INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Name	**:**	**ELECTRONIC MEASUREMENT AND INSTRUMENTATION**
Course Code	**:**	**AEC014**
Class	**:**	**B.Tech VI Semester**
Branch	**:**	**ECE**
Regulation	**:**	**IARE-R16**
Year	**:**	**2019-2020**
Course Coordinator	**:**	**Ms. P Annapurna, Assistant Professor**
Course Faculty	**:**	Ms. P Annapurna, Assistant Professor Mr. Mohd Khadir,Assistant Professor Ms. M Saritha, Assistant Professor Ms. M Lavanya, Assistant Professor

COURSE OBJECTIVES:

The course should enable the students to:

I.	Acquire a sound understanding theory and performance characteristics of instruments and errors in measurement and apply to DC voltmeters, ammeters, ohmmeters.
II.	Provide concepts and operation of different signal generators and wave form analyzers.
III.	Compare and contrast different types of oscilloscopes.
IV.	Select different types of D.C and A.C bridges for measurement of passive components and physical parameters.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AEC014.01	Analyze Block schematics of measuring systems, performance characteristics like accuracy, precision, resolution and the types of errors.
AEC014.02	Understand the analog measuring instruments its working of analog measuring instruments D' Arsonval movement.
AEC014.03	Discuss various types measuring range meters like DC and AC voltmeters ammeters.
AEC014.04	Understand of basic building of Cathode ray oscilloscopes and cathode ray tubes its specifications and applications.
AEC014.05	Illustrate the various types of special purpose oscilloscopes and discuss Lissajous figures, frequency measurement, phase measurement, CRO probes.
AEC014.06	Understand working principle of signal generators like AF and RF signal generators and Discuss the types of function generators.

AEC014.07	Understand the function of various types of signal analyzers and discuss the type like AF, HF wave analyzers.
AEC014.08	Understand the various wave analyzers heterodyne wave analyzers, harmonic distortion, spectrum analyzers, power analyzers.
AEC014.09	Discuss various measurements using DC bridges for Wheat stone bridge, Kelvin bridge.
AEC014.10	Discuss various measurements using AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner & ground connection.
AEC014.11	Understand transducers and its classifications and discuss strain gauges, force and displacement tranducers, resistance thermometers, hotwire anemometers, LVDT, thermocouples, synchros
AEC014.12	Discuss the types of transducers Piezoelectric transducers, variable capacitance transducers; Magneto strictive transducers
AEC014.13	Determine measurement of physical parameters Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture
AEC014.14	Illustrate the following: active and passive, primary and secondary transducers
AEC014.15	Illustrate the measurement of physical parameters of transducer like velocity, force, pressure, high pressure, vacuum level, temperature measurements
AEC014.16	Apply the concept of Electronic measurement and instrumentation to understand and analyze the real time applications.
AEC014.17	Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

TUTORIAL QUESTION BANK

UNIT-I INTRODUCTION TO MEASURING INSTRUMENTS				
PART-A (Short Answer Questions)				
S. No	**Questions**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course learning Outcome**
1	Define the performance characteristics of an instrument?	Remember	CO1	AEC014.01
2	List the classification of performance characteristics of an instrument?	Understand	CO1	AEC014.01
3	Distinguish between static and dynamic characteristics?	Understand	CO1	AEC014.01
4	Define precision and accuracy. Explain the difference between them.	Remember	CO1	AEC014.01
5	List out the characteristics of a precision.	Understand	CO1	AEC014.01
6	Explain the types of errors possible in an instrument?	Remember	CO1	AEC014.01
7	Explain ohmmeter and its classification?	Understand	CO1	AEC014.02
8	Explain briefly about DC voltmeters and AC voltmeters?	Understand	CO1	AEC014.02
9	Define the terms Accuracy, Precision, Resolution,	Understand	CO1	AEC014.02
10	Define the following terms, i. Repeatability ii. Reproducibility iii. Sensitivity.	Remember	CO1	AEC014.01
11	What are the different types of static errors in a system?	Remember	CO1	AEC014.02
12	What are Lissajous figures? How are they produced?	Remember	CO1	AEC014.02
13	Write short notes on Delay lines.	Understand	CO1	AEC014.03
14	List out the specifications of instruments	Remember	CO1	AEC014.03
15	Define successive approximation type	Understand	CO1	AEC014.03
PART-B (Long Answer Questions)				
1	Discuss about the Ayton Shunt Circuit and explain how current Measurement is done?	Remember	CO1	AEC014.01
2	List out the different types of errors that occur in measurements, and explain in detail about them.	Understand	CO1	AEC014.01
3	Describe the basic performance characteristics of a system? Explain in detail about it.	Understand	CO1	AEC014.01
4	Explain the constructional details and difference between Ohmmeter series type and shunt type.	Remember	CO1	AEC014.02
5	Explain the working principle of PMMC movement with the help of equations.	Understand	CO1	AEC014.02
6	Define voltmeter sensitivity. What is the loading effect of a DC voltmeter?	Remember	CO1	AEC014.02
7	Discuss about D'Arsonval Movement with a neat diagram	Understand	CO1	AEC014.02
9	Give the block schematic of a general measuring system and explain the same.	Understand	CO1	AEC014.02
10	Define and Explain in detail about the following terms : i. Significant figures ii. Conformity.	Understand	CO1	AEC014.01
11	Classify and explain various types of errors in measurement.	Remember	CO1	AEC014.01

