ST. ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai)

ANGUCHETTYPALAYAM, PANRUTI – 607 106.

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

BE 3251 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

II SEMESTER

Prepared by

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DEPARTMENT OF MECHANICAL ENGINEERING

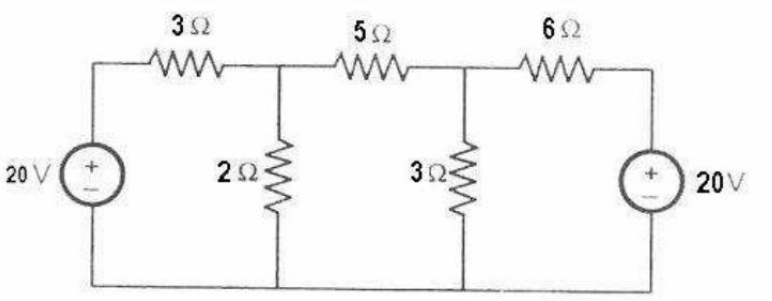
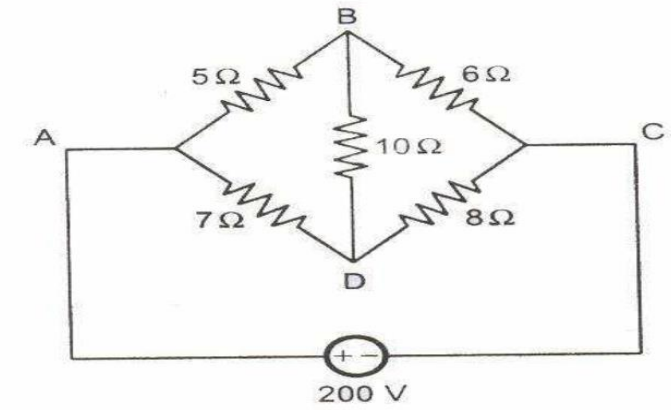
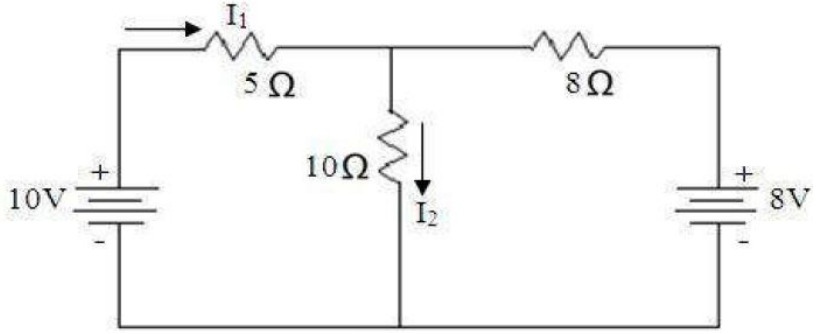
QUESTION BANK

