Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–II • EXAMINATION – SUMMER - 2017

Subject Code: 2724114 **Date: 29/05/2017**

Subject Name: Sensor Signal Processing

Time: 02:30 PM To 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)**	Define (1) Signal (2) Analog Signal (3) Pulse (4) Digital (5) Mixed Signal	**05**
	(b)	What is the difference between sensor and transducer ?	**02**
	(c)	What is a Radio Frequency Identification sensor ? What type of output does it give ? One wants to use such sensor for application in a store where in Helmets are sold. When any customer wants to buy a helmet, the shop keeper should be able locate its position from his computer or mobile device. Is it possible to develop such solution ? Justify your answer.	**07**
Q.2	**(a)**	How does one can sense temperature of an integrated circuit while it is operative ? Can you list out sensors for such application ?	**04**
	(b)	What is a semiconductor strain gauge sensor ? How can one process the output of such sensor ? Suggest one application where it can be used.	**03**
	(c)	What is the use of proximity type sensor ? List different types of proximity sensor you may know. Can it be used to sense mobile phones kept any where in the bag of a person ? Justify your answer with suitable illustration.	**07**
		OR	
	(c)	Draw (1) Inverting amplifier circuit (2) Non inverting amplifier circuit (3) Difference amplifier circuit (4) Low pass filter circuit (5) High pass filter circuit (6) Band pass filter circuit (7) Schmitt Trigger circuit	**07**
Q.3	**(a)**	How can one implement high pass and low pass digital filters ? Explain your answer to the point with steps and block diagram.	**07**
	(b)	One needs to have digital indication of tilt of an electric pole located in prime location. Suggest sensor for such an application. In case, information about such multiple electric poles needs to be communicated to disaster management system for early warning system before they collapse. The intimation needs to be sent as the pole tilts by 10° from its vertical position. Suggest complete solution with suitable statements and block diagram	**07**
		OR	
Q.3	**(a)**	Touch sensors are used widely now a days. Explain the principle of operation of such sensors.	**07**
	(b)	How can one obtain indication of humidity and soil moisture content ? Explain.	**07**
Q.4	**(a)**	What are different types of solar sensors you may know? Suggest conditioning circuits for such transducer in order to get electrical output.	**07**
	(b)	What are different types of temperature sensors used in process industries ? Draw their characteristics.	**07**

OR

Q.4	**(a)**	What is a Hall Effect Transducer ? Where can it be used ? How can you condition the output of such transducer for providing its output to digital system.	**07**
	(b)	Explain principle of operation of different A/D converters with explicit operation on $\sum$- Δ converter.	**07**
Q.5	**(a)**	Explain principle of operation of different D/A converters. State its specifications.	**07**
	(b)	What is a Mixed mode signal processing architecture ? Why are such architectures useful ? How can they handle interference related issues.	**07**

OR

Q.5	**(a)**	What are the digital signal processing operations those are required to be performed on digitized signal obtained from A/D converter ?	**07**
	(b)	In order to create a digital railway station and digital bus station how many different types of sensors and transducers would be needed ? List all of them. Consider safety, clean, green and solar powered stations. You can include amenities like Vending machine and Drinking water tank. Can you tag each bench available on the station ?	**07**

****