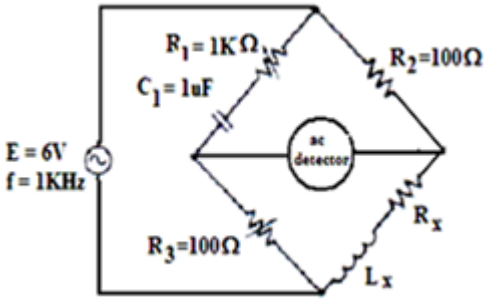
12	Define and express the following terms, a) Fidelity b) Speed of response c) Lag d) Dynamic error	Remember	CO1	AEC014.02
13	Explain in detail about characteristics and functionality of the Multimeter.	Remember	CO1	AEC014.02
14	Classify all Lissajous figures? How are they produced? What are the applications of the same?	Understand	CO1	AEC014.03
15	Describe the function of DC voltmeter and multirange voltmeter with neat operation explanation?	Remember	CO1	AEC014.03
16	How the working of a potentiometer type digital voltmeter be explained	Understand	CO1	CAEC014.02
PART-C (Analytical Questions)				
1	It is desired to extend the range of a 10mA Ammeter with Rm=100 Ω to measure 15A. Draw the circuit and determine the value of R.	Remember	CO1	AEC014.02
2	Determine the Multiplier resistance on the 50V range of a DC Voltmeter, which uses 300mA meter movement having internal resistance of 1.2Ω.	Remember	CO1	AEC014.02
3	A Voltmeter having a sensitivity of 15k Ω /V reads 80V on a 100Vscale, when connected across an unknown resistor. The current through the resistor is 2mA. Calculate the % of error due to loading Effect.	Understand	CO1	AEC014.02
4	A basic D'Arsonval movement with a full scale deflection of 100 μA and an internal resistance of 2000 Ω is available. It is to be Converted into a 0-5V, 0-10V, 0-25V, and 0-50V multi range voltmeter using individual multipliers for each range. Calculate the values of the individual resistors.	Remember	CO1	AEC014.02
5	A Voltmeter having a Sensitivity of 20k Ω /V reads 100V units 150V scale, when connected across an unknown resistor Rx. The current passing through the resistor is 2.0mA .Calculate the %error due to loading effect.	Remember	CO1	AEC014.03
6	The following values are obtained from the measurements of the value of a resistor:147.2 , 147.4 , 147.9 , 147.1 , 147.5 , 147.6 , 147.4 , 147.6 , 147.5 . Calculate a) Arithmetic mean b) Average deviation c) Standard Deviation	Understand	CO1	AEC014.03
7	A 200 Ω basic movement is to be used as an ohmmeter requiring full scale deflection of 1 mA and internal battery voltage of 5 V. A half scale deflection marking of 2 k is desired. Calculate, i. The values of R1 and R2 ii. Maximum value of R to compensate for a 3% drop in battery voltage	Remember	CO1	AEC014.03
7	A voltmeter having a sensitivity of 1KΩ/V is connected across an unknown resistance in series with a milli ammeter reading 80V on 150V scale. When the milli ammeter reads 10mA, Calculate the, i. apparent resistance of the unknown resistor ii. Actual resistance of the unknown resistor, iii. Error due to the loading effect of the voltmeter.	Remember	CO1	AEC014.03
8	Two ammeters are joined in series in a circuit carrying 100 A. one ammeter has a resistance of 10000 ohm shunted by	Understand	CO1	AEC014.03