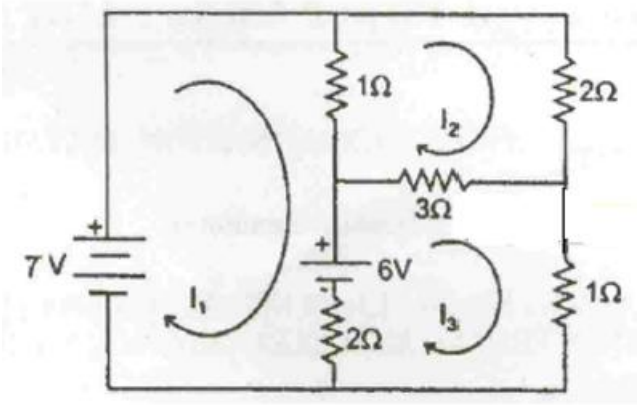
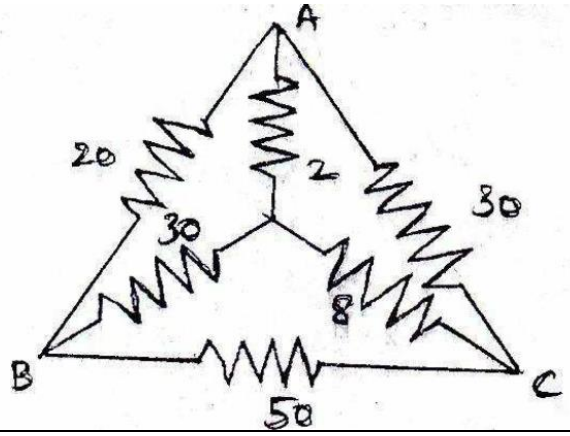
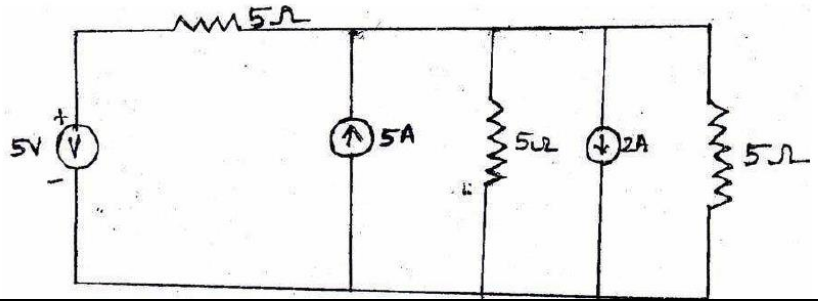
SUBJECT : BE 3251 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

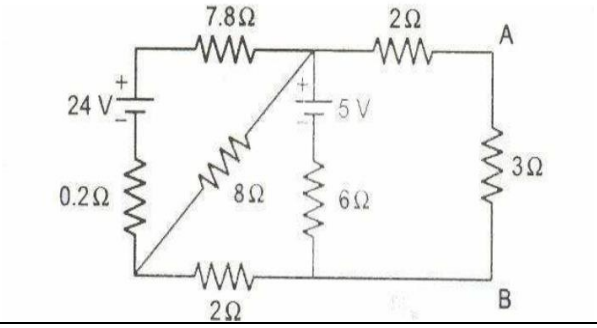
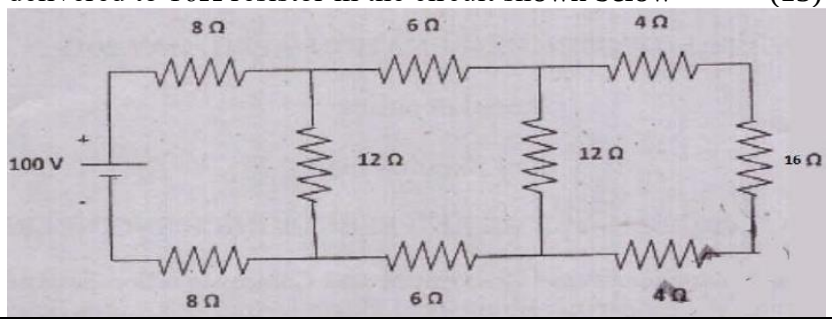
SEM / YEAR: II / I

