



SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING QUESTION BANK

SUBJECT : EE8403 – MEASUREMENTS AND INSTRUMENTATION

SEM / YEAR: IV/II

UNIT I - <u>INTRODUCTION</u>				
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration, Principle and types of analog and digital voltmeters, ammeters.				
PART – A				
Q.No	Questions	BT Level	Competence	COs
1.	Define Gross and Random errors.	BTL 6	Create	CO1
2.	Illustrate the difference between Accuracy and Precision.	BTL 5	Evaluate	CO1
3.	Distinguish between Gravity control and Spring Control.	BTL 4	Analyse	CO1
4.	Give the International standards of Measurements.	BTL 3	Apply	CO1
5.	Define the Calibration of an Instrument?	BTL 3	Apply	CO1
6.	What is Average deviation? What does it indicate on a measuring instrument?	BTL 1	Knowledge	CO1
7.	Define the term “Sensitivity” of an Instrument.	BTL 5	Evaluate	CO1
8.	The true value of a voltage is 100V. The values indicated by a measuring instrument are 104, 103, 105, 103 and 105V. Calculate the Accuracy and Precision of the measurement.	BTL 6	Create	CO1
9.	List the Functional elements of a Measuring Instrument.	BTL 4	Analyse	CO1
10.	A Voltmeter reads 152 volts for a particular measurements. If the true value of the measurement is 154 volts, Determine the percentage static relative error and static correction.	BTL 1	Knowledge	CO1
11.	Define Dynamic characteristics of an Instrument.	BTL 2	Understand	CO1
12.	Compose the Different standards of an Instrument.	BTL 1	Knowledge	CO1
13.	Define the Static characteristics of an Instrument.	BTL 4	Analyse	CO1
14.	Explain Absolute error of measurement?	BTL 3	Apply	CO1
15.	Compare Resolution and Precision.	BTL 4	Analyse	CO1
16.	How are the Absolute and Relative errors expressed mathematically?	BTL 6	Create	CO1
17.	Define Limiting error. Derive the expression for Relative limiting error.	BTL 6	Create	CO1
18.	Define Linear time invariant and Linear time invariant systems. Prepare some examples for the same.	BTL 5	Evaluate	CO1
19.	Why PMMC Ammeters are the most widely used instrument?	BTL 2	Understand	CO1
20.	Compare Moving coil with Moving iron Instruments.	BTL 2	Understand	CO1

PART – B					
1.	By using a micrometer screw, the following readings were taken of a certain length: 1.34, 1.38, 1.56, 1.47, 1.42, 1.44, 1.53, 1.48, 1.40, 1.59 mm. Formulate the necessary equations and calculate the following: a. Arithmetic mean b. Average deviation c. standard deviation and d. variance	(13)	BTL 4	Analyse	CO1
2.	(i) Discuss the different types of standards of measurement. (ii) Describe the static and dynamic characteristics of measuring instruments.	(6) (7)	BTL 1	Knowledge	CO1
3.	(i) Explain the functional elements of an instrument with a neat block diagram (ii) Define accuracy and reproducibility of an instrument and explain.	(8) (5)	BTL 3	Apply	CO1
4.	(i) What are the different types of error? Explain how to eliminate errors in instrument. (ii) An electric current of 3 Ampere is flowing through a resistance of 10 ohms. It was found that the resistance was 0.2% greater than what was specified as rated and the ammeter measurement was 0.5% more than the true value. Determine the relative error in power measurement.	(8) (5)	BTL 6 BTL 6	Create Create	CO1 CO1
5.	Describe the functional elements of an instrument with the block diagram and draw the static and dynamic characteristics.	(13)	BTL 1	Knowledge	CO1
6.	A circuit was tuned for resonance by eight different students and the value of resonant frequency in kHz were recorded as 532, 548, 543, 535, 546, 531, 543 and 536 calculate a. Arithmetic mean b. Deviation c. standard deviation d. average deviation	(13)	BTL 5	Evaluate	CO1
7.	Describe about various methods of Calibration and explain with suitable example	(13)	BTL 2	Understand	CO1
8.	(i) Describe the various modes of statistical evaluation of Measurement data. (ii) Discuss in detail about calibration	(7) (6)	BTL 2	Understand	CO1
9.	(i) Explain any four Static characteristics of Measuring Instruments. (ii) How are Errors classified? Explain Systematic error.	(7) (6)	BTL 2	Understand	CO1
10.	(i) Explain the Classification of Standards in detail. (ii) Discuss the Significance of Calibration.	(7) (6)	BTL 1	Knowledge	CO1
11.	(i) Discuss the Different types of Standards and Errors of Measurements. (ii) Discuss in detail about the Sources of errors in Measurement Techniques.	(7) (6)	BTL 3 BTL 3	Apply Apply	CO1 CO1