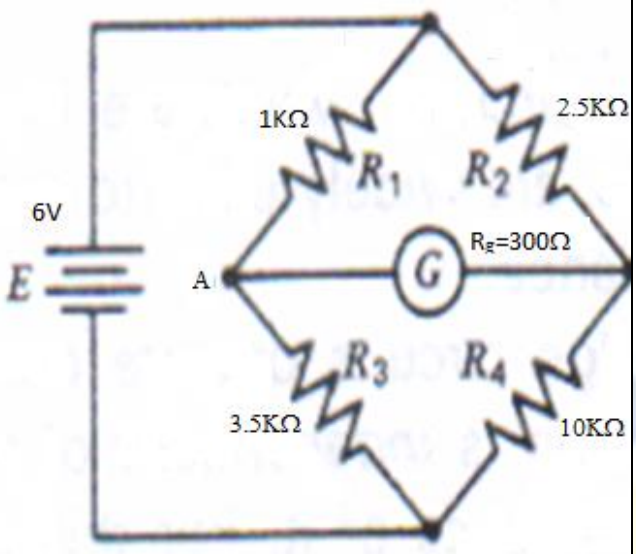
	0.10 ohm while the other ammeter has a resistance of 150 ohm shunted by 0.02ohm. if the shunts are interchanged what would be the readings of the instruments?			
UNIT-II OSCILLOSCOPE				
PART-A (Short Answer Questions)				
1	Discuss about the CRT and its internal structure?	Understand	CO2	AEC014.16
2	Define CRO?	Understand	CO2	AEC014.16
3	Discuss vertical amplifier with a neat block diagram?	Understand	CO2	AEC014.16
4	Describe the roles of horizontal and vertical amplifiers?	Remember	CO2	AEC014.17
5	Explain vertical section of CRT?	Understand	CO2	AEC014.16
6	Explain about horizontal section of CRT.	Understand	CO2	AEC014.16
7	Discuss about dual beam CRO?	Understand	CO2	AEC014.16
8	Define dual trace oscilloscope?	Understand	CO2	AEC014.17
9	Define sampling oscilloscope?	Remember	CO2	AEC014.16
10	Write briefly about storage oscilloscope?	Understand	CO2	AEC014.17
11	Compare dual trace oscilloscopes and dual beam CRO.	Understand	CO2	AEC014.17
12	What are the different types of CRO probes?	Understand	CO2	AEC014.17
13	Explain about digital CRO	Understand	CO2	AEC014.17
14	Discuss about the Lissajous figures	Understand	CO2	AEC014.17
15	What is mean by storage oscilloscopes	Understand	CO2	AEC014.17
PART-B (Long Answer Questions)				
1.	Explain the major parts of CRT with a block diagram.	Understand	CO2	AEC014.16
2.	Draw the neat diagrams of both vertical & horizontal deflection systems and explain briefly about their working.	Understand	CO2	AEC014.16
3.	Explain briefly about the Horizontal deflecting system?	Remember	CO2	AEC014.16
4.	Draw the block diagram of general purpose CRO and explain its working.	Understand	CO2	AEC014.17
5.	Explain about storage oscilloscope with block diagram?	Remember	CO2	AEC014.17
6.	Explain the working of Dual trace CRO with neat block diagram.	Understand	CO2	AEC014.16
7.	Explain with neat Block Diagram of Digital Storage oscilloscope?	Remember	CO2	AEC014.16
8.	Draw the block diagram of Sampling oscilloscope and explain its working.	Understand	CO2	AEC014.17
9.	Explain the method of finding phase relationship of two waveforms using Lissajous figures?	Remember	CO2	AEC014.16
10.	Explain the method of finding frequency relationship of two waveforms using Lissajous figures?	Understand	CO2	AEC014.17
11.	Explain the working of Dual Beam CRO with neat block diagram.	Understand	CO2	AEC014.16
12.	Explain about Delay lines in CROs.	Understand	CO2	AEC014.17
13.	List out the different types of probes used for CROs? Explain about each of them	Remember	CO2	AEC014.17
14.	Explain the Applications of Oscilloscopes.	Understand	CO2	AEC014.17
15.	Explain how different Lissajous figures can be used to measure various parameters?	Understand	CO2	AEC014.17
PART-C (Analytical Questions)				
1	Determine the secondary emission ratio `S' of a digital storage oscilloscope, if the value secondary emission current I_S is 15µA, and the primary beam current I_p is 150µA.	Understand	CO2	AEC014.17
2	Determine the Velocity of electron beam of an	Remember	CO2	AEC014.16

