

VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SUBJECT : BE8255 –BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING

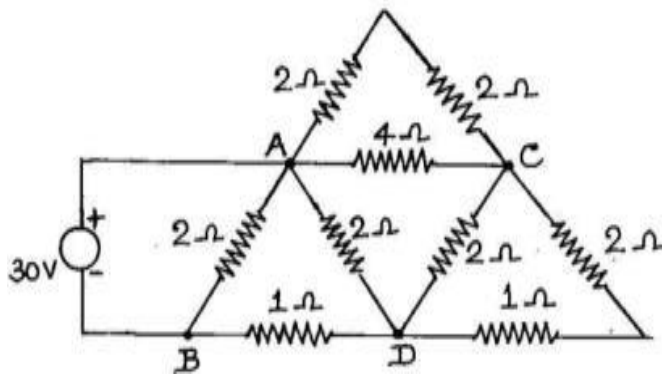
SEM / YEAR: II/ 1st Year CSE& IT

UNIT I - ELECTRICAL CIRCUITS ANALYSIS

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems – Thevenin's theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

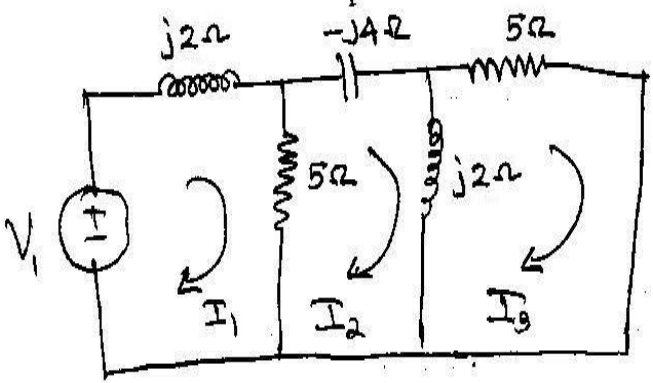
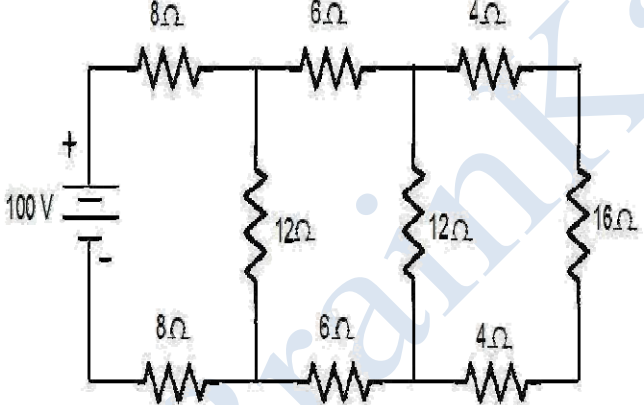
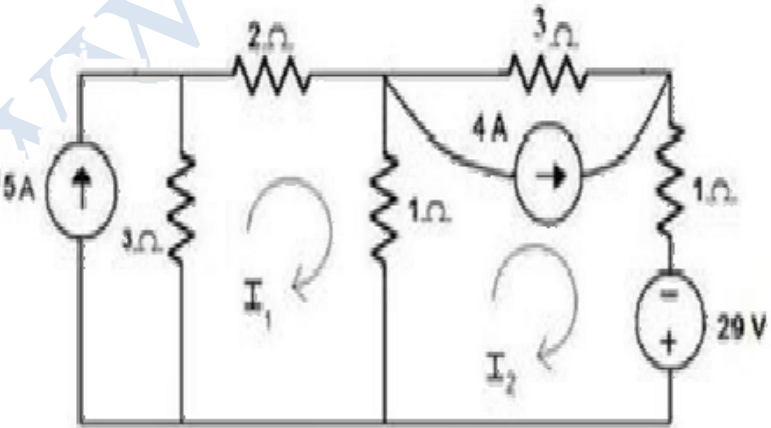
PART – B

