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 **Semester**: III

**Course Code**: ECE3015

PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION JULY 2024

**Date**: 18-07-2024

**Time**: 9:30 AM TO 12:30 PM

 **Course Name**: Measuring Instruments and sensors

**Program:** B. Tech

**Max Marks**:100 **Weightage**: 50%

# Instructions:

1. *Read the all questions carefully and answer accordingly.*
2. *Nonprogrammable/Scientific calculators are permitted.*

# Part A [Memory Recall Questions]

**Answer all the Questions. Each question carries 2 marks. (5Qx2M= 10M)**

1. A transducer is an electronic device that converts energy from one form to another. In view of the definition of the transducer, describe various types of transducers. [2M](C.O.No.3) [Knowledge level]
2. The transducer, which converts a mechanical displacement proportionally into electrical signal and it producing an output voltage of 2.6 V for displacement of 0.4 mm. Calculate the sensitivity of this transducer. [2M](C.O.No.4) [Knowledge level]
3. A Wheatstone bridge has 𝑃=3.5 𝑘Ω, 𝑄=7 𝑘𝛺 and the galvanometer null is obtained when 𝑆=5.51 𝑘Ω. Calculate the value of R Determine the resistance measurement range for the bridge if S is adjustable from 1 kΩ to 8 kΩ [2M](C.O.No.1) [Knowledge level]
4. Transducers are devices, which convert variations in physical quantity, which is non – electrical such as temperature, pressure, sound, light etc. in to an equivalent electrical signal (voltage, current etc). Define Active, Passive transducers with example. [2M](C.O.No.2) [Knowledge level]
5. A Strain gauge is a sensor whose resistance varies with applied force. Illustrate its working principle with the necessary equations. . [2M](C.O.No.3) [Knowledge level]

# Part B [Thought Provoking Questions]

**Answer all the Questions. Each question carries 15 marks. (2Qx15M=30M)**

1. A measuring system exists to provide information about the physical value of some variable being measured.
	1. Explain the methods of measurement with an example.
	2. Static characteristics of measuring instruments..

[15M](C.O.No.3)[Comprehension level]

1. Static sensitivity is the ratio of change in output to corresponding change in input under linear conditions. The following resistance values of a platinum resistance thermometer were measured at a range of temperatures. Determine the measurement sensitivity and inverse static sensitivity of the instrument.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Temperature(0c) | 200 | 228 | 256 | 284 |
| Resistance | 307 | 314 | 321 | 328 |

[15M](C.O.No.1) [Comprehension level]

# Part C [Problem Solving Questions]

**Answer all the Questions. Each question carries 20 marks. (3Qx20M=60M)**

1. The Cathode Ray Oscilloscope (CRO) is a very useful and versatile laboratory instrument used for display, measurement and analysis of waveform and other phenomena in electrical and electronic circuits. Explain how a beam of electrons upon striking a fluorescent screen produces the luminous spot. [20M](C.O.No.3) [Application level]
2. A DVM is an instrument used for measuring electric potential difference between two points in an electric circuit. It is connected in parallel. A DVM consist of attenuator, ADC and counter. An electrical engineer wants to design a DVM using resistor and comparator only as an ADC.
	1. Identify which ADC will be suitable for the design.
	2. A dual slope ADC integrates an input voltage of 300 mV for 50 ms. Estimate the time for Which the reference voltage of 100 mV be integrated? Predict the digital count of the ADC? Clock frequency is 15 kHz. [20M](C.O.No.3) [Application level]
3. a) Identify the AC bridge given below which consists of a source, a balance detector and four arms. It is a modified version of a Wheatstone bridge, which is used to measure the self-inductance of a circuit. It works on the principle of null deflection method (also known as the “bridge method”) to calculate an unknown inductance i in a circuit. Compute its balanced condition.



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b) A Maxwell bridge is a modification to a Wheatstone bridge used to measure an Unknown inductance in terms of calibrated resistance and inductance or resistance and capacitance. Explain the types of Maxwell's bridge, which are used to determine

the self-inductance of the circuit. [20M](C.O.No.4)