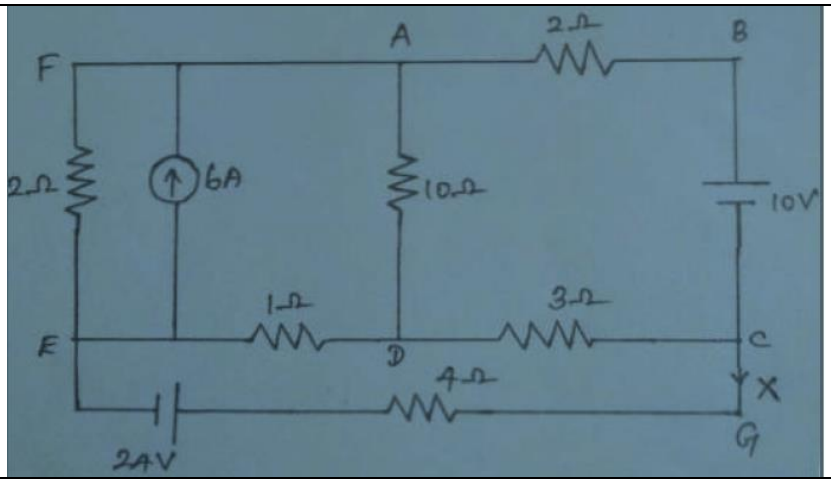
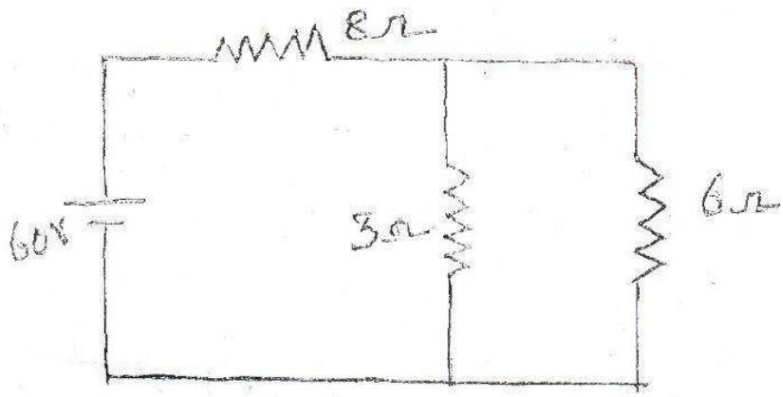
UNIT-I: ELECTRICAL CIRCUITS

PART – A				
Q.No	**Questions**	**BT Level**	**Competence**	**Course Outcome**
1.	Explain how voltage source with a source resistance can be converted into an equivalent current source.	1	Remember	CO1
2.	Define active elements and passive elements.	3	Apply	CO1
3.	Under what condition AC circuit said to be resonant?	4	Analyze	CO1
4.	State the different types of instruments based on their operating principles	1	Remember	CO1
5.	Define power.	2	Understand	CO1
6.	Mention the two types of MI instruments.	5	Evaluate	CO1
7.	Write down the expression for effective resistance when three resistances are connected in series and parallel.	2	Understand	CO1
8.	State Kirchhoff's laws.	2	Understand	CO1
9.	What are the advantages of electromechanical measuring instruments?	1	Remember	CO1
10.	State Ohm's law.	5	Evaluate	CO1
11.	Three inductive coils each with resistance of 15Ω and an inductance of 0.03H are connected in star to a 3 phase 400V, 50Hz supply. Calculate the phase voltage.	1	Remember	CO1
12.	Define power factor.	4	Analyze	CO1
13.	Define real power.	2	Understand	CO1
14.	Define apparent power.	3	Apply	CO1
15.	Define RMS value.	4	Analyze	CO1
16.	State the principle of moving iron instrument.	1	Remember	CO1
17.	Define current.	6	Create	CO1
18.	Define the principle of moving iron instrument for attraction type.	6	Create	CO1
19.	List any three types of indicating instruments.	1	Remember	CO1

20.	Define power and power factor for single phase.	3	Apply	CO1
21.	Mention the errors in moving iron instruments.	1	Remember	CO1
22.	Two resistances of 4 ohm and 6 ohms are connected in parallel across 10v battery. Determine the current through 6-ohm resistance.	1	Remember	CO1
23.	Give the voltage and current equation for a purely resistance circuit.	2	Understand	CO1
24.	A 120Ω resistor has a specified maximum power dissipation of 1 W. Calculate the maximum current level.	2	Understand	CO1
	PART – B			
1.	Find the current through 5 ohm resistance using mesh current analysis. (13) 	1	Remember	CO1
2.	Find the current through 10-ohm resistance using mesh current analysis. (13) 	5	Evaluate	CO1
3.	(a) Fig.1 shows a two D.C source network, the branch current I_1 and I_2 are marked in it. By using Kirchhoff's law, calculate and examine the current I_1. (07)  (b) A series circuit has R=10Ω, L=50mH and C=100μF and is supplied and is applied with 200V, 50 Hz. Find and examine the value of: (1) Impedance (2) Current (3) Power (4) Power factor (5) Phase angle (6) Voltage drop across each element. (06)	6	Create	CO1

