



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
Course Code	:	AEE008
Program	:	B.Tech
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Branch	:	Electrical and Electronics and Engineering
Section	:	A,B
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Course Faculty	:	MS. Lekha Chandran, Assistant Professor, EEE Mr. P SHIVAKUMAR, Assistant Professor, EEE

OBJECTIVES

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
UNIT - I					
1	Classify instruments based on their functions.	Indicating instruments, Integrating instruments and Recording instruments	Remember	CLO1	CAEE008.01
2	Define the term measurement	Measurement is an act or the result of comparison between the quantity and a predefined standard.	Remember	CLO1	CAEE008.01
3	What are the effects used to produce deflecting torque	Magnetic effect, thermal effect, electro static effect	Remember	CLO2	CAEE008.02
4	Explain the different essential torques in indicating instruments.	Deflecting torque, Controlling torque, Damping torque.	Remember	CLO1	CAEE008.01
4	Summarize the applications of measurement systems.	The instruments and measurement systems are used for Monitoring of processes and operations. Control of processes and operations. Experimental engineering analysis.	Remember	CLO1	CAEE008.01
5	What are the basic requirements of measurement a measuring system?	The standard used for comparison purpose must be accurately defined and should be commonly accepted. The apparatus used and the method adopted must be provable.	Understand	CLO2	CAEE008.02
6	Summarise the advantages of PMMC instruments	Uniform scale, no hysteresis loss, accurate, high efficiency.	Remember	CLO2	CAEE008.02
7	Name the types of instruments used for making voltmeter and ammeter.	PMMC type, Moving iron type, Dynamometer type, Hot wire type, Electrostatic type Induction type.	Remember	CLO2	CAEE008.02
8	Explain the disadvantages of PMMC instruments	Cannot be used for ac measurements Some errors are caused by temperature variations.	Understand	CLO2	CAEE008.02
9	Describe the applications of PMMC instruments	Measurements of dc voltage and current used in dc galvanometer.	Remember	CLO2	CAEE008.02
10	What are the advantages of Dynamometer type instruments	Can be used for both dc and ac measurements. Free from hysteresis and eddy current errors.	Remember	CLO2	CAEE008.02
12	Outline the advantages of Moving iron type instruments	Less expensive and can be used for both dc and ac Reasonably accurate.	Remember	CLO2	CAEE008.02

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
13	Define extension of range of PMMC instruments.	In ammeter by connecting a shunt resistor In voltmeter by connecting a series resistor.	Remember	CLO2	CAEE008.02
14	State the advantages of Hot wire type instruments	Can be used for both dc and ac unaffected by stray magnetic fields readings are independent of frequency and waveform	Remember	CLO2	CAEE008.02
15	What are the damping methods used in Measuring instruments	Eddy current damping, Air friction damping, Fluid friction damping	Remember	CLO2	CAEE008.02
16	What are the causes of errors in PMMC	Temperature effect, Spring material and age, ageing of magnet	Remember	CLO2	CAEE008.02
17	How the induction effect is used to produce the deflecting torque	When a non magnetic conducting disc is placed in a magnetic field produced by electro magnets which are excited by alternating currents an emf is induced in it	Remember	CLO2	CAEE008.02
18	What are the methods used to produce control torque	Gravity control and spring control	Remember	CLO2	CAEE008.02
19	What is the purpose of deflecting torque	The deflecting torque is used to deflects the pointer from initial zero position	Remember	CLO2	CAEE008.02
20	What are the applications of integrating instruments	These instruments are used to measure the electrical quantity of electricity delivered over a period of time	Remember	CLO2	CAEE008.02
21	What is meant by measurement?	Measurement is an act or the result of comparison between the quantity and a predefined standard.	Understand	1	CAEE008.01
22	Mention the basic requirements of measurement.	The standard used for comparison purpose must be accurately defined and should be commonly accepted. The apparatus used and the method adopted must be provable.	Remember	1	CAEE008.01
23	List the types of instruments	Indicating instrument, integrating instruments and recording instruments	Understand	1	CAEE008.01
24	Give the applications of measurement systems.	The instruments and measurement systems are suited for monitoring of processes and operations.	Understand	1	CAEE008.01
25	Name the different essential torques in indicating instruments.	Deflecting torque, controlling torque, damping torque	Understand	2	CAEE008.02
26	Name the types of instruments used for making voltmeter and ammeter.	PMMC type, moving iron type, dynamometer type, hot wire type, electrostatic type and induction type.	Understand	2	CAEE008.02