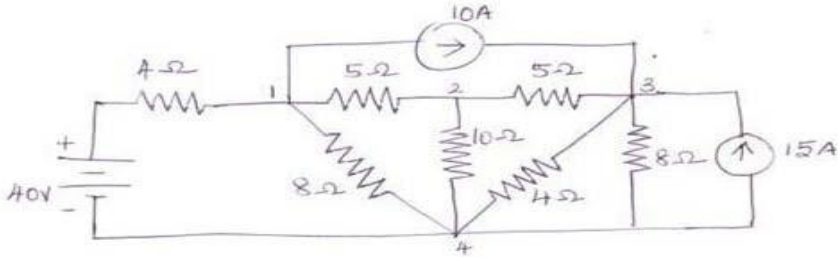
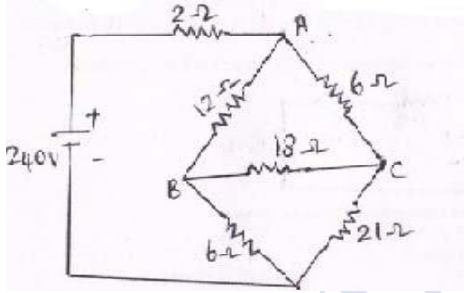
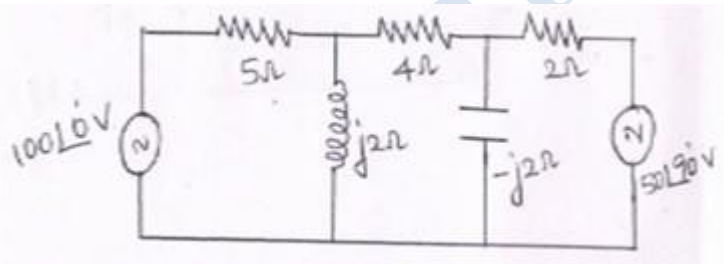
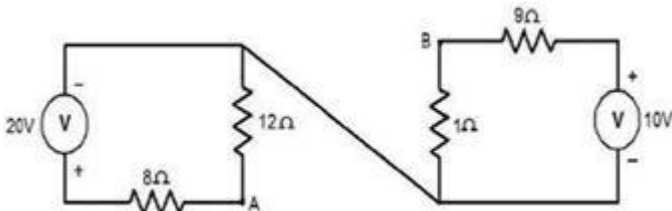
1. Interpret the current delivered by the source shown in the circuit below. (13 marks)

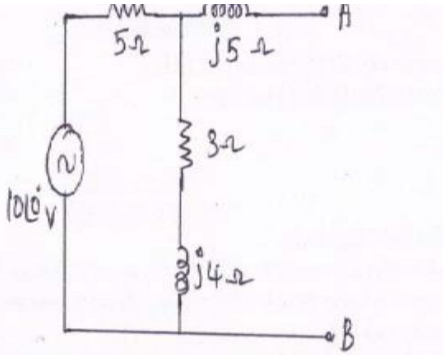
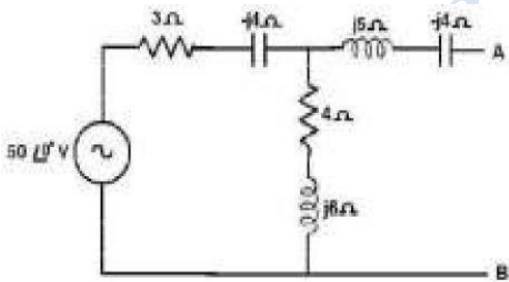
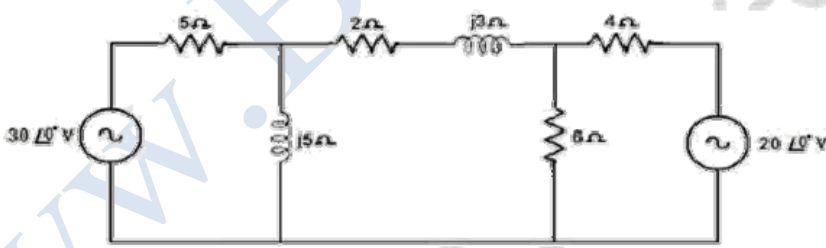
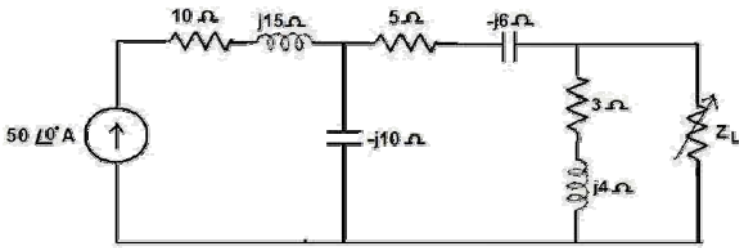


