Question Paper

Exam Date & Time: 20-Nov-2018 (10:00 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SCHOOL OF INFORMATION SCIENCES

FIRST SEMESTER MASTER OF ENGINEERING - ME (AUTOMOTIVE EMBEDDED SYSTEMS) Sensors and Transducers [AES 601]

Duration: 180 mins.

END SEMESTER DEGREE EXAMINATION NOVEMBER 2018

Answer all the questions.

1)

Marks: 100

- With reference to sensors explain the following with suitable examples ⁽¹⁰⁾ and diagrams.
 - a. Range b. Resolution c.Accuracy

(3+4+3) marks

²⁾ Briefly explain the principle of operation of the below sensors:

(10)

- a. Resistance Temperature Detector (RTD)
- b. Thermistors

c. Thermocouple (4+4+2) marks

³⁾ A thermistor is connected with a series resistance of 5 kilo ohms & a ⁽¹⁰⁾ supply voltage of 10 volts. The resistance variation of the thermistor for temperature variation is shown below.

Temp in degree centigrade	0	50	100
Resistance in kilo ohms	10	1	0.1

Draw a graph indicating voltage across thermistor vs resistance with and without linearization.

⁴⁾ Explain the following with suitable diagram / example: ⁽¹⁰⁾

a. Need for a sample & hold circuit.
b. Need for
oversampling
(5+5) marks

⁵⁾ Given an analog input signal whose voltage ranges from 0 to 10 V, and ⁽¹⁰⁾ an 8-bit digital encoding, calculate the correct encoding for 6.5 volts and then verify the same using successive approximation method.

6)	⁶⁾ Write the block diagram of a typical Data Acc used to measure signals from 4 different sens consideration of each block.	uisition System which is ⁽¹ sors. Explain the design	.0)
7)	⁷⁾ It is required to detect a random glitch in an Hz. The peak to peak amplitude of the ECG si duration of the glitch is 5 milliseconds and th 20 microvolts. It is required to have 20 samp analysis. Calculate:	ECG signal of frequency 2 ⁽¹ gnal is 50 mv. The e amplitude of the glitch is les of the glitch for	.0)
	a. Number of ADC bits required b. Sampling frequency c. Conversion time of ADC d. Memory required to store 10 minutes of EC (3+3+1+3) marks	CG signal.	
8)	 (a) With a block diagram explain working of c (6 marks) (b) Calculate the conversion time of a 16-bit of following specifications: 	ounter ramp ADC. (1 counter ramp ADC for the	.0)
	 The supply voltage = 10 volts Input voltage = 4.5 volts Clock frequency to ADC = 1 MHz marks) 	(4	
9)	 (a) Explain with suitable diagrams how speed an automobile using Hall effect sensor.(6 mains) (b) Calculate the speed of the vehicle in km/h is 20:1, the diameter of the tyre is 56 cm & the from gear 400 Hz. (4 marks) 	measurement is done in ⁽¹ rks) nr., if the gear to tyre ratio ne pulse frequency output	.0)
10)	¹⁰⁾ Briefly explain the following:		(10)

a. Types of DC motors b. Stepper motor (6 + 4) marks

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