4.	Use mesh analysis to determine the three mesh currents in the circuit shown below. (13) 	3	Apply	CO1
5.	Find the Effective resistance across the terminal A & B. (13) 	2	Understand	CO1
6.	(a) Derive the expression for RMS and Average value of an alternating quantity (a sine wave). (04) (b) Compare series and parallel circuit. (05) (c) Three inductive coils each with resistance of 15Ω and an inductance of 0.03H are connected in star to a 3 phase 400V, 50Hz supply. Calculate the phase voltage. (04)	1	Remember	CO1
7.	Three similar coils connected in star, take a power of 1.5KW at a power factor of 0.2 lagging from a 3 phase, 400V, 50Hz supply. Calculate the resistance and inductance of each coil. (13)	2	Understand	CO1
8.	Derive the equation for given delta network transformation in to star network. (13)	1	Remember	CO1
9.	Find the total Current and total Resistance in the circuit given. (13) 	2	Understand	CO1
10.	Find the current through branch AB by using mesh current analysis. (13)	1	Remember	CO1

				
11.	With neat sketch describe the construction and principle of operation of Permanent Magnet Moving Coil (PMMC) type of instrument. Obtain the expression for its deflecting torque. List the merits and demerits of PMMC Instrument. (13)	4	Analyze	CO1
12.	(a) Determine the line current, power factor and total power when a three phase 400V supply is given to a balanced load of impedance (8+j6)Ω in each branch, is connected in star. (07) (b) State and explain Kirchhoff's Laws. (06)	4	Analyze	CO1
13.	Explain the working principle of repulsion type M.I instruments and derive its deflection torque. (13)	4	Analyze	CO1
14.	Obtain expression of power and power factor for three phase A.C star connected balanced load circuit. (13)	3	Apply	CO1
15.	Draw and explain the working principle of attraction type, repulsion type M.I instruments and derive its deflection torque. (13)	1	Remember	CO1
16.	With the help of a neat diagram, explain the construction and operation of induction type energy meter. (13)	2	Understand	CO1
17.	Explain the construction and operation of dynamo meter type watt meter. (13)	1	Remember	CO1
	PART – C			
1.	Calculate (i) equivalent resistance across the terminal of the supply (ii) total current supplied by the source (iii) power delivered to 16Ω resistor in the circuit shown below (15) 	5	Evaluate	CO1
2.	Determine the current 'X', power in the 4Ω resistance of the circuit shown below: (15)	6	Create	CO1

				
3.	Derive the equation for given star network transformation in to delta network. (15)	6	Create	CO1
4.	Consider the following network as shown in figure. Determine the power observed by the 6Ω. (15) 	5	Evaluate	CO1
5.	Draw and explain the working principle of attraction type, repulsion type M.I instruments and derive its deflection torque. (15)	5	Evaluate	CO1

UNIT-II: ELECTRICAL MACHINES

PART – A				
Q.No	**Questions**	**BT Level**	**Competence**	**Course Outcome**
1.	What is an electric generator?	1	Remember	CO2
2.	Mention the difference between core and shell type transformers.	2	Understand	CO2
3.	List the major parts of DC machine.	5	Evaluate	CO2
4.	Write down the condition for maximum efficiency in case of DC generator.	1	Remember	CO2
5.	Write down the power equation of DC motor.	2	Understand	CO2
6.	Give the emf equation of a transformer and define each term.	1	Remember	CO2
7.	What is greatest advantage of DC motor?	1	Remember	CO2
8.	What is Transformer?	2	Understand	CO2