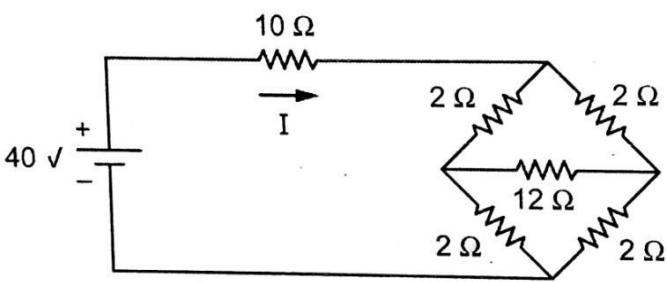
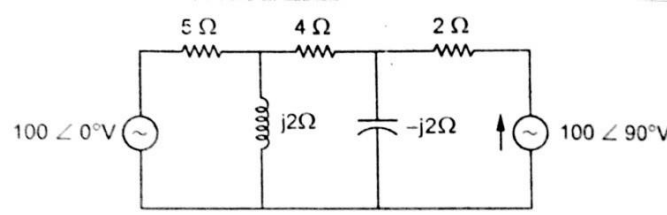
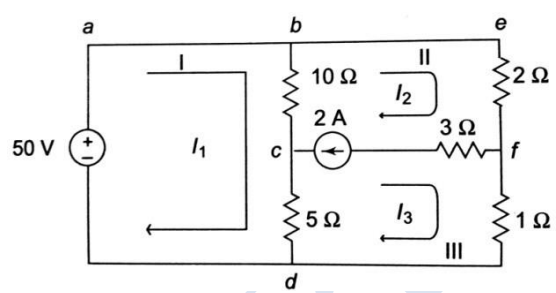
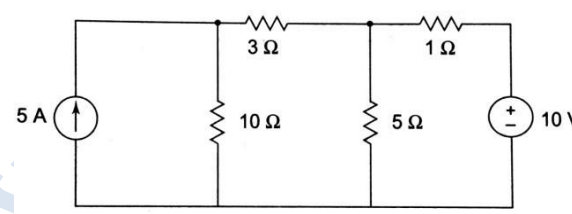
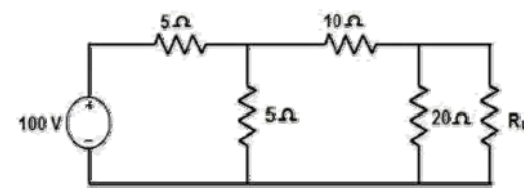
BTL 2

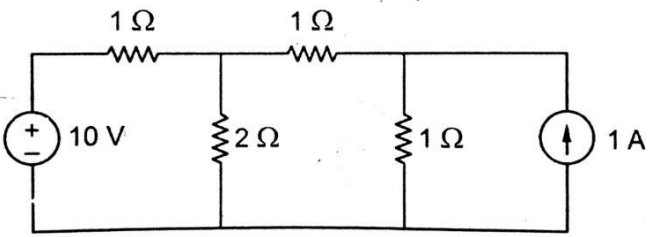
Understand

2.	<p>For the network shown below, label the current ratio (I_1/I_3) by applying mesh analysis. (13 marks)</p> 	BTL 1	Remember
3.	<p>Tabulate a) the equivalent resistances across the terminals of the supply, b) total current supplied by the source and c) power delivered to 16 ohm resistor in the circuit shown in figure. (13 marks)</p> 	BTL 1	Remember
4.	<p>Analyze the mesh currents I_1 and I_2 for the given circuit shown below. (13 marks)</p> 	BTL 4	Analyze

5.	Use Nodal Voltage method and estimate the power dissipated in the $10\ \Omega$ resistance on the circuit shown in the fig (13 marks)	BTL 2	Understand
			