12.	The following values were obtained from the measurements of the values of 147.2, 147.4, 147.9, 147.7, 147.5, 147.6, and 147.5. Calculate a) The arithmetic mean b) The standard deviation c) The probable error of average of Ten readings	(13)	BTL 6	Create	CO1
13.	(i) Discuss with a neat sketch and explain the working principle of PMMC Instrument. (ii) A meter A has a range of 0-100 V and a multiplier resistance of 25ohm. The meter B has range of 0-1000V and a multiplier resistance of 150K .Both meter have basic resistance of 1K .Which meter is more sensitive?	(7) (6)	BTL 1 BTL 4	Knowledge Apply	CO1 CO1
14.	Explain construction and working Principle of various types of Digital Voltmeter (DVM)	(13)	BTL 5	Evaluate	CO1

PART-C

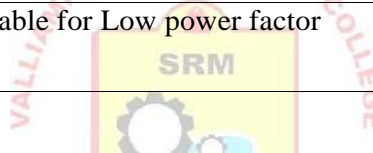
1.	Draw and Explain the block diagram of Generalized Instrumentation System.	(15)	BTL 1	Knowledge	CO1
2.	What are the different inputs for studying the Dynamic response of a system? Compose and Sketch them.	(15)	BTL 3	Apply	CO1
3.	A moving coil instrument gives a full scale deflection for a current of 20mA with a potential difference of 200mV across it. Calculate: a) Shunt required to use it as an ammeter to get a range of 0-200A. b) Multiplier required to use it as voltmeter of range 0-500V.	(15)	BTL 2	Understand	CO1
4.	(i) Compose the three categories of Systematic errors in the Instrument and explain in detail. (ii) A PMMC Ammeter gives reading of 40mA when connected across two opposite corners of a Bridge rectifier, the other two corners of which are connected in series with a capacitor to 100 k, 50 Hz supply. Compose the value for Capacitance.	(7) (8)	BTL 5 BTL 5	Evaluate Evaluate	CO1 CO1

UNIT II -ELECTRICAL AND ELECTRONICS INSTRUMENTS

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

PART – A

Q.No	Questions	BT Level	Competence	COs
1.	A basic D'Arsonval movement with a full deflection of 50 micro amps and internal resistance of 500 ohm is used as voltmeter. Formulate the necessary equation and calculate the value of multiplier resistance needed to measure a voltage range of 0-10V.	BTL 2	Understand	CO2
2.	How are basic instruments converted into higher range ammeter?	BTL 2	Understand	CO2
3.	Define Creeping in Energy meter.	BTL 1	Knowledge	CO2
4.	Illustrate the Types of analog ammeter used for Instrumentation.	BTL 6	Create	CO2
5.	Write the torque Equation for the moving iron instruments	BTL 4	Analyse	CO2
6.	A (0-25) Ammeter has a guaranteed accuracy of 1 percent of full scale reading. The current measured by this instrument is 10A. Formulate the necessary equation and calculate the limiting error in percentage.	BTL 1	Knowledge	CO2
7.	Why the ordinary Watt-meters are not suitable for Low power factor circuits?	BTL 1	Knowledge	CO2



