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Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2019

EI3CO11 Sensors and Signal Conditioning

Programme: B.Tech. Branch/Specialisation: EI

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. A transducer converts: **1**

(a) Mechanical energy into electrical energy
(b) Mechanical displacement into electrical signal
(c) One form of energy into another form of energy
(d) Electrical energy into mechanical form

ii. An inverse transducer converts: **1**

(a) Electrical energy into any other form of energy
(b) Electrical energy into optical energy
(c) Mechanical displacement into electrical signal
(d) Electrical energy into mechanical form

iii. Tuned magneto-elastic transducer can be used for generation of: **1**

(a) Radio waves (b) Electric Current
(c) Ultrasound waves (d) All of these

iv. For measurement of temperature: **1**

(a) Only intrinsic type fiber optics transducer can be used
(b) Only interferometric type fiber optics transducer can be used
(c) Both intrinsic and interferometric type fiber optics transducer can be used
(d) None of these

v. Law of intermediate metals in thermocouples allows them to: **1**

(a) Use reference junction compensation
(b) Use meters for measurement without disturbing the circuit conditions
(c) Use extension wires of materials other than the one used for making thermocouples
(d) Both (b) and (c)

P.T.O.

vi. A thermocouple: **1**
(a) Has a low time constant when it is bare
(b) Has a low time constant if it is provided with a sheath
(c) Has the same time constant whether it is bare or is provided with a sheath
(d) None of these

vii. Infrared radiation interacts with all molecules except: **1**
(a) Carbon Monoxide (b) Carbon dioxide
(c) Nitrogen (d) None of these

viii. Which of the following is used to record the electrical activity of muscles? **1**
(a) ECG (b) EEG (c) EMG (d) All of these

ix. A potentiometer is basically a: **1**
(a) Deflection type instrument
(b) Null type instrument
(c) Deflection as well as Null type instrument
(d) A digital instrument

x. The reading of a polar type a.c. potentiometer when measuring the reactance of a coil are I= $12\angle 13.8^0$ A, V= $27.8 \angle 29.7^0$. The reactance of the coil is: **1**
(a) 2.317 Ω (b) 0.632 Ω (c) 2.22 Ω (d) -2.22 Ω

Q.2 Attempt any two:
i. Explain following terms: Calibration and sensitivity. **5**
ii. Determine the magnitude and limiting errors in ohms and in percentage if following resistances (in ohms) connected in parallel: 50 ± 3%, 75 ± 5% **5**
iii What are the sources of errors in measurement? **5**

Q.3 Attempt any two:
i. Explain the working of Turbine flow meter method. **5**
ii. Compare Filled thermometer with Bimetallic thermometer. **5**
iii. With the help of necessary figures, explains Elastic Transducer. **5**

Q.4 Attempt any two:
i. An AC LVDT has the following data: Input 6.3 V, Output 5.2 V, range ± 0.5 in. Calculate the output voltage vs core position for a

core movement going from 0.4 in. to -0.3 in.
ii. Explain working of Thermistor with its advantages and limitations. **5**
iii. With the help of suitable diagram explain the working of Unbonded Strain Gauge. **5**

Q.5 Attempt any two:
i. What are the affecting factors of quality of air? **5**
ii. Explain various sensors we are using in home appliances. **5**
iii. Explain various sensors we are using in four wheelers. **5**

Q.6 Attempt any two:
i. What is the significance of SAR in the mobile phones which we are using now days? **5**
ii. With the help of block diagram, explain basic operation of a Data Logger. **5**
iii. What are the applications of Sample and Hold circuit, also explain its working? **5**

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Marking Scheme
EI3CO11 Sensors and Signal Conditioning

Q.1	i.	A transducer converts: (c) One form of energy into another form of energy	**1**
	ii.	An inverse transducer converts: (a) Electrical energy into any other form of energy	**1**
	iii.	Tuned magneto-elastic transducer can be used for generation of: (c) Ultrasound waves	**1**
	iv.	For measurement of temperature: (c) Both intrinsic and interferometric type fiber optics transducer can be used	**1**
	v.	Law of intermediate metals in thermocouples allows them to: (d) Both (b) and (c)	**1**
	vi.	A thermocouple: (a) Has a low time constant when it is bare	**1**
	vii.	Infrared radiation interacts with all molecules except: (c) Nitrogen	**1**
	viii.	Which of the following is used to record the electrical activity of muscles? (b) EEG	**1**
	ix.	A potentiometer is basically a: (b) Null type instrument	**1**
	x.	The reading of a polar type a.c. potentiometer when measuring the reactance of a coil are I= $12\angle 13.8^0$ A, V= $27.8 \angle 29.7^0$. The reactance of the coil is: (b) 0.632 Ω	**1**

Q.2		Attempt any two:		
	i.	Calibration Definition and explanation	2.5 marks	**5**
		Sensitivity Definition and explanation	2.5 marks	
	ii.	Magnitude of error	2 marks	**5**
		Limiting errors	2 marks	
		Rnet	1 marks	
	iii	Sources of errors in measurement		**5**

Q.3		Attempt any two:		
	i.	Working of Turbine flow meter method.		**5**
	ii.	Comparison Filled thermometer with Bimetallic thermometer.		**5**
	iii.	Diagram of Elastic Transducer	1 mark	**5**
		Working	4 marks	

Q.4		Attempt any two:		
	i.	Calculate the output voltage vs core position for a core movement going from 0.4 in. to -0.3 in. 4.16 to -3.12 linear Stepwise marking		**5**
	ii.	Working of Thermistor	3 marks	**5**
		Advantages and limitations.	2 marks	
	iii.	Working of Unbonded Strain Gauge	4 marks	**5**
		Diagram	1 mark	

Q.5		Attempt any two:		
	i.	Affecting factors of quality of air?		**5**
	ii.	Sensors we are using in home appliances.		**5**
	iii.	Sensors we are using in four wheelers.		**5**

Q.6		Attempt any two:		
	i.	Significance of SAR in the mobile phones		**5**
	ii.	Basic operation of a Data Logger	3 marks	**5**
		Block diagram	2 marks	
	iii.	Applications of Sample and Hold circuit	2 marks	**5**
		Working	3 marks	

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