Roll No											

PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF INFORMATION SCIENCE
END TERM EXAMINATION - AUGUST 2024

Semester: IV	**Date: 09-08-2024**
Course Code: ECE3015	**Time: 09.30am to 12.30pm**
Course Name: Measuring Instruments and Sensors	**Max Marks: 100**
Program: B Tech (ECE)	**Weightage: 50%**

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A			
	ANSWER ANY 5 QUESTIONS	**5Q X 2M=10M**	
1	List the static characteristics of a measuring instruments.	(CO 1)	[Knowledge]
2	Differentiate between relative and absolute error.	(CO 1)	[Knowledge]
3	Strain gauge is an application of resistive transducer in brief explain working of strain gauge.	(CO 2)	[Knowledge]
4	Digital voltmeter is used to measures the voltage, write the block diagram of digital voltmeter.	(CO 2)	[Knowledge]
5	Define standard deviation.	(CO 1)	[Knowledge]
6	Transducer coverts the physical quantity sound, pressure to electrical quantity, in brief explain working principle of resistive transducer.	(CO 3)	[Knowledge]
7	Inducive transducer works on the principle of inductance mention the parameters that can be changed to vary the inductance.	(CO2)	[Knowledge]

PART B			
	ANSWER ANY 5 QUESTIONS	**5Q X 10M=50M**	
8	Analog-to-digital conversion (ADC) is an electronic process in which a continuously variable, or analog, signal is changed into a multilevel digital signal without altering its essential content. With required block diagram and truth table explain 2-bit flash type ADC.	(CO2)	[Comprehension]
9	A digital multimeter (DMM) is a multifunctional meter that displays its electrical quantitative values on an LCD screen. Explain in detail digital multimeter with necessary block diagram.	(CO2)	[Comprehension]

10	A cathode ray oscilloscope is an electrical test device used to produce waveforms in response to several input signals. With neat block diagram explain working of cathode ray tube used in oscilloscope.	(CO2)	[Comprehension]
11	LVDT construction involves mounting a primary winding, P, and two secondary windings, S1 and S2, on a cylindrical former. Explain in detail working principle of LVDT with required block diagram.	(CO3)	[Comprehension]
12	Transducers are devices which converts variations in physical quantity which is non – electrical such as temperature, pressure, sound, light etc in to an equivalent electrical signal. Describe different types of transducers in briefly.	(CO3)	[Comprehension]
13	An analog-to-digital converter changes an analog signal that's continuous in terms of both time and amplitude to a digital signal that's discrete in terms of both time and amplitude. Explain counter type ADC with required block diagram.	(CO2)	[Comprehension]
14	The cathode-ray oscilloscope (CRO) is a common laboratory instrument that provides accurate time and amplitude measurements of voltage signals over a wide range of frequencies. With suitable block explain cathode ray oscilloscope.	(CO2)	[Comprehension]

PART C

ANSWER ANY 2 QUESTIONS **2Q X 20M=40M**

15	a) A linear resistance potentiometer is 50 mm long and is uniformly wound with a wire having a resistance of $\mathbf{10\ k\Omega}$. Find the linear displacement when the resistance of the potentiometer as measure by a Wheatstone bridge for two cases is: 1) $\mathbf{3000\ \Omega}$ 2) $\mathbf{7000\ \Omega}$. If it is possible to measure a minimum of $\mathbf{10\ \Omega}$ using the arrangement, find the resolution. (10 Marks). b) Find the strain that is resulted from a tensile force of 1000 N applied to a 10 m long Aluminum bar having cross sectional area of $\mathbf{4 \times 10^{-4}\ m^2}$. The modulus of elasticity of Aluminum is $\mathbf{69\ GN/m^2}$. (10 marks)	(CO1)	[Application]
16	**a)** In a test temperature is measured 100 times with variation in apparatus and procedure. After applying the corrections, the result are as follows Temp in degrees: 397, 398, 399, 400, 401, 402, 403, 404, 405 Frequency of occurrence: 1, 3, 12, 23, 37, 16, 4, 2, 2 Calculate the a) arithmetic mean b) mean deviation c) standard deviation variance (10 marks). **b)** A compressive force is applied to a structural member. The strain is 5 micro – strain. Two separate gauges are attached to the structural member, one is nickel wire strain gauge having a gauge factor of -12.1 and the other is nichrome wire strain gauge having a gauge factor of 2. Calculate the value of the resistance of the gauges after they are strained. The resistance of both the gauges before being strained is $\mathbf{120\ \Omega}$. (10 marks).	(CO2)	[Application]
17	a) A resistance wire strain gauge having a gauge factor is 2 is bonded to a steel structural member subjected to a stress of $\mathbf{100\ MN/m^2}$. The modulus of elasticity of steel is $\mathbf{200\ GN/}$. Calculate the percentage change in the value of the gauge resistance due to the applied stress (10marks). b) A Wheatstone bridge has P=3.5 $k\Omega$,=7 $k\Omega$ and the galvanometer null is obtained when S=5.51 $k\Omega$. Calculate the value of R. Determine the resistance measurement range for the bridge if S is adjustable from 1 kΩ to 8 kΩ (10marks).	(CO3)	[Application]