8.	How does one extend the range of Ammeter and Voltmeter?		BTL 1	Knowledge	CO2
9.	Specify the use of copper shading bands. Where is it placed in the Energy meter?		BTL 4	Analyse	CO2
10.	Point out any two applications of CT and of PT.		BTL 2	Understand	CO2
11.	Explain the different types of Iron loss.		BTL 3	Apply	CO2
12.	Distinguish with example, the term “Hysteresis”.		BTL 4	Analyse	CO2
13.	What is Phase sequence Indicator?		BTL 1	Knowledge	CO2
14.	List out the Various causes which occur errors in a Dynamometer Wattmeter.		BTL 3	Apply	CO2
15.	Define Phase meter? Point out the Types of Phase meter.		BTL 3	Apply	CO2
16.	List out the methods used for Measurement of Iron loss in Ferromagnetic materials.		BTL 5	Evaluate	CO2
17.	Which type of Frequency meter is used over a wide range of voltage? Why?		BTL 5	Evaluate	CO2
18.	How the Flux Density is Measured?		BTL 5	Evaluate	CO2
19.	What is the need to evaluate Phase-angle error in Instrument Transformer?		BTL 4	Analyse	CO2
20.	Draw the block diagram of frequency meter and explain it.		BTL 1	Knowledge	CO2
PART – B					
1.	Discuss the Construction and its Working principle of Electrodynamometer type Wattmeter.	(13)	BTL 4	Analyse	CO2
2.	Discuss with Circuit and Phase diagram, describe the working of Single phase AC Energy Meter.	(13)	BTL 5	Evaluate	CO2
3.	State Blondel’s theorem and explain how the power measurement using two wattmeter method.	(13)	BTL 2	Understand	CO2
4.	Describe the Construction and Working of Permanent Magnet Moving coil Instrument. Also Derive the expression for deflection	(13)	BTL 2	Understand	CO2
5.	Obtain the Mathematical expression for deflecting torque and Controlling torque for the DC Ammeter. And also write the advantages and disadvantages.	(13)	BTL 3	Apply	CO2
6.	Discuss the working principle of operation of Electrodynamometer type of Instruments with its constructional diagram.	(13)	BTL 6	Create	CO2
7.	i) Write a Technical note on the Magnetic Measurements. ii) Explain the measurement of iron losses through Wattmeter method with setup and derive the expression for total iron losses	(6) (7)	BTL 6	Create	CO2

8.	(i) Explain the Methods of turns compensation used in current Transformers to reduce ratio error.	(7)	BTL 3	Apply	CO2
	(ii) Explain the term “loading” in voltmeter and give the method to remove the adverse effect of the same.	(6)	BTL 2	Understand	CO2
9.	(i) The C oil of instrument has 42.5 turns. The mean width of the coil is 2.5cm and the axial length of the coil is 2 cm. If the flux density is 0.1 Wb/m ² , Calculate the torque on the moving coil in NM	(6)	BTL 4	Analyse	CO2
	(ii) A 100/5A current transformer having a rated burden of 25 VA has an iron loss of 0.4W and a magnetizing current of 2 A. Calculate its ratio error and phase angle error when supplying rated output current to a meter having a ratio of resistance to reactance 5.	(7)			
10.	(i) Discuss the effect of the following on the error of current Transformer a) Change of primary winding circuit and b) Change in secondary winding circuit burden	(6)	BTL 3	Apply	CO2
	(ii) How is multi-meter used to measure different parameters? Explain.	(7)			
11.	(i) How do you demonstrate the B-H curve using “step by step” Method ?	(6)	BTL 3	Apply	CO2
	(ii) What are the different methods used for the measurement of frequency? Explain any one method.	(7)	BTL 3	Apply	CO2
12.	Write short notes on: a. Current transformer b. Weston frequency meter	(13)	BTL 2	Understand	CO2
13.	(i) Discuss in detail, about the working principle and characteristics of CT with its phasor diagram.	(7)	BTL 6	Create	CO2
	(ii) Explain the operating principle of instrument transformer.	(6)	BTL 2	Understand	CO2
14.	Describe the constructional and working of an induction type wattmeter. Also derive an expression for the average torque which is proportional to power.	(13)	BTL 3	Apply	CO2

PART-C

1.	Discuss with Circuit and Phase diagram, describe the working of Three phase AC Energy Meter.	(15)	BTL 5	Evaluate	CO2
2.	(i) Explain the construction and working principle of digital Frequency meter.	(8)	BTL 5	Evaluate	CO2
	(ii) Discuss with Circuit diagram, describe the working of single phase Electrodynamicometer type power factor meter.	(7)			
3.	(i) Show a neat connection diagram of a three phase energy meter used for measurement of energy incorporating CT and PT. Explain, Why CT and PT are used.	(8)	BTL 6	Create	CO2
	(ii) Discuss briefly the three types of operating torque needed for the satisfactory operation of the indicating instruments.	(7)			
4.	A current transformer has a single turn primary and 400 secondary turns. The magnetizing current is 90A while core loss current is 40A. Secondary circuit phase angle is 28deg. Calculate the actual primary current and ratio error when secondary carries 5A current.	(15)	BTL 5	Evaluate	CO2

