Explain in detail at least two examples of proximity sensors. **07**

(b) Explain principle of light sensors. Explain different types of light sensors with their application. **07**

OR

(b) A Strain gauge pressure sensor has the following specification. Will it be suitable for measurement of pressure of order of order of 100 KPa to an accuracy of ± 5 kPa In an environment where the temperature is reasonably constant at about 20° C.? **07**

Ranges 2 to 70 MPa, 70 kPa to 1MPa

Excitation 10 V d.c.or a.c.(r.m.s)

Full range output : 40mv

Nonlinearity and Hysteresis error ± 0.5 %

Temperature range -54 to 120degree centigrade

Thermal shift zero 0.030 % full range output/degree centigrade

Thermal shift sensitivity 0.030 % full range output /degree centigrade

Q.3 (a) Explain with neat sketch Meter In and Meter out circuit in Hydraulic system. **07**

(b) Write three basic types of faults in pneumatic systems. When the fail safe circuits employed in pneumatic systems? **07**

OR

Q.3 (a) Explain throttling circuits with throttle in the forward line and backward line for hydraulic system. **07**

(b) Explain the function of a relief valve with the help of relieving circuit for a hydraulic system. **07**

Q.4 (a) Explain modeling of linear actuator & rotary actuator. **07**

(b) Derive an equation for a system having input force F with the output displacement X for a system described by damper C and mass m. **07**

OR

Q.4 (a) Derive a equation relating the input voltage to a d.c. servomotor & the output angular velocity assuming the motor is armature controlled. **07**

Q.4 (b) Explain modeling of throttle valve and relief valve. **07**

Q.5 (a) Explain various shapes of slide ways in machine tool. **07**

(b) Explain recirculating ball screws in machine tool design. **07**

OR

Q.5 (a) What is stick slip phenomenon ? How it is minimized? **07**

(b) Explain strength and rigidity consideration in machine tool design. Why rigidity consideration is widely used for machine tool structure design ? **07**
