SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

1905404– MEASUREMENTS AND INSTRUMENTATION

Regulation – 2019

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Prepared by

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SUBJECT :1905404– MEASUREMENTS AND INSTRUMENTATION

SEM / YEAR:IV/II

UNIT I - INTRODUCTION				
Functional elements of an instrument – Classification of Instruments - 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.	What are the basic functional elements of an instrument?	**BTL 4**	**Create**	**CO1**
2.	Briefly explain the role of primary sensing element.	**BTL 5**	**Evaluate**	**CO1**
3.	What are defection and null output instruments?	**BTL 4**	**Analyse**	**CO1**
4.	Give the classification of secondary instruments	**BTL 3**	**Apply**	**CO1**
5.	Compare Resolution and Precision.	**BTL 3**	**Apply**	**CO1**
6.	Define the term “Sensitivity” of an Instrument.	**BTL 1**	**Knowledge**	**CO1**
7.	Define the Static characteristics 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.	Define Dynamic characteristics of an 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 fidelity.	**BTL 2**	**Understand**	**CO1**
12.	State the different types of standards in an Instrument.	**BTL 1**	**Knowledge**	**CO1**
13.	Enumerate the term calibration employed in instruments.	**BTL 4**	**Analyse**	**CO1**
14.	Explain Absolute error of measurement?	**BTL 3**	**Apply**	**CO1**
15.	Define Limiting error. Derive the expression for Relative limiting error.	**BTL 4**	**Analyse**	**CO1**
16.	What are gross errors?	**BTL 6**	**Create**	**CO1**
17.	What is Average deviation ?What does indicate on a measuring instrument?	**BTL 6**	**Create**	**CO1**
18.	Distinguish between Gravity control and Spring Control.	**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**
21.	Define (i) Resolution (ii) Static Sensitivity.	**BTL 1**	**Knowledge**	**CO1**
22.	What is meant by calibration of the instrument ?	**BTL 1**	**Knowledge**	**CO1**
23.	Draw the functional elements of measurements system.	**BTL 1**	**Knowledge**	**CO1**
24.	List any 4-static characteristics of measurement system.	**BTL 1**	**Knowledge**	**CO1**
PART – B				

1.	(i) Explain the functional elements of an instrument with a neat block diagram (ii) Define accuracy and reproducibility of an instrument and explain.	(13)	**BTL 2** **BTL 2**	**Understand** **Understand**	**CO1** **CO1**
2.	Discuss the various classification of instruments in detail	(13)	**BTL 2**	**Understand**	**CO1**
3.	Describe the static and dynamic characteristics of measuring instruments.	(13)	**BTL 1**	**Knowledge**	**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 resistanceof10ohms.Itwasfoundthattheresistancewas0.2% greater than what was specified as rated and the ammeter measurementwas0.5%more than the true value. Determine the relative error in power measurement.	(8) (5)	**BTL6** **BTL6**	**Create** **Create**	**CO1** **CO1**
5.	(i) Define and explain the following static characteristics of an instrument .(a) Accuracy (b) Resolution (c) Sensitivity (d) Linearity (ii)Explain the types of static errors possible in an instrument.	(8) (5)	**BTL 1** **BTL 2**	**Knowledge** **Understand**	**CO1** **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 (i) Arithmetic mean (ii) Deviation (iii)Standard deviation (iv)Average deviation	(13)	**BTL 5**	**Evaluate**	**CO1**
7.	By using a micrometer screw, the following readings were taken of a certainlength: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: (i) Arithmetic mean (ii) Average deviation (iii)standard deviation and (iv)variance	(13)	**BTL 4**	**Analyse**	**CO1**
8.	Define the following terms in the context of normal frequency distribution of data: (i) Mean value (ii) Deviation (iii) Average deviation (iv) Variance (v) Standard deviation.	(13)	**BTL 2**	**Understand**	**CO1**
9.	Classify and explain the different types of error and also mention its compensation methods.	(13)	**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)	**BTL3** **BTL3**	**Apply** **Apply**	**CO1** **CO1**
12.	The following values were obtained from the measurements of	(13)	**BTL 6**	**Create**	**CO1**