	oscilloscope when voltage applied is 2500V.			
3	The deflection sensitivity of a CRT is 0.05mm/V and an unknown voltage is applied to the horizontal deflection plate, which shifts the spot by 5mm towards the right. Determine the unknown applied voltage.	Understand	CO2	AEC014.17
4	The x-deflection plates of a CRT are 20mm long and 5mm apart. The centre of the plate from the screen is 25 cm away. The accelerating voltage is 3000V. Determine the deflection sensitivity and the factor.	Understand	CO2	AEC014.17
5	The x-deflection plates in the CRT are 1mm apart and 25mm long. The centre of the plate is 20cm from the screen. The accelerating voltage is 3000V. Find the V_{rms} of the sinusoidal voltage applied to x-deflection plates if the length of the trace is 10cm. Find the electrostatic deflection sensitivity.	Remember	CO2	AEC014.16
6	Determine the Velocity of electron beam of an oscilloscope when voltage applied is 1400V.	Remember	CO2	AEC014.16
7	The x-deflection plates of a CRT are 15mm long and 5mm apart. The centre of the plate from the screen is 20 cm away. The accelerating voltage is 1000V. Determine the deflection sensitivity and the factor.	Understand	CO2	AEC014.17
UNIT-III SIGNAL GENERATORS				
PART-A (Short Answer Questions)				
1.	Distinguish between square and pulse wave generators?	Understand	CO3	AEC014.06
2.	Define a Function Generator?	Understand	CO3	AEC014.06
3.	Distinguish between the oscillator and function generator?	Remember	CO3	AEC014.06
4.	List out the applications of function generator?	Understand	CO3	AEC014.06
5.	What is sweep generator?	Understand	CO3	AEC014.06
6.	Explain the method of generate random noise.	Remember	CO3	AEC014.06
7.	List the specifications of Signal generators?	Understand	CO3	AEC014.06
8.	Define duty cycle.	Understand	CO3	AEC014.06
9.	List the requirements of a pulse.	Remember	CO3	AEC014.06
10.	State the function of symmetry control in a pulse generator.	Understand	CO3	AEC014.06
CIE II				
1.	Define a wave analyzer?	Understand	CO3	AEC014.07
2.	List different types of wave analyzers.	Understand	CO3	AEC014.07
3.	Differentiate between AF wave analyzer and RF wave analyzer	Remember	CO3	AEC014.07
4.	Define distortion. Define harmonics and the term 'total harmonic distortion'	Understand	CO3	AEC014.08
5.	Differentiate between wave analyzer and spectrum analyzer	Remember	CO3	AEC014.08
6.	State different types of harmonic distortion analyzer	Remember	CO3	AEC014.08
7.	Explain heterodyning?	Understand	CO3	AEC014.07
PART-B (Long Answer Questions)				
1.	Explain the working of a standard sweep generator with diagram	Understand	CO3	AEC014.06
2.	Discuss in detail about RF signal generator operation.	Understand	CO3	AEC014.06
3.	With a neat diagram discuss the operation of a pulse generator.	Understand	CO3	AEC014.06
4.	List the applications of random noise generator.	Remember	CO3	CAEC014.06
5.	With the help of block diagram explain the functioning of a conventional standard signal generator.	Understand	CO3	CAEC014.06