UNIT III - COMPARISON METHODS OF MEASUREMENTS					
D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.					
PART – A					
Q.No	Questions		BT Level	Competence	COs
1.	What is a potentiometer? List its application.		BTL 3	Apply	CO3
2.	Point out the grounding techniques available in measurements.		BTL 4	Analyse	CO3
3.	With the neat circuit diagram, illustrate the balanced equation of Wheatstone bridge.		BTL 1	Knowledge	CO3
4.	Draw the circuit diagram write the expression for unknown inductance and its resistance of Anderson's bridge.		BTL 4	Analyse	CO3
5.	How Maxwell's bridge differ from Anderson bridge, although both are used for measuring inductance?		BTL 3	Apply	CO3
6.	What are the sources of electromagnetic interference?		BTL 2	Understand	CO3
7.	Write the necessary balance condition for a Schering bridge		BTL 4	Analyse	CO3
8.	Evaluate why there are two conditions of balance in AC bridges?		BTL 4	Analyse	CO3
9.	Which bridge is used to measure incremental inductance? Write the expression.		BTL 3	Apply	CO3
10.	List the application of AC bridge.		BTL 4	Analyse	CO3
11.	Generalize the active and passive bridge circuits?		BTL 3	Apply	CO3
12.	Deduce the principle of grounding.		BTL 1	Knowledge	CO3
13.	List the application of DC potentiometers.		BTL 2	Understand	CO3
14.	State the features of ratio transformers which make them popular for bridge applications.		BTL 6	Create	CO3
15.	What is an isolation amplifier? Analyze and write where is it used?		BTL 1	Knowledge	CO3
16.	State the condition for balance in a wheatstone bridge.		BTL 1	Knowledge	CO3
17.	What is the use of potentiometer in the field of electrical measurement?		BTL 3	Apply	CO3
18.	Specify the purpose of Wagner earthing device.		BTL 1	Knowledge	CO3
19.	What are the main causes of ground loop currents?		BTL 2	Understand	CO3
20.	Discuss the working principle of a digital plotter.		BTL 3	Apply	CO3
PART – B					
1.	Quote the procedure of measuring a low resistance with help of Kelvin's double bridge. Derive the relation to find unknown resistance.	(13)	BTL 6	Create	CO3
2.	Describe in detail about: a. Interference and screening b. Multiple earth and earth loops.	(13)	BTL 5	Evaluate	CO3