9.	Why single-phase induction motor is not self-starting?	6	Create	CO2
10.	What is Back e.m.f?	1	Remember	CO2
11.	Define Transformation ratio of a Transformer?	1	Remember	CO2
12.	In a single-phase transformer Np=350 turns, Ns=1050 turns, Ep=400V.Find Es	3	Apply	CO2
13.	What are all the applications of DC motor?	3	Apply	CO2
14.	What are the types of transformers based on the construction?	4	Analyze	CO2
15.	What is the function yoke in a dc machine?	5	Evaluate	CO2
16.	Give the emf equation of DC generator.	3	Apply	CO2
17.	What are all the two types of excitations?	6	Create	CO2
18.	What is meant by residual magnetism?	4	Analyze	CO2
19.	Give the types of DC generator.	2	Understand	CO2
20.	List out the applications of various types of generators.	4	Analyze	CO2
21.	Give the torque equation of a DC motor.	1	Remember	CO2
22.	What is the principle of DC motor?	1	Remember	CO2
23.	Calculate the generated e.m.f, by a 4 pole, wave- wound armature having 45 slots with 18 conductors per slot when driven at 1200 rpm and the flux per pole is 0.016Wb.	4	Analyze	CO2
24.	List out the types of single-phase induction motors.	2	Understand	CO2
	PART – B			
1.	Draw a neat sketch of a DC generator and label the component parts. Name the material used for each component part. (13)	1	Remember	CO2
2.	Derive the torque and speed equation of dc motor. (13)	1	Remember	CO2
3.	(a) Derive the emf equation of a dc generator. (06) (b)Derive the emf equation of a transformer. (07)	1	Remember	CO2
4.	(a) A single phase 2200/250V, 50Hz transformer has net core area of 36cm2 and maximum flux density of 6Wb/m^2. Calculate the number of primary turns and secondary turns. (06) (b) A DC shunt generator supplies a load of 7.5KW 200V. Calculate the induced emf if the armatu resistance is 0.6Ωand the field resistance is 80Ω. (07)	1	Remember	CO2
5.	With the neat sketches, explain the working principle and the construction of DC motor. Also derive the torque and speed equation. (13)	2	Understand	CO2
6.	Explain the principle and working of a single-phase transformer. (13)	4	Analyze	CO2
7.	Why a single-phase induction motor is not self-starting? Explain the working of single-phase induction motor. (13)	2	Understand	CO2
8.	Explain the construction and working principle of capacitor start and capacitor run single phase induction motor. What are its advantages and practical applications? (13)	2	Understand	CO2
9.	Explain the characteristics of a dc shunt motor. Sketch the graphical representation of the concerned characteristics. (13)	4	Analyze	CO2

10.	Draw the circuit diagram of the following three types of DC motors and write the relationships among the current and voltages. (a) Separately DC motor (b) Shunt motor (c) Series motor. (13)	5	Evaluate	CO2
11.	Explain the working principle of DC generator with neat diagram. (13)	4	Analyze	CO2
12.	With diagram describe construction and operation of single-phase transformer. (13)	6	Create	CO2
13.	Give the types of DC generator. List out the application of its.(13)	3	Apply	CO2
14.	How can the alternating current waveform in the armature be converted into a dc waveform in DC generators? (13)	3	Apply	CO2
15.	Explain the construction and operating principle of split phase Induction motor. (13)	2	Understand	CO2
16.	Explain the working principles of various types of single-phase induction motor with neat diagram. (13)	2	Understand	CO2
17.	(a)A short shunt cumulative compound DC generator supplies 7.5KW at 230V. The shunt field, series field, and armature resistances are 100,0.3and 0.4Ω respectively. Calculate the induced e.m.f and the load resistance. (07) (b) A 30KW,300V, DC shunt generator has armature and field resistance of 0.05 and 100Ω respectively. Calculate the total power developed by the armature when it delivers full output power. (06)	1	Remember	CO2
PART-C				
1.	(a)With neat diagram explain the construction and principle of a single-phase transformer. What are the characteristics of an ideal transformer? (08) (b) Express the emf equation of transformer. (07)	5	Evaluate	CO2
2.	A 200V DC shunt motor takes a load current of 100A and runs at 750rpm. The resistance of the armature winding and of shunt field winding is 0.1Ω and 40Ω respectively. Find the torque developed by the armature. (15)	6	Create	CO2
3.	Draw and explain the different characteristics of DC series and DC shunt Generator. (15)	5	Evaluate	CO2
4.	At starting the windings of a 230V,50Hz, split phase induction motor, main winding: R = 4Ω, X_L = 7.5Ω. Find 1. Current IM in the main winding. 2.Current IS in the starting winding. 3. Phase angle between I_M and I_S. 4. Line current. 5. Power factor of the motor. (15)	6	Create	CO2
5.	A DC motor connected to a 460V supply has an armature resistance of 0.15 ohms. Calculate (1) the value of back emf when the armature current is 120A. (2) the value of armature current when the back emf is 447V. (15)	6	Create	CO2