6.	Draw the block diagram of a function generator and explain its operation.	Understand	CO3	CAEC014.06
7.	What is sweep generator? Explain in detail.	Understand	CO3	CAEC014.06
8.	Explain the method of producing sine waves in a function generator.	Understand	CO3	CAEC014.06
9.	Explain the operation of a basic signal generator.	Understand	CO3	CAEC014.06
10.	How broadband sweep frequencies are generated using a sweep generator.	Understand	CO3	CAEC014.06
11.	List various control on the front panel of a pulse generator. Mention their uses.	Understand	CO3	CAEC014.06
12.	State the function of frequency sweeper and marker generator in a sweep generator.	Understand	CO3	CAEC014.06
13.	Explain with the block diagram the operation of a pattern generator.	Understand	CO3	CAEC014.06
	CIE II			
1.	Explain with a daigram the working principle of spectrum analyzer?	Understand	CO3	CAEC014.08
2.	Explain the working principle of wave analyzer with neat block diagram.	Understand	CO3	CAEC014.07
3.	Discuss about basic principle of AF wave analyzer with neat sketch.	Remember	CO3	CAEC014.07
4.	Explain the working of the harmonic distortion analyzer?	Understand	CO3	CAEC014.08
5.	Explain the working of the Power analyzer?	Understand	CO3	CAEC014.08
6.	Differentiate between wave analyzer and harmonic distortion analyzer?	Remember	CO3	CAEC014.08
7.	Why is it necessary to measure distortion? Explain wien bridge method of a harmonic distortion analyzer?	Remember	CO3	CAEC014.08
8.	Describe the causes of harmonic distortions.	Understand	CO3	CAEC014.08
9	List the various patterns generated by a pattern generator and explain.	Understand	CO3	CAEC014.06
10	Differentiate between a function generator and pulse and square wave generator.	Remember	CO3	CAEC014.06
PART-C (Analytical Questions)				
1.	Draw the block diagram of video signal generator and explain its operation.	Remember	CO3	CAEC014.06
2.	Define sweep generator. Draw its block diagram.	Understand	CO3	CAEC014.06
3.	Explain the operation of AF sine and square wave generator with neat block diagram.	Remember	CO3	CAEC014.06
4.	Define signal generator. List various types of signal generators used in measurement systems.	Understand	CO3	CAEC014.06
5.	Differentiate between a function generator and pulse and square wave generator.	Remember	CO3	CAEC014.06
	CIE II			
1	Determine the dynamic range of a spectrum analyser with a third- order intercept point of +40dBm and a noise level of -100dBm.	Understand	CO3	CAEC014.08
2	What is the minimum detectable signal of a spectrum analyzer with a noise figure of 20dB and using a 1-kHz, 3-dB filter?	Understand	CO3	CAEC014.08
3	Define a distortion analyzer. State the working principle of distortion analyzer?	Remember	CO3	CAEC014.08
4	Give the block schematic of RF spectrum analyzer and explain its working?	Remember	CO3	CAEC014.07
5	Explain the procedure of measurement of a harmonic distortion analyzer using a bridged-T type.	Understand	CO3	CAEC014.08