3.	With the circuit diagram, describe the principle of operation of duo-range DC Potentiometer.	(13)	BTL 4	Analyse	CO3
4.	(i) Draw a neat diagram of Kelvin double bridge and explain how to measure low resistance.	(7)	BTL 5	Evaluate	CO3
	(ii) Obtain an expression for measurement of inductance using Maxwell's inductance bridge with a neat circuit diagram.	(6)	BTL 4	Analyse	
5.	Explain how the inductance is measured in terms of known Capacitance using Maxwell's bridge. Compose the conditions for balance.	(13)	BTL 2	Understand	CO3
6.	Describe the following:	(13)	BTL 2	Understand	CO3
	a. Grounding techniques b. Causes of electromagnetic measurements in measurements.				
7.	(i) In a balanced network, AB is a resistance of 500 ohm in series with an inductor of 0.18H, BC and DA are non-inductive resistances of 1 k ohm each and CD consists of a resistance R in series with a capacitor C. A potential difference of 5 V at a frequency of $5000/2$ is applied between points A and C. Determine the values of R and C.	(7)	BTL 5	Evaluate	CO3
	(ii) Draw and explain the balance conditions of a Wheatstone bridge.	(6)	BTL 2	Understand	CO3
8.	(i) Explain the construction of Anderson's bridge. Derive the unknown quantities at balance condition. Also write its advantages and disadvantages.	(7)	BTL 4	Analyse	CO3
	(ii) Derive the expressions for measurement of unknown capacitance with a neat bridge circuit.	(6)	BTL 4	Analyse	CO3
9.	(i) How does one measure the resistance using potentiometer?	(7)	BTL 1	Knowledge	CO3
	(ii) Estimate the way to measure the phase angle using ratio transformer?	(6)	BTL 2	Understand	CO3
10.	(i) Explain in detail the electro-static and electro-magnetic interference.	(7)	BTL 1	Knowledge	CO3
	(ii) Describe the Importance of Grounding. What are the different grounding techniques used?	(6)			
11.	Draw the diagram of Co-ordinate type A.C. potentiometer and explain its working principle.	(13)	BTL 3	Apply	CO3
12.	(i) Explain the theory and working principle of Wheat stone's Bridge. Derive the relation for finding unknown resistance.	(7)	BTL 2	Understand	CO3
	(ii) Describe any one method for the measurements of high resistance.	(6)			
13.	(i) With the help of Schering bridge, explain how loss angle of a dielectric can be determined.	(7)	BTL 2	Understand	CO3
	(ii) Explain the measurements of frequency by Wien's bridge.	(6)			
14.	(i) Explain the theory and working principle of Hay's Bridge. Derive the relation for finding unknown resistance and inductance	(7)	BTL 2	Understand	CO3
	(ii) Obtain an expression for measurement of inductance using Anderson's bridge with a neat circuit diagram.	(6)			

<u>PART-C</u>					
1.	Design a volt-ratio box with a resistance of 20 ohms/volt and ranges 3V, 10V, 30V, 100V. The Volt-ratio box is to be used with a Potentiometer having a measuring rang of 1.6V.	(15)	BTL 3	Apply	CO3
2.	Evaluate the expression for the current through the galvanometer in case of unbalanced Wheatstone Bridge. And also state its application	(15)	BTL 5	Evaluate	CO3
3.	A Maxwell's Capacitance bridge Shown below figure, is used to measure an unknown inductance in comparison with capacitance. The various values at balance: $R_2= 400\text{ohm}$; $R_3= 600\text{ohm}$; $R_4=1000\text{ohm}$; $C_4=0.5\mu\text{F}$. Calculate the value of R_1 and L_1 . Calculate also the value of storage Q Factor of the coil if frequency is 1000Hz.	(15)	BTL 4	Analyse	CO3
4.	An AC bridge has the following constants arm AB- Capacitor of $0.5\mu\text{ F}$ in parallel with 1K resistance. Arm AD- resistance of 2 K . Arm DC-Capacitor of $0.5\mu\text{ F}$. Arm CD-Unknown C_x and R_x in series, frequency- 1KHz . Determine the unknown capacitance and dissipation factor.	(15)	BTL 5	Evaluate	CO3

UNIT IV - STORAGE AND DISPLAY DEVICES

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

PART – A

Q.No	Questions	BT Level	Competence	COs
1.	State the advantages of LED from the intensity of light and	BTL 2	Understand	CO4
2.	Formulate the principle of dot matrix display?	BTL 1	Knowledge	CO4
3.	Distinguish between LED and LCD.	BTL 3	Apply	CO4
4.	Classify the functions of data logger?	BTL 6	Create	CO4
5.	Illustrate how does dynamic scattering type LCD work?	BTL 2	Understand	CO4
6.	Point out the advantages of magnetic tape recorder?	BTL 1	Knowledge	CO4
7.	Mention the use of Lissajous patterns.	BTL 4	Analyse	CO4
8.	Differentiate the functions of printer and plotter	BTL 3	Apply	CO4
9.	List the main parts of cathode ray tube?	BTL 1	Knowledge	CO4
10.	Generalize the types of printers according to printing	BTL 5	Evaluate	CO4

