Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 710806N
Subject Name: Mechanical Engineering for Mechatronics

Date: 04 /02 /2011 **Time: 02.30 pm – 05.00 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 Automatic Camera. **07**

(b) How design of Mechatronics differs from traditional design? **07**

Q.2 **(a)** Define Hall effect. Explain the linear and threshold hall effect sensors. **07**

(b) A thermocouple element when taken from a liquid at 50^0 C and plunged into a liquid at 100^0 C at time t=0 gave the following e.m.f. values. Determine the 95% response time. **07**

Time(s):	0	20	40	60	80	100	120
e.m.f.(mv):	2.5	3.8	4.5	4.8	4.9	5.0	5.0

OR

(b) A pressure sensor consisting of a diaphragm with strain gauges bonded to its surface has the following information in its specification. **07**
Ranges: 0 to 1400KPa, 0 to 35000KPa
Non-linearity error: +/-0.15% of full range.
Hysteresis error: +/- 0.05% of full range.
What is the total error due to non-linearity & hysteresis for a reading of 1000KPa on the 0 to 1400KPa range?

Q.3 **(a)** Explain Hydrostatic transmission with neat sketch. **07**

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

OR

Q.3 **(a)** Explain the function of a Relief valve, with the help of a relieving circuit for a Hydraulic system. **07**

(b) Derive the equation for the Pull of a double-acting cylinder. **07**

Q.4 **(a)** Explain Thermal system. Derive the equation for modeling of a Thermal system. **07**

(b) Derive a differential equation relating the input voltage to a d.c. servo motor & the output angular velocity, assuming that the motor is armature controlled & the equivalent circuit for the motor has an armature with just resistance, its inductance being neglected. **07**

OR

Q.4 **(a)** Give the modeling of flow control valves. **07**

(b) Derive an equation relating the input, force F, with the output, displacement x, for a system described by a damper c, & mass m. **07**

Q.5	**(a)**	Give the detail classification of Guideways. Write the basic principles of design for strength & for rigidity of machine tool structures.	**07**
	(b)	Explain Hydrodynamic effect with suitable sketch. State the criterion for bearing material selection.	**07**

OR

Q.5	**(a)**	What is stick-slip phenomenon? Explain in brief the techniques to minimize stick-slip motions.	**07**
	(b)	What is preloading? Describe its methods for recirculating ball screw.	**07**

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