UNIT V - MEASUREMENTS AND INSTRUMENTATION

PART – A				
Q.No	**Questions**	**BT Level**	**Competence**	**COs**
1.	What are the basic functional elements of an instrument?	**BTL 4**	**Create**	**CO5**
2.	Briefly explain the role of primary sensing element.	**BTL 5**	**Evaluate**	**CO5**
3.	What are defection and null output instruments?	**BTL 4**	**Analyse**	**CO5**
4.	Give the classification of secondary instruments	**BTL 3**	**Apply**	**CO5**
5.	Compare Resolution and Precision.	**BTL 3**	**Apply**	**CO5**
6.	Define the term "Sensitivity" of an Instrument.	**BTL 1**	**Knowledge**	**CO5**
7.	Define the Static characteristics of an Instrument.	**BTL 5**	**Evaluate**	**CO5**
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**	**CO5**
9.	Define Dynamic characteristics of an Instrument.	**BTL 4**	**Analyse**	**CO5**
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**	**CO5**
11.	Define fidelity	**BTL 2**	**Understand**	**CO5**
12.	State the different types of standards in an Instrument.	**BTL 1**	**Knowledge**	**CO5**
13.	Enumerate the term calibration employed in instruments	**BTL 4**	**Analyse**	**CO5**
14.	Explain Absolute error of measurement?	**BTL 3**	**Apply**	**CO5**
15.	Define Limiting error. Derive the expression for Relative limiting error.	**BTL 4**	**Analyse**	**CO5**
16.	What are gross errors?	**BTL 6**	**Create**	**CO5**
17.	What is Average deviation ?What does It indicate on a measuring instrument?	**BTL 6**	**Create**	**CO5**
18.	Distinguish between Gravity control and Spring Control.	**BTL 5**	**Evaluate**	**CO5**
19.	Why PMMC Ammeters are the most widely used instrument?	**BTL 2**	**Understand**	**CO5**
20.	Compare Moving coil with Moving iron Instruments.	**BTL 2**	**Understand**	**CO5**

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	CO5
2.	Discuss the various classification of instruments in detail	(13)	BTL 2	Understand	CO5
3.	Describe the static and dynamic characteristics of measuring instruments.	(13)	BTL 1	Knowledge	CO5
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	CO5 CO5
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	CO5 CO5
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	CO5
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	CO5
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	CO5
9.	Classify and explain the different types of error and also mention its compensation methods	(13)	BTL 2	Understand	CO5
10.	(i) Explain the Classification of Standards in detail. (ii) Discuss the Significance of Calibration.	(7) (6)	BTL 1	Knowledge	CO5
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	CO5 CO5

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**	**CO5**
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**	**CO5** **CO5**
14.	Explain construction and working Principle of various types of Digital Voltmeter (DVM)	(13)	**BTL 5**	**Evaluate**	**CO5**
	PART-C				
1.	Draw and Explain the block diagram of Generalized Instrumentation System with illustration.	(15)	**BTL 1**	**Knowledge**	**CO5**
2.	What are the different inputs for studying the Dynamic response of a system? Compose and Sketch them.	(15)	**BTL 3**	**Apply**	**CO5**
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**	**CO5**
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**	**CO5** **CO5**