KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Seventh Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEE0016**:** Sensing Techniques and Sensor Systems

<u>**COURSE OUTCOMES**</u>

CO1: Interpret the sensor parameters, errors, and response of the instrumentation sensing.
CO2: Build the resonator sensors with modelling and design for different applications.
CO3: Develop the perception about semiconductor sensors for various sensing parameters.
CO4: Summarize the sensing parameters of optical fibre sensors
CO5: Infer the intelligent sensing and signal characterization in various systems

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	What are the various categories of errors in the measuring instrument?	CO1	[K_1]
2.	Distinguish accuracy and precision in measurement system.	CO1	[K_2]
3.	The temperature measurement is carried out using pyrometer and the values are X1 = 490.7 °C, X2 = 500.1°C, X3 = 495.2°C, X4 = 493.6°C. For the given data, Calculate Arithmetic mean Standard deviation and probable error.	CO2	[K_3]
4.	Differentiate longitudinal and torsional vibration.	CO2	[K_2]
5.	What is meant by ISFET? Mention its applications.	CO3	[K_2]
6.	Why are thermistors preferred for temperature measurement in the lower temperature regime?	CO3	[K_2]
7.	What are the advantages of fibre optic transducer?	CO4	[K_2]
8.	What is total Internal Reflection in fibre optics? What happens if angle of incidence is greater than critical value in fibre optics?	CO4	[K_2]
9.	What are the various types of artificial neural networks?	CO5	[K_2]
10.	An ECG waveform is recorded in form of analog signal. How to determine the sampling frequency of the ECG waveform?	CO5	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Describe the various units of instrumentation system with neat sketch.	8	CO1 [K_1]

b)	Develop the model for the overall transfer function of a measurement system using a temperature sensor.	8	CO1	[K₂]

12. a)	Explain the concept of harmonic oscillations and derive the expression for it. Formulate the condition for oscillations in overdamped and underdamped scenario.	8	CO2	[K₂]
b)	Explain the working principle of a vibrating cylinder for mass and density measurement with neat diagram and relevant waveforms.	8	CO2	[K₂]

13. a)	Explain the working principle of hall effect transducer along with its applications	8	CO3	[K₂]
b)	Explain how photo-multiplier tube is employed for converting light energy to high intensity light energy.	8	CO3	[K₂]

14.	Explain the working principle of Extrinsic fibre optic sensor and discuss how it can be employed for displacement measurement. Illustrate any one application of Extrinsic fibre optic displacement sensor with real time example.	16	CO4	[K₃]

15. a)	Explain the components of the smart sensor system with inbuilt processor.	8	CO5	[K₂]
b)	Explain the role of Artificial intelligence in instrumentation with an application.	8	CO5	[K₃]

16. a)	What are the various sensors employed for measuring temperature? Explain the working principle of thermocouple with neat diagram. Explain how cold junction compensation is done in thermocouple?	10	CO3	[K₃]
b)	What are various parameters that are to be considered when selecting sensor for a particular application? Illustrate the criteria and typical range of sensor parameters to be considered in choosing it for domestic, Industrial, automotive and Medical applications.	6	CO1	[K₃]

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