	the values of 147.2, 147.4, 147.9, 147.7, 147.5, 147.6, and 147.5. Calculate (i) arithmetic mean (ii) standard deviation (iii) The probable error of average of Ten readings				
13.	(i) Discuss with a neat sketch and explain the working principle of PMMC Instrument. (ii) AmeterAhasarangeof0-100Vandamultiplierresistance of 25ohm.The meter B has range of 0-1000V and a multiplier resistance of 150KΩ .Both meter have basic resistance of 1KΩ.Which meter is more sensitive?	(7) (6)	**BTL1** **BTL4**	**Knowledge** **Apply**	**CO1** **CO1**
14.	Explain construction and working Principle of various types of Digital Voltmeter (DVM).	(13)	**BTL 5**	**Evaluate**	**CO1**
15.	Explain the principle, construction and working of MI Instrument. And also explain the types of MI Instruments.	(13)	**BTL 1**	**Knowledge**	**CO1**
16.	(i) What is a standard? Explain the different type standards. (ii) Explain in details about calibration technique.	(7) (6)	**BTL3** **BTL3**	**Apply** **Apply**	**CO1** **CO1**
17.	(i) Describe the functional elements of an instrument with block diagram, (ii) Explain the dynamic characteristics of an instrument in details.	(7) (6)	**BTL1** **BTL4**	**Knowledge** **Apply**	**CO1** **CO1**
	PART-C				
1.	Draw and explain the block diagram of Generalized Instrumentation System with illustration.	(15)	**BTL 1**	**Knowledge**	**CO1**
2.	What are the different inputs for the studying of the Dynamic response of a system? Compose and Sketch them.	(15)	**BTL 3**	**Apply**	**CO1**
3.	Explain in detail the types of errors and sources of error in measurement technique.	(15)	**BTL 2**	**Understand**	**CO1**
4.	Explain the principle, construction, working of PMMC Instruments. And also mention the advantages and disadvantages of it.	(13)	**BTL5**	**Evaluate**	**CO1**
5	Explain the characteristics of measurement system: (i)Static Characteristics (ii)Dynamic Characteristics.	(7) (8)	**BTL 2**	**Understand**	**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.	How the measuring instruments can be classified ?	**BTL 2**	**Understand**	**CO2**
2.	List out various causes in which the error of Electro dynamo type wattmeter.	**BTL 2**	**Understand**	**CO2**
3.	Define Creeping in Energy meter.	**BTL 1**	**Knowledge**	**CO2**
4.	Illustrate the Types of analog ammeter used for	**BTL 6**	**Create**	**CO2**

	Instrumentation.				
5.	Write the torque Equation for the moving iron instruments		**BTL 4**	**Analyse**	**CO2**
6.	Mention any 4-applications of Multimeter.		**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.	Which torque is absent in energy meter? Why?		**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 use wide range of voltage? Why?		**BTL 5**	**Evaluate**	**CO2**
18.	How the Flux Density is Measured?		**BTL 5**	**Evaluate**	**CO2**
19.	Point out any two applications of CT and of PT.		**BTL 4**	**Analyse**	**CO2**
20.	Draw the block diagram of frequency meter and explain it.		**BTL 1**	**Knowledge**	**CO2**
21.	What are the different methods used for the measurement frequency ?		**BTL 1**	**Knowledge**	**CO2**
22.	Draw the basic diagram for Electro Dynamo type Wattmeter.		**BTL 3**	**Apply**	**CO2**
23.	Mention the main elements of Induction type Energy Meter.		**BTL 3**	**Apply**	**CO2**
24.	Define transformer ratio of an Instrumentation Transformer(IT).		**BTL 5**	**Evaluate**	**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)	**BTL2**	**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 t o r q u e for the DC Ammeter. 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. (ii) Explain the term "loading" in voltmeter and give the method to remove the adverse effect of the same.	(7) (6)	**BTL3** **BTL2**	**Apply** **Understand**	**CO2** **CO2**
9.	(i) The Coil 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/m2, Calculate the torque on the moving coil in NM (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 supply in grated output current .	(6) (7)	**BTL3** **BTL2**	**Apply** **Understand**	**CO2** **CO2**
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. (ii) How is multi-meter used to measure different parameters? Explain with suitable diagram.	(6) (7)	**BTL 3** **BTL 3**	**Apply** **Apply**	**CO2** **CO2**
11.	(i) How do you demonstrate the B-H curve using "step by step" Method ? (ii) What are the different methods used for the measurement of frequency? Explain any one method.	(6) (7)	**BTL3** **BTL3**	**Apply** **Apply**	**CO2** **CO2**
12.	Write short notes on: (i) Current transformer (ii) 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. (ii) Explain the operating principle of instrument transformer.	(7) (6)	**BTL6** **BTL2**	**Create** **Understand**	**CO2** **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**
15.	Describe the construction details and working of (i) Single Phase Induction type Energy meter.	(13)	**BTL 2**	**Understand**	**CO2**
16.	How do you determine the B-H curve by "Step by Step" method ?	(13)	**BTL 3**	**Apply**	**CO2**
17.	Explain with neat sketch types of instrumentation transformer.	(13)	**BTL 6**	**Create**	**CO2**
	PART-C				
1.	Describe the construction details and working of (i) Single Phase Induction type Energy meter (ii) Three Phase Induction Type Energy Meter,	(15)	**BTL 5**	**Evaluate**	**CO2**
2.	(i) Explain the construction and working principle of digital Frequency meter. (ii) Discuss with Circuit diagram, describe the working of single phase Electrodynamometer type power factor meter.	(8) (7)	**BTL 5**	**Evaluate**	**CO2**