11.	Compare the merits and demerits of LED and LCD.		BTL 3	Apply	CO4
12.	Quote the principle of operation of ink jet printer.		BTL 2	Understand	CO4
13.	Deduce the purpose of post deflection acceleration (PDA) in CRT.		BTL 2	Understand	CO4
14.	Specify the application of Data loggers.		BTL 2	Understand	CO4
15.	List the basic components of a tape recorder?		BTL 4	Analyse	CO4
16.	A 31/2 digit voltmeter is used for measurement. What is its resolution? How it would display a reading of 12.57V in 100V scale?		BTL 1	Knowledge	CO4
17.	Contrast line printer and dot matrix printer		BTL 2	Understand	CO4
18.	Compare the dual trace and dual beam CRO.		BTL 2	Understand	CO4
19.	Classify the different types of magnetic recording?		BTL 1	Knowledge	CO4
20.	State the reason for having complementary characteristic between the reproduce head and the amplifier connected to the reproduce head in a magnetic tape recorder?		BTL 1	Knowledge	CO4
PART – B					
1.	(i) Describe construction and working of magnetic tape recorder. (ii) With a help of functional block diagram, explain the operation of a Cathode Ray Oscilloscope.	(6) (7)	BTL 4	Analyse	CO4
2.	(i) Develop a neat block diagram of X-Y recorder and describe its working. (ii) Explain the principle and working of CRT display with a neat diagram.	(6) (7)	BTL 3	Apply	CO4
3.	(i) Explain the theory of seven segment display. Draw the circuit diagram of a common anode display. (ii) What is data logger? What are its components? What are the functions of data logger?	(6) (7)	BTL 3	Apply	CO4
4.	With the help of the fundamental block diagram, explain the working principle of digital storage oscilloscope, mention its advantages over analog CRO?	(13)	BTL 6	Create	CO4
5.	Describe the direct and frequency modulation magnetic tape recording types. Give its merits and demerits.	(13)	BTL 1	Knowledge	CO4
6.	Relate and contrast the working, advantages and disadvantages of LED and LCD.	(13)	BTL 5	Evaluate	CO4
7.	Generalize the short notes on (i) Magnetic disk and tape (ii) Recorders and printers.	(6) (7)	BTL 1	Knowledge	CO4
8.	Give the basic block diagram of a digital data recording system.	(13)	BTL 1	Knowledge	CO4
9.	(i) Relate the features of FM recording with PDM Recording. (ii) Explain with neat sketch the bar graph display.	(6) (7)	BTL 2	Understand	CO4

10.	a) List out the advantages of X-Y records over strip chart recorder. b) List the advantages of laser printer. c) Interpret power requirement of LCD? d) Describe the different types of sweeps used in CRO	(3) (3) (3) (4)	BTL 6	Create	CO4
11.	What are the advantages of using a magnetic tape recorder? Explain how the tape recorder works with suitable diagrams.	(13)	BTL 3	Apply	CO4
12.	Write a short note on plotter. Discuss the operation of drum type plotter. Compare it with a printer and state its uses.	(13)	BTL 2	Understand	CO4
13.	Explain the Dot matrix printer working and sketch the construction layout.	(13)	BTL 3	Apply	CO4
14.	Illustrate the working principle of data logger and sketch the layout.	(13)	BTL 6	Create	CO4

PART-C

1.	Design the following : (i) 7 segment display (ii) Alpha numeric display	(8) (7)	BTL 6	Create	CO4
2.	(i) Evaluate in detail the process of recording and reading in an audio cassette (ii) Design how a PN junction diode act as light emitting diode	(8) (7)	BTL 6	Create	CO4
3.	Explain the operation Dot matrix printer to print the alphabetic letter 'A'	(15)	BTL 3	Apply	CO4
4.	Design and construct the Digital Storage Oscilloscope to display the digital signal	(15)	BTL 3	Apply	CO4

UNIT V - TRANSDUCERS AND DATA ACQUISITION SYSTEMS

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers

PART – A

Q.No	Questions	BT Level	Competence	COs
1.	Define primary transducer?	BTL 1	Knowledge	CO5
2.	Quote the principle of operation of optical transducer?	BTL 1	Knowledge	CO5
3.	What are the factors to be considered for selection of transducers?	BTL 1	Knowledge	CO5
4.	Write the functions of transducer.	BTL 1	Knowledge	CO5
5.	Compare sensor and transducer.	BTL 6	Create	CO5
6.	Mention the need of ADC and DAC in digital data acquisition system.	BTL 1	Knowledge	CO5
7.	In capacitive transducer, which principle exhibits linear characteristics? How?	BTL 1	Knowledge	CO5
8.	Define piezo electric effect.	BTL 2	Understand	CO5
9.	Mention the electrical phenomena used in transducers.	BTL 1	Knowledge	CO5
10.	What are the basic requirements of the transducer?	BTL 3	Apply	CO5
11.	Classify any two applications of Smart Sensors	BTL 3	Apply	CO5
12.	List the elements of DAQ System.	BTL 2	Understand	CO6
13.	What are the two ways that the DAS are used to measure and record analog	BTL 2	Understand	CO6

