Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 2714703 **Date: 09-01-2015**

Subject Name: Sensor Technology

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary and clearly mention the same.**
3. **Figures to the right indicate full marks.**
4. **Draw neat schematic diagrams wherever necessary. Diagrams with inferior quality may not be awarded credit.**

Q.1 **(a)** Explain the following sensor characteristics. Support your answer with neat schematic diagrams. **07**

Hysteresis, Output impedance, Dead band, Excitation, Accuracy

(b) Evaluate the statement with suitable examples: ñMercury gravitational sensors are used as analog and digital sensors both.ò Give suitable examples. **07**

Q.2 **(a)** Describe in detail the working principle of Hall Effect sensor with the help of neat schematic diagrams and its equivalent circuit. How can a Hall Effect sensor be utilized to detect slip in robotic application? Discuss about the set up and sensitivity of this sensor for slip sensing. **07**

(b) Explain various time-dependent characteristics of sensors using linear differential equations. Give practical applications of each case to support your answer. **07**

OR

(b) Explain the following in terms of environmental factors affecting the sensor. **07**

1. Short term and long term drift along with the materials responsible for it to occur and pre-aging effect
2. Self-heating error and measures to reduce it

Q.3 **(a)** Explain the principle of induction and self-induction to bring out the concept of induction of a coil (L). With the help of the mathematical equation of induction of a coil (L), evaluate that the voltage polarity is different for increased and decreased currents flowing in the same direction. **07**

(b) Describe in brief the following principles: **07**

1. Seebeck effect
2. Pyroelectric effect

OR

Q.3 **(a)** Explain the design and working principle of moisture detecting sensor with neat schematic diagrams and its transfer function. Give suitable practical applications of this sensor. **07**

	(b)	What is the full form of LVDT and RVDT? Define working of LVDT and RVDT both for pressure measurement. Support your answer with the design and set up of these sensors for pressure measurement. Assume suitable data, if necessary to design this set up and clearly mention the same.	**07**
Q.4	**(a)**	Differentiate between absolute and incremental encoders for distance measuring application. Give explanation about linear and rotary encoders for linear and rotational measurements.	**07**
	(b)	Design and develop a sensor for measuring the thickness of thin film on flat and curved surfaces. Give details about the working principle and set up of the sensor proposed by you. Assume suitable data and clearly mention the same.	**07**

OR

Q.4	**(a)**	Evaluate the statement: ñSensor based on the working principle of Eddy current is used to detect the size and shape of the component for its acceptance or rejection.ò Support your answer with the description of complete set up and working principle of sensors based on the working principle of eddy current.	**07**
	(b)	Compare and contrast using neat sketches between the proximity detector with polarized light and proximity detector with transverse inductive principle.	**07**
Q.5	**(a)**	Give details of various tactile sensors available for various robotic applications with suitable examples and explanation.	**07**
	(b)	Justify the statement: ñStrain gauge sensors are used for force, torque and temperature measurement.ò Support your answer with suitable explanation and appropriate examples.	**07**

OR

Q.5	**(a)**	Evaluate the statement: ñHigh end and low end trimmer resistors are used to control linearity errors of linear potentiometer.ò	**07**
	(b)	Explain the working principle of synchros with practical application.	**07**

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