UNIT-IV TRANSDUCERS				
PART-A (Short Answer Questions)				
1	Draw the phasor diagram and write the equations for balance conditions in the case of Maxwell's Inductance Bridge.	Understand	CO4	CAEC014.10
2	Draw the circuit of a Wheatstone bridge and derive the conditions of balance.	Remember	CO4	CAEC014.09
3	What are the modifications and additional features incorporated in a low voltage Schering bridge for it to be used on high voltages?	Understand	CO4	CAEC014.10
4	Why is Hay's bridge suited for measurement of inductance of high Q coils?	Remember	CO4	CAEC014.10
5	Explain how the use of a balancing coil helps in elimination of errors on account of resistance of leads.	Understand	CO4	CAEC014.09
6	What is a bridge? What is the importance of bridge?	Remember	CO4	CAEC014.09
7	Define the term 'null' as applied to bridge measurement?	Remember	CO4	CAEC014.09
8	State the two balance conditions of wien bridge?	Understand	CO4	CAEC014.10
9	Compare AC and DC bridges.	Understand	CO4	CAEC014.10
10	Draw the circuit of Anderson bridge	Remember	CO4	CAEC014.10
11	State the two conditions that must be satisfied to obtain bridge balance?	Understand	CO4	CAEC014.09
PART-B (Long Answer Questions)				
1	What are the different problems associated with measurement of low resistances? Explain the principal of working a Kelvin's double bridge. Draw the circuit of a Kelvin's double bridge used for the measurement of low resistances. Write the condition for balance.	Remember	CO4	CAEC014.09
2	What is the significance of bridge circuit measurements over direct meter measurements.	Remember	CO4	CAEC014.09
3	Describe the working of a low voltage schering bridge. Derive the equations for capacitance and dissipation factor. Draw the phasor diagram of the bridge under conditions of balance.	Remember	CO4	CAEC014.10
4	Derive the general equations for balance for an ac bridge. Prove that the two conditions for magnitude and phase to be satisfied to get balance for an ac bridge	Understand	CO4	CAEC014.10
5	Derive the equations of balance for an Anderson's bridge. Draw the phasor diagram for conditions under balance.	Understand	CO4	CAEC014.10
6	Explain how Wien's bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters.	Understand	CO4	CAEC014.10
7	Explain the function and working of Wagner Earth Devices.	Understand	CO4	CAEC014.10
8	Describe how Wheatstone bridge may be used to control various physical parameters	Remember	CO4	CAEC014.09
9	State the limitations of wheatstone bridge and how to overcome those limitations.	Remember	CO4	CAEC014.09
10	Explain with a daigram the working of Anderson bridge?	Understand	CO4	CAEC014.10
PART-C (Analytical Questions)				
1	For a max well bridge R1=235 k, C1=0.012mF, calculate unknown inductive impedance in series.	Remember	CO4	CAEC014.10
2	A Maxwell bridge is used to measure inductive impedance. The bridge constants at balance are C1=0.01μF, R1=470k Ω, R2=5.1k Ω and R3=100kΩ.	Understand	CO4	CAEC014.10

	Find the series equivalent of the unknown impedance?			
3	In a certain Wheatstone bridge Rb=400kΩ, Rb=100kΩ, Rd=300k Ω usual notation. Determine the current through the detector galvanometer.	Understand	CO4	CAEC014.09
4	A Maxwell bridge is used to measure inductive impedance. The bridge constants at balance are C1=0.03μF, R1=500k Ω, R2=5k Ω and R3=10kΩ. Find the series equivalent of the unknown impedance	Remember	CO4	CAEC014.10
5	In a Wien bridge oscillator R1 = R2 =75k, C1=C.2= 400pf with usual notation. Determine the frequency of oscillations?	Understand	CO4	CAEC014.10
6	Given the Opposite-Angle (Hay's) bridge of Figure. Find, (i) The equivalent series resistance, R_x. (ii) The inductance, L_x. 	Remember	CO4	CAEC014.10
7	Find the equivalent series element for the unknown impedance of the Schering bridge network whose impedance measurements are to be made at null. R_1 = 470 kΩ C_1 = 0.01 mF R_2 = 100 kΩ C_3 = 0.1 mF	Understand	CO4	CAEC014.10
8	The four arms of an Hay's alternating current bridge are arranged as follows: AB is coil of unknown impedance, BC is non-reactive resistor of 1000 Ω, CD is a non-reactive of 833Ω in series with a standard capacitor of 0.38μF, DA is non-reactive resistor of 16800Ω. If the supply frequency is 50Hz, determine the inductance and resistance at the balanced conditions. Derive the conditions for balance and draw the phasor diagram under balanced conditions.	Understand	CO4	CAEC014.10
9	An unbalanced wheatstone bridge is given in figurs. Calculate the current through the galvanometer.	Remember	CO4	CAEC014.09