3.	(i)Show a neat connection diagram of a three phase energy meter used form measurement of energy in corporation CT and PT. Explain, Why CT and PT are used. (ii) Discuss briefly the three types of operating torque needed for the satisfactory operation of the indicating instruments.	(8) (7)	**BTL 6**	**Create**	**CO2**
4.	Describe the method for the determination of B-H Curve for magnetic material (i) Method of Reversal (ii) Step by step method.	(15)	**BTL 5**	**Evaluate**	**CO2**
5.	Write Short notes on the following (i) Western type Frequency Meter (ii) Vibrating Reed type Frequency Meter (iii) Ratio Meter Type Frequency Meter	(15)	**BTL 2**	**Understand**	**CO2**

UNIT III - COMPARATIVE METHODS OF MEASUREMENTS

D.C and AC 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.	List the application of DC potentiometers.	**BTL 4**	**Analyse**	**CO3**
3.	With the neat circuit diagram, illustrate the balanced equation of Wheatstone bridge.	**BTL 1**	**Knowledge**	**CO3**
4.	Differentiate the principle of dc potentiometer and ac potentiometer.	**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.	Draw the circuit diagram write the expression for unknown inductance and its resistance of Anderson's bridge.	**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.	Give the relationship between the bridge balance equation of DC bridge and AC bridge	**BTL 1**	**Knowledge**	**CO3**
13.	What are the ways of minimizing the electromagnetic interference?	**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.	What is meant by grounding ?	**BTL 1**	**Knowledge**	**CO3**
17.	What are the sources of electromagnetic interference?	**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**
21.	List the various types of detectors for AC Bridges.		**BTL 4**	**Analyse**	**CO3**
22.	What is meant by multiple earth ?		**BTL 3**	**Apply**	**CO3**
23.	Mention the different types of interference signal.		**BTL 4**	**Analyse**	**CO3**
24.	Give some of the applications of DC Potentio meter.		**BTL 3**	**Apply**	**CO3**
	PART – B				
1.	With the circuit diagram, describe the principle of operation of duo-range DC Potentiometer.	(13)	**BTL 4**	**Analyse**	**CO3**
2.	Draw the diagram of Co-ordinate type AC potentiometer and explain its working principle.	(13)	**BTL 3**	**Apply**	**CO3**
3.	(i) Explain the theory and working principle of Wheat stone's Bridge. Derive the relation for finding unknown resistance. (ii) Describe any one method for the measurements of high resistance.	(7) (6)	**BTL 2** **BTL 2**	**Understand** **Understand**	**CO3** **CO3**
4.	Draw a neat diagram of Kelvin double bridge and explain how to measure low resistance.	(13)	**BTL5**	**Evaluate**	**CO3**
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: (i) Grounding techniques (ii) Causes of electromagnetic measurements.	(13)	**BTL 2**	**Understand**	**CO3**
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 $5000/2\pi$ is applied between points A and C. Determine the values of R and C. (ii) Draw and explain the balance conditions of a Wheatstone bridge.	(7) (6)	**BTL5** **BTL2**	**Evaluate** **Understand**	**CO3** **CO3**
8.	(i) Explain the construction of Anderson's bridge. Derive the unknown quantities at balance condition. Also write it's advantages and disadvantages. (ii) Derive the expressions for measurement of unknown capacitance with a neat bridge circuit.	(7) (6)	**BTL4** **BTL4**	**Analyse** **Analyse**	**CO3** **CO3**
9.	(i) How does one measure the resistance using potentiometer? (ii) Estimate the way to measure the phase angle using ratio transformer?	(7) (6)	**BTL1** **BTL2**	**Knowledge** **Understand**	**CO3** **CO3**
10.	(i) Explain in detail the electro-static and electro- magnetic interference. (ii) Describe the Importance of Grounding. What are the different grounding techniques used?	(7) (6)	**BTL 1** **BTL 1**	**Knowledge** **Knowledge**	**CO3** **CO3**