14.	Describe inverse transducers with example		BTL 1	Knowledge	CO6
15.	What is thermal imager?		BTL 6	Create	CO6
16.	Discuss in brief about thermocouple?		BTL 1	Knowledge	CO6
17.	Write the desired properties of thermo couple metals		BTL 1	Knowledge	CO6
18.	Describe strain gauge? List its types.		BTL 2	Understand	CO6
19.	Explain in brief about gauge factor? Give its expression.		BTL 6	Create	CO6
20.	Quote piezoelectric effect?		BTL 3	Apply	CO6
PART – B					
1.	(i) Describe the construction and working of potentiometer type resistance transducer for measuring linear displacement. (ii) A 5-plate transducer has plates of dimensions 20mm*20 mm and separated 0.25mm apart. The arrangement is to be used for measuring displacement. Determine the sensitivity of the arrangement. Assume air medium.	(7) (6)	BTL 1	Knowledge	CO5
2.	(i) What is called piezo- electric transducer? Explain its working with neat diagram (ii) Examine how to measure pressure using capacitive type transducer.	(7) (6)	BTL 5	Evaluate	CO5
3.	Elaborate the types of resistive and inductive transducer used for measuring pressure.	(13)	BTL 1	Knowledge	CO5
4.	(i) Explain in brief about data acquisition system? With generalized block diagram, explain the functions of it. (ii) Describe about smart sensors.	(7) (6)	BTL 5	Evaluate	CO5
5.	Tell about the selection criteria for the transducer? Explain the working principle of LVDT with neat sketch and characteristics. Give advantages, disadvantages and applications of LVDT	(13)	BTL 1	Knowledge	CO5
6.	Discuss in brief on the following. (i) See-back effect. (ii) Piezoelectric transducer. (iii) Resistance thermometer.	(5) (4) (4)	BTL 3	Apply	CO5
7.	(i) Explain how a Hall Effect transducer is used to measure electric current with a schematic representation. (ii) Describe the concept of smart sensors.	(7) (6)	BTL 1	Knowledge	CO5
8.	(i) Describe the measurement of resistance using strain gauge. (ii) Describe the various factors influencing the type of transducer for a particular application.	(7) (6)	BTL 4	Analyse	CO6
9.	(i) What are rosettes type strain gauges? Under which condition rosettes are used? Draw any two types of rosettes. (ii) Discuss active and passive transducers with an example briefly for each type.	(7) (6)	BTL 4	Analyse	CO6
10.	(i) Write in detail about the construction and working principle of LVDT. (ii) List the advantages of LVDT	(10) (3)	BTL 6 BTL 3	Create Apply	CO6
11.	(i) Describe in detail, the working principle of capacitive Microphone. (ii) Write a detailed technical note on smart sensors .Explain also the various built in features of them compared to conventional sensors.	(7) (6)	BTL 1	Knowledge	CO6
12.	Explain in detail about hall effect transducer and mention s of hall effect transducer.	(13)	BTL 4	Analyse	CO6

13.	(i) Explain the working of thermal imagers. (ii) Explain the major components of thermal imagers	(7) (6)	BTL 1	Knowledge	CO6
14.	Elucidate the element of data acquisition system.	(13)	BTL 4	Analyze	CO6
<u>PART-C`</u>					
1.	i) Describe the different modes of operation of piezo electric transducer. ii) Explain in detail the working of any two digital transducers.	(15)	BTL 1	Knowledge	CO5
2	Design the piezo- electric transducer and give the formula for coupling coefficient.	(15)	BTL 5	Evaluate	CO5
3	Explain in detail about the components, working, types and applications of thermal imagers.	(15)	BTL 4	Analyse	CO6
4	Design the Block diagram arrangement of DAS and describe the function of each component and also state its applications	(15)	BTL 6	Create	CO6



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