6.	Using star-delta transformation, in the following wheat stone bridge circuit of figure. Calculate i) the equivalent resistance between P&Q ii) the total current (iii) the current through the $18\ \Omega$ resistor. (13 marks)	BTL 3	Apply
			
7.	Calculate loop currents by mesh analysis (13 marks)	BTL 3	Apply
			
8.	Deduce the expressions for star connected arms in terms of delta connected arms and delta connected arms in terms of star connected arms(13 marks)	BTL 5	Evaluate
9.	Give Thevenin's equivalent across the terminals AB for the circuit shown in figure below. (13 marks)	BTL 2	Understand
			

10.	<p>Analyze the given circuit and obtain Norton's equivalent circuit . (36 marks)</p> 	BTL 4	Analyze
11.	<p>(i) Derive and list the expressions for resistors in series and parallel (6 marks)</p> <p>(ii) Quote the Kirchhoff's current law and prove it by using the definition of current (7 marks)</p>	BTL 1 BTL 1	Remember Remember
12.	<p>Determine the Thevenin's equivalent for the figure and develop the Norton's equivalent from the same. (13 marks)</p> 	BTL 6	Create
13.	<p>Using superposition theorem, Identify the current through (2+j3) ohm impedance branch of the circuit shown. (13 marks)</p> 	BTL 1	Remember
14.	<p>Examine and identify the maximum power delivered to the load in the circuit. (13 marks)</p> 	BTL 1	Remember

PART – C			
1.	<p>Simplify the circuit and point out the current flowing through the 10Ω resistor, for the circuit diagram shown in figure (15 marks)</p> 	BTL 4	Analyze
2.	<p>Simplify and point out the current I in the network, Using the principle of super position theorem. (15 marks)</p> 	BTL 4	Analyze
3.	<p>i. Examine and identify the current in the 5Ω resistor in the network given in figure (8 marks)</p>  <p>ii. Find out the current in each branch of the circuit shown in figure (7 marks)</p> 	BTL 3	Apply
4.	<p>i Examine the value of R_L so that maximum power is delivered to the load resistance shown in figure. (8 marks)</p> 	BTL 4	Analyze

	<p>ii. Give the current through the 2Ω resistor in the circuit shown in figure using superposition theorem. (7 marks)</p> 	BTL 4	Analyze
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UNIT 2 ELECTRICAL MACHINES

DC and AC ROTATING MACHINES: Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer- Emf equation- All day efficiency calculation.

PART B			
1	Explain with the help of a sketch, the constructional features of a dc machine and briefly describe the functions of armature core, commutator and brushes. (13)	BTL 2	Understand
2	(i) Briefly explain about the principle of operation of DC generator.(6) (ii) Arrive at an Emf equation of DC generator. (7)	BTL3	Apply
3	A six-pole, lap-connected generator is driven at 600rpm. It has 100 slots with 24 conductors per slot. What is the magnitude of the generated emf? If the number of conductors per slot is changed to 20. At what speed should the generator be run for the same voltage to be generated? The flux per pole is 0.02Wb.(13)	BTL 4	Analyze
4	(i) Explain the principle of operation of DC motor.(7) (ii) Derive an expression for the torque developed by a dc motor. (6)	BTL 4	Analyze

5	Discuss the various methods of speed control of DC motors. (13)	BTL 2	Understand
6	A 300V, four-pole dc motor draws a current of 50A when supplying a certain load. The armature is wave-wound and has 600 conductors. If the flux per pole is 40mwb and the armature resistance. (13)	BTL 4	Analyze
7	Explain with sketches the constructional features of a synchronous machine. (13)	BTL 2	Understand
8	Explain the Principle of operation of a three phase induction motor and distinguish between slip and rotor frequency. (13)	BTL 1	Remember
9	Derive an expression for the torque developed by a three-phase induction motor. (13)	BTL 4	Analyze
10	Explain the principle of operation of stepper motors with their merits and demerits. (13)	BTL 2	Understand
11	Write detailed note on how rotation occurs in a BLDC motor and mention a few of its applications. (13)	BTL3	Apply
12	State the various parts of a transformer and their function. (13)	BTL 1	Remember