				
10	A sample Bakelite was tested by the bridge method(Schering) at 11KV, 50Hz. Balance was obtained at the following values **AB**- dielectric material under test in the form of a capacitor **BC**- a standard air capacitor at 100pF **CD**- capacitor of 0.6μF in parallel with a non-reactive resistance of 300Ω **DA**- nonreactive resistance of 100Ω. Calculate the capacitance and equivalent series resistance of the sample	Understand	CO4	CAEC014.10
UNIT-V TRANSDUCERS				
PART-A (Short Answer Questions)				
1	Define transducer?	Remember	CO5	CAEC014.16
2	List the classification of transducers?	Understand	CO5	CAEC014.16
3	Define strain gauge?	Understand	CO5	CAEC014.16
4	Discuss about LVDT?	Remember	CO5	CAEC014.17
5	Write brief notes on thermocouples?	Understand	CO5	CAEC014.17
6	Discuss the principle of operation of strain gauges?	Remember	CO5	CAEC014.16
7	Explain the desirable characteristics of strain gauge?	Understand	CO5	CAEC014.16
8	List out the applications of transducers?	Understand	CO5	CAEC014.17
9	List out the advantages of thermocouples	Understand	CO5	CAEC014.16
10	List the limitations of thermocouple	Remember	CO5	CAEC014.17
11	Discuss the method of measurement of force?	Remember	CO5	CAEC014.16
12	Explain the method of measurement of pressure	Remember	CO5	CAEC014.17
13	Discuss about the method of measurement of velocity	Understand	CO5	CAEC014.17
14	Discuss the method of measurement of humidity	Remember	CO5	CAEC014.17
15	Describe the method of measurement of moisture	Understand	CO5	CAEC014.17
16	Explain the method of measurement of displacement	Understand	CO5	CAEC014.16
PART-B (Long Answer Questions)				
1	Define a transducer? Write the classifications of transducers?	Remember	CO5	CAEC014.16
2	Explain working of strain gauge and what are its specific advantages?	Understand	CO5	CAEC014.16
3	Explain about Piezo-electric effect?	Understand	CO5	CAEC014.16
4	Explain the desirable characteristics of thermocouples?	Remember	CO5	CAEC014.17
5	Explain in detail about Displacement transducers.	Understand	CO5	CAEC014.17

6	Define and Describe about resistance thermometers.	Remember	CO5	CAEC014.16
7	Define and Explain about Variable Capacitance transducers.	Understand	CO5	CAEC014.16
8	Define and Explain the Magneto Strictive transducers	Understand	CO5	CAEC014.17
9	Explain the Principle, working, Construction, characteristics and applications of thermistors.	Understand	CO5	CAEC014.16
10	Explain the Principle and working of Strain gauges	Remember	CO5	CAEC014.17
11	Distinguish between thermocouple and thermistor?	Remember	CO5	CAEC014.16
12	Explain the principle , working , construction , Characteristics and applications of LVDTs	Remember	CO5	CAEC014.17
13	List out the Salient features of Semiconductor Strain gauges? Explain	Understand	CO5	CAEC014.17
14	Define and Explain the principle and working of Hot-wire Anemometer	Remember	CO5	CAEC014.17
15	Explain in detail about the operation of a Piezo electric transducer.	Understand	CO5	CAEC014.17
PART-C (Analytical Questions)				
1	A resistance strain gauge with a guage factor of 2 is cemented to a steel member, which is subjected to a strain of 1x10-6.If original resistance value of the gauge is 130 Ω, calculate the change in resistance.	Remember	CO5	CAEC014.16
2	2 An ac LVDT has the following data. Input = 6.3V, Output = 5.2V, range ±0.5 in. Determine (i)Calculate the output voltage vs core position for a core movement going from +0.45in. to -0.30 in. (ii) The output voltage when the core is -0.25 in. from the centre.	Remember	CO5	CAEC014.17
3	3 A resistance strain gage with a gage factor of 2 is fastended to a steel member subjected to a stress of 1010 kg/cm2 . The modulus of elasticity of steel is approximately 1.1x106 kg/cm2 . Calculate the change in resistance ΔR, of the strain-gage element due to the applied stress.	Understand	CO5	CAEC014.16
4	A resistance strain gauge with a guage factor of 2 is cemented to a steel member, which is subjected to a strain of 5x10-6.If original resistance value of the gauge is 100 Ω, calculate the change in resistance.	Remember	CO5	CAEC014.16
5	2 An ac LVDT has the following data. Input = 4.3V, Output = 4.2V, range ±0.5 in. Determine (i)Calculate the output voltage vs core position for a core movement going from +0.15in. to -0.20 in. (ii) The output voltage when the core is -0.25 in. from the centre.	Remember	CO5	CAEC014.17
6	3 A resistance strain gage with a gage factor of 2 is fast ended to a steel member subjected to a stress of 1050 kg/cm2 . The modulus of elasticity of steel is approximately 2.1x106 kg/cm2 . Calculate the change in resistance ΔR, of the strain-gage element due to the applied stress.	Understand	CO5	CAEC014.16

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