11.	Describe about the multiple earth and earth loops.	(13)	**BTL 1**	**Knowledge**	**CO3**
12.	Discuss the advantages and limitations of electromagnetic interference in measurements.	(13)	**BTL 2**	**Understand**	**CO3**
13.	(i) With the help of Schering bridge, explain how loss angle of a dielectric can be determined. (ii) Explain the measurements of frequency by Wien's bridge.	(7) (6)	**BTL 2**	**Understand**	**CO3**
14.	Explain the theory and working principle of Hay's Bridge. Derive the relation for finding unknown resistance and inductance.	(13)	**BTL 2**	**Understand**	**CO3**
15.	Describe the operation of AC Potentiometer. Explain the different of AC Potentiometer.	(13)	**BTL5**	**Evaluate**	**CO3**
16.	Explain in details about the interference and screening in measurements	(13)	**BTL 2**	**Understand**	**CO3**
17.	Draw a neat sketch of a modern slide wire DC Potentiometer and discuss how the potentiometer is standardized.	(13)	**BTL 2**	**Understand**	**CO3**
	PART-C				
1.	Designavolt-ratioboxwitharesistanceof20ohms/volt and ranges 3V, 10V, 30V, 100V.The Volt-ratio box is to be used with a Potentiometer having a measuring rang of1.6V.	(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.	Explain the following AC Bridges (i) Maxwell's Bridge (ii) Anderson's Bridge.	(15)	**BTL 4**	**Analyse**	**CO3**
4.	Explain how the transformer ratio bridge can be used for the measurement of (i) Resistance (ii) Capacitance (iii) Phase Angle.	(15)	**BTL 5**	**Evaluate**	**CO3**
5.	Explain the interference caused due to electrostatic coupling and Electromagnetic induction and describe protect against such effects.	(15)	**BTL 4**	**Analyse**	**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.	Define the term LED. List some application of LED.	**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 methodology		**BTL 5**	**Evaluate**	**CO4**
11.	What is delayed sweep?		**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.	Write the features of digital XY-Recorder.		**BTL 1**	**Knowledge**	**CO4**
21.	What is meant by data logger? Draw the block diagram of data logger.		**BTL 2**	**Understand**	**CO4**
22.	List the components of magnetic tape type recorder.		**BTL 2**	**Understand**	**CO4**
23.	Differentiate the function of printer and plotter.		**BTL 1**	**Knowledge**	**CO4**
24.	List some applications of LED.		**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 the FM recording with the PDM Recording. (ii) Explain with neat sketch the bar graph display.	(6) (7)	**BTL 2**	**Understand**	**CO4**
10.	List out the advantages of X-Y records over strip chart recorder. (i) List the advantages of laser printer. (ii) Interpret power requirement of LCD? (iii) 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**
15.	Explain the construction and functionalities of various components of CRT Display.	(13)	**BTL 6**	**Create**	**CO4**
16.	Draw a neat block diagram of XY-Recorder and explain its working.	(13)	**BTL 1**	**Knowledge**	**CO4**
17.	Explain the following types of recorders (i) Strip Chart Recorder (ii) Magnetic tape type recorder	(13)	**BTL 5**	**Evaluate**	**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 audiocassette (ii) Design how a PN junction diode acts 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**
5.	Draw the block diagram of CRO and explain each block.	(13)	**BTL 2**	**Understand**	**CO4**

UNIT V - TRANSDUCERS AND DATA ACQUISITION SYSTEMS

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, Mechanical Transducers, 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	**BTL 1**	**Knowledge**	**CO5**

	system.				
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 mechanical 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 signals?		**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 LVDT.		**BTL 1**	**Knowledge**	**CO6**
17.	Write the materials used for piezo electric transducer. Mention any 2- applications of it.		**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**
21.	Formulate the elements of data acquisition system.		**BTL 6**	**Create**	**CO6**
22.	What is meant by thermal imager ?		**BTL 1**	**Knowledge**	**CO6**
23.	Define Hall effect. Mention any 2-applications of Hall effect.		**BTL 1**	**Knowledge**	**CO6**
24.	What is meant by smart sensors. List any two applications of smart sensors.		**BTL 2**	**Understand**	**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 features, classification and working of mechanical transducers.	(13)	**BTL 1**	**Knowledge**	**CO5**
6.	Discuss in brief on the following. (i) Capacitive transducer. (ii) Piezo electric 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 in short about the mechanical transducers.	(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)	**BTL6** **BTL3**	**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 some applications 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 principle of operation of optical transducers.	(13)	**BTL 4**	**Analyze**	**CO6**
15.	Describe the linear and angular measurement using capacitive transducer.	(13)	**BTL 4**	**Analyse**	**CO6**
16.	Explain the factors need to be considered for the selection of transducers.	(13)	**BTL 4**	**Analyse**	**CO6**
17.	What is meant by transducer ? Explain how the transducer can be classified.	(13)	**BTL 4**	**Analyze**	**CO6**
	PART-C`				
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**
5.	Explain in details the construction and working of LVDT. Mention the advantages, disadvantages and applications of it.	(15)	**BTL 5**	**Evaluate**	**CO5**