13	(i) Explain the working principle of a single phase transformer.(7) (ii) Define all-day efficiency of a transformer and explain its significance.(6)	BTL3	Apply
14	Arrive at an expression for emf equation of the transformer and discuss about transformation ratio. (13)	BTL5	Evaluate
PART C			
1	Classify generators according to their connections and draw the equivalent circuit for each category.(15)	BTL 6	Create
2	A four-pole, wave connected shunt generator has 900 conductors. If the flux per pole is 0.03wb and the speed of the generator is 700rpm, what is the magnitude of the armature voltage? If the armature current is 40A, determine (a) the terminal voltage, (b) the field current, and (c) the load supplied. The armature and field resistances are 0.25Ω and 100Ω respectively. If the generator is now lap-wound, what is the flux per pole required to supply the same load? (15)	BTL5	Evaluate
3	(i) Describe with a help of connection diagram, the operation of a split-phase induction motor.(7) (ii) Draw the connection diagram of shaded-pole induction motor and explain. (8)	BTL5	Evaluate
4	Enumerate the assumptions made in an ideal transformer. Starting with an ideal transformer on no-load, explain its working under load condition. (15)	BTL5	Evaluate

UNIT 3 UTILIZATION OF ELECTRICAL POWER

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Batteries-NiCd, Pb Acid and Li ion-Charge and Discharge Characteristics. Protection-need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

PART B			
1	Write a short note on electricity generation using renewable energy source solar(13)	BTL 2	Understand
2	Write a short note on electricity generation using renewable energy source wind. (13)	BTL 2	Understand
3	Draw a schematic diagram of a mercury vapour lamp and explain its working. What is the role of capacitor? (13)	BTL 1	Remember
4	Draw and explain the working of sodium vapour lamp(13)	BTL 1	Remember
5	Draw a schematic diagram of a fluorescent tube and discuss the role of (a) choke (b) tubelight (c) starter (13)	BTL 4	Analyze
6	Draw the electric circuit of a domestic refrigerator and explain the role of each components and its working. (13)	BTL 4	Analyze
7	Draw the electric circuit of a air conditioning and explain its working. (13)	BTL 2	Understand

8	Describe the construction and working of a lead acid battery. (13)	BTL 2	Understand
9	Describe the construction and working of a Li ion battery. (13)	BTL 2	Understand
10	Describe the construction and working of a lead acid battery. (13)	BTL 4	Analyze
11	Describe the construction and working of a NiCd battery. (13)	BTL 3	Apply
12	Write a short notes on the characteristics of NiCd and Li ion battery. (13)	BTL 3	Apply
13	Write a detailed note on electricity tariffs for domestic consumers.	BTL 5	Evaluate
14	(i) Summarize the importance of protective schemes employed in power system.(6) (ii) Show the essential quantities of protection.(7)	BTL 6 BTL 6	Create Create
PART C			
1	Draw a single line diagram of an ac power system and clearly show the various sub systems and the range of voltages at which they operate.(15)	BTL 4	Analyze
2	Enumerate the different types of renewable energy source of generating electrical power and explain its working operation. (15)	BTL 5	Evaluate
3	Categorize the different types of batteries and distinguish between various types of storage batteries. (15)	BTL 4	Analyze
4	Show with the help of labeled diagrams the essential features of (i) pipe (8) and (ii) plate earthing. (7)	BTL5	Evaluate

UNIT 4 ELECTRONIC CIRCUITS

PN Junction-VI Characteristics of Diode, zener diode, Transistors configurations - amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723, LM 317.

PART B			
1	With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias and show the effect of temperature on its V-I characteristics. (13)	BTL 4	Analyze
2	i) Why the Zener diode is called as regulator. (6) ii) Explain V-I characteristics of Zener diode and Compare Zener Diode with ordinary diode. (7)	BTL 4	Analyze
3	Discuss the switching characteristics of a transistor with neat sketch. (13)	BTL 2	Understand
4	Describe the static input and output characteristics of CB configuration of a transistor with neat circuit diagram. (13)	BTL 1	Remember
5	Compose the expression for current gain, input impedance and voltage gain of a CE Transistor Amplifier. (13)	BTL 6	Create
6	Discuss the most commonly used transistor configuration? Why? And Explain the configuration? (13)	BTL 2	Understand
7	i) Illustrate the types of differential amplifiers. (7) ii) Illustrate power amplifier? Explain their types? (6)	BTL 3	Apply
8	Discuss the different oscillator circuit to produce sustained oscillations? (13)	BTL 2	Understand
9	Draw the circuit diagram and explain the working of full wave	BTL 5	Evaluate

