ST. ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY

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ANGUCHETTYPALAYAM, PANRUTI – 607 106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

EE 8403 - MEASUREMENTS AND INSTRUMENTATION

IV SEMESTER

Prepared by

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DEPARTMENT OF ELECRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

SUBJECT : EE 8403 – 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 It 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**

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.	(8) (5)	**BTL 3**	**Apply**	**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%morethanthetruevalue.Determinethe 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 and 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 as532,548,543,535,546,531,543 and 536. calculate a. Arithmetic mean b. Deviation c. Standard deviation d. Average deviation	(13)	**BTL 5**	**Evaluate**	**CO1**
7.	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: a. Arithmetic mean b. Average deviation c. standard deviation and d. variance	(13)	**BTL 4**	**Analyse**	**CO1**
8.	Define the following terms in the context of normal frequency distribution of data: a) Mean value, b) Deviation, c) Average deviation, d) Variance e) 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 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) 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**
	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 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) Shuntrequiredtouseitasanammetertogetarangeof0-200A. b) Multiplierrequiredtouseitasvoltmeterofrange0-500V.	(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)	**BTL5** **BTL5**	**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.Formulatethenecessaryequationandcalculatethelimiting error inpercentage.		**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**
	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 ingrated outputcurrenttoameterhavingaratioofresistancetoreactance5.	(6) (7)	**BTL 4**	**Analyse**	**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.	(6) (7)	**BTL 3**	**Apply**	**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: 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. (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**
	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. (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.	Acurrenttransformerhasasingleturnprimaryand400secondary turns. The magnetizing current is 90A while core loss current is 40A.Secondarycircuitphaseangleis28deg.Calculatetheactual primarycurrentandratioerrorwhensecondarycarries5Acurrent.	(15)	**BTL 5**	**Evaluate**	**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.

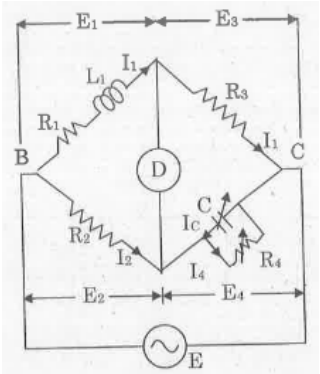
PART – A

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.	Deduce the principle of 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

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 A.C. 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: a. Grounding techniques b. Causes of electromagnetic measurements in measurements.	(13)	**BTL 2**	**Understand**	**CO3**
7.	(i) In a balanced network, AB is a resistance of 500 ohm inseries 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**	**Knowledge**	**CO3**
11.	Describe about the multiple earth and earth loops.	(13)	**BTL 1**	**Knowledge**	**CO3**
12.	Discusstheadvantagesandlimitationsofelectromagneticinterferencein 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.	(i) Explain the theory and working principle of Hay's Bridge. Derive the relation for finding unknown resistance and inductance.	(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.	A Maxwell's Capacitance bridge Shown below figure, is used to measure an unknown inductance in comparison with capacitance. The various values at balance: R2= 400ohm; R3= 600ohm; R4=1000ohm; C4=0.5μF.Calculate the value of R1 and L1.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 0.5μ F in parallel with 1KΩ resistance. Arm AD- resistance of 2 KΩ. Arm DC-Capacitor of 0.5μ 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 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.	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 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**
	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 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 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 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 features, classification and working of mechanical transducers.	(13)	**BTL 1**	**Knowledge**	**CO5**
6.	Discuss in brief on the following. (i) See-backeffect. (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**
	PART-C				
1.	(i)Describe the different modes of operation of piezoelectric 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**