	bridge rectifier and derive the expression for average output current and rectification efficiency. (13)		
10	Describe ADC and its Types in Detail. (13)	BTL 1	Remember
11	Describe DAC and its Types in Detail. (13)	BTL 1	Remember
12	Illustrate in detail about different types of Multivibrator using 555 timers. (13)	BTL 3	Apply
13	Briefly Explain the Voltage regulator using LM 723. (13)	BTL 4	Analyze
14	Briefly Explain the Voltage regulator using LM 317. (13)	BTL 5	Evaluate
PART C			
1	Explain the half wave and full wave rectifiers with relevant diagram. (15)	BTL 5	Evaluate
2	Illustrate the requirements for producing sustained oscillations in feedback circuits? Discuss any two audio frequency oscillators. (15)	BTL 3	Apply
3	Compose the delta sigma modulation? Explain the A/D conversion using Delta modulator. (15)	BTL-6	Create
4	Explain the operation of switching regulators. Give its advantages. (15)	BTL 5	Evaluate

UNIT 5 ELECTRICAL MEASUREMENT

Characteristic of measurement-errors in measurement, torque in indicating instruments-moving coil and moving iron meters, Energy meter and watt meter. Transducers-classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

PART B			
1	Enlist and discuss the various types of error in measurement? (13)	BTL-2	Understand
2	(i) Classify different types of measuring instruments.(6)	BTL-1	Remember
	(ii) Discuss the important features of measuring instruments?(7)	BTL-2	Understand
3	Describe briefly the working of moving coil permanent magnet instrument with a neat diagram. (13)	BTL-2	Understand
4	Describe briefly the working of moving iron instrument with a neat diagram. (13)	BTL-2	Understand
5	Describe briefly the working of moving coil Dynamometer instrument with a neat diagram. (13)	BTL-4	Analyze
6	Explain in detail the different types of instruments used for measurement of power? (13)	BTL-5	Evaluate
7	Explain in detail the different types of instruments used for measurement of electrical energy? (13)	BTL-5	Evaluate
8	With the neat block diagram explain the working and operation principle of CRO? (13)	BTL-6	Create

9	(i) What is a sensor? Distinguish between active and passive sensor? (6)	BTL-6	Create
	(ii) Based on output, how are sensors categorized? Compare the different types of sensors. (7)	BTL-5	Evaluate
10	(i) Detail out the various properties of a good transducers. (6)	BTL-1	Remember
	(ii) Draw the block diagram of a basic measuring system. Discuss the role of each component. (7)	BTL-1	Remember
11	Categorize the different types of resistance transducers. With the neat diagram explain the working of resistance thermometer (RTD) (13)	BTL-5	Evaluate
12	Explain with the neat diagram the working principle and operation of different types of strain gauge. (13)	BTL-3	Apply
13	(i) Explain the principle of working of a variable inductor transducer. Describe the operation of an LVDT with the help of a diagram. (8)	BTL-3	Apply
	(ii) Enumerate the advantages and disadvantages of an LVDT. (5)	BTL-1	Remember
14	(i) How do piezoelectric transducers work? State their advantages and disadvantages. Enumerate the application of piezoelectric transducers. (8)	BTL-3	Apply
	(ii) Explain with the help of a sketch the working of a photoelectric transducer. (5)	BTL-4	Analyze
PART C			
1	Enlist and discuss the various types of errors in measurement (15)	BTL 5	Evaluate
2	Derive the expressions for deflection and controlling torques for (i) attraction and (ii) Repulsion types of MI instruments. (15)	BTL-6	Create
3	Enumerate the various types of transducer categories based on the functions they perform. Distinguish clearly, with examples, between active and passive devices. (15)	BTL 5	Evaluate
4	(i) Draw the block diagram of a basic measuring system. Discuss the role of each component (8)	BTL-6	Create
	(ii) Enumerate in detail about the LDR (7)		