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
27	State the advantages of PMMC instruments	Uniform scale, no hysteresis loss, very accurate, high efficiency.	Understand	2	CAEE008.02
28	State the disadvantages of PMMC instruments	Cannot be used for ac measurements some errors are caused by temperature variations.	Understand	2	CAEE008.02
29	State the applications of PMMC instruments	Measurements of dc voltage and current used in dc galvanometer.	Remember	2	CAEE008.02
30	How the range of instrument can be extended in PMMC instruments.	In ammeter by connecting a shunt resistor, in voltmeter by connecting a series resistor.	Understand	2	CAEE008.02
31	State the advantages of dynamometer type instruments	It can be used for both dc and ac measurements. Free from hysteresis and eddy current errors.	Understand	2	CAEE008.02
32	State the advantages of moving iron type instruments	Less expensive Can be used for both dc and ac Reasonably accurate.	Understand	2	CAEE008.02
33	State the advantages of hot wire type instruments	It can be used for both dc and ac unaffected by stray magnetic fields readings are independent of frequency and waveform	Understand	2	CAEE008.02
34	What are the damping methods used in measuring instruments	1. Eddy current damping 2. Air friction damping Fluid friction damping	Remember	2	CAEE008.02
35	What are the causes of errors in PMMC	1. Temperature effect 2. Spring material and age Ageing of Magnet	Understand	2	CAEE008.02
36	How the induction effect is used to produce the deflecting torque	When a non magnetic conducting disc is placed in a magnetic field produced by electro magnets which are excited by alternating currents an emf is induced in it	Remember	2	CAEE008.02
37	What are the methods used to produce control torque	1. Gravity control Spring control	Understand	2	CAEE008.02
38	What is the purpose of deflecting torque	The deflecting torque is used to deflects the pointer from initial zero position	Remember	2	CAEE008.02
39	What are the effects used to produce deflecting torque	1.Magnetic effect 2.Thermal effect 3.Electro static effect	Understand	2	CAEE008.02

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
40	What are the applications of integrating instruments	These instruments are used to measure the electrical quantity of electricity delivered over a period of time. Ex: Energy meter	Understand	2	CAEE008.02
UNIT – II					
1	Explain the working principle of potentiometer?	The principle of the potentiometer is that For a wire having uniform area of cross section and uniform composition, the potential drop is directly proportional to the length of wire.	Understand	CLO4	CAEE008.04
2	Classify types of potentiometers?	Rotary and slider.	Understand	CLO4	CAEE008.04
3	Why potentiometer measurement is superior to voltmeter?	The terminal voltage of a cell is the potential difference between its electrodes. A voltmeter cannot be used to measure the emf of a cell because a voltmeter draws some current from the cell. To measure a cell's emf a potentiometer is used since in a potentiometer measurement no current involved.	Understand	CLO4	CAEE008.04
4	What is meant by standardization of potentiometer?	Standardizing a potentiometer simply refers to the process of finding the pd per unit length of the potentiometer. The slide wire in the potentiometer circuit has a uniform cross sectional area, and therefore a uniform resistance	Remember	CLO4	CAEE008.04
5	What is meant by calibration of potentiometer?	A potentiometer is an instrument for measuring voltage by comparison of an unknown voltage with a known reference voltage. Since the reference voltage can be produced from an accurately calibrated voltage divider, a potentiometer can provide high precision in measurement	Remember	CLO5	CAEE008.05
6	How can we increase the sensitivity of a potentiometer?	Sensitivity of potentiometer can be increased by. Sensitivity of potentiometer can be increased by increasing the length of the potentiometer wire and by reducing the current in the circuit by using a rheostat. Both the methods help in decreasing the potential gradient, and thereby increasing the resistivity.	Understand	CLO5	CAEE008.05
7	What is voltage ratio box?	The volt-ratio box measures the high voltage. The construction of the volt-ratio box is very simple. It consists the simple resistive potential divider which has many tapping on the input side. The volt-ratio box gives the accurate result of measure voltage. The operation of the volt-ratio box is simple.	Understand	CLO5	CAEE008.05

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
8	What are the applications of DC potentiometer?	The potentiometer is used as a voltage divider in the electronic circuit. The potentiometer is used in radio and television (TV) receiver for volume control, tone control and linearity control. The potentiometer is used in medical equipment	Understand	CLO5	CAEE008.05
9	What is the difference between AC and DC potentiometer?	In AC potentiometer, one can use resistors or even inductors or capacitors as impedances which will drop voltages and provide a voltage less than applied voltage. DC potentiometer only measures the magnitude of the unknown voltage.	Understand	CLO5	CAEE008.05
10	What is the use of current transformers?	Current transformers used for measuring AC current	Understand	CLO6	CAEE008.06
11	What are the errors in C.Ts	Ratio error and phase difference error. The ratio error is the amount by which the secondary current differs from exact proportionality to the primary current and is expressed as a percentage of the rated secondary current. The phase difference error is the angle by which the secondary current differs in phase from the primary current and is expressed in minutes of arc.	Understand	CLO7	CAEE008.07
12	What are materials used for the core of a CT and why	In order to reduce the ampere turns required the core of a CT must have high permeability, small iron loss, a low flux density and low phase difference error. Two suitable materials are Silicon steel having the maximum permeability of 4500 at flux densities of 5000 lines/cm ² with phase difference error of 1.5 to 2°. Mumetal, a nickel-iron alloy containing a small amount of copper having the maximum permeability of about 80000 at flux densities of about 3500 lines/cm ² with phase difference error of below 0.5°.	Understand	CLO6	CAEE008.06
13	What are the differences between CTS and PTS	A CT is connected in series with the line whereas a PT is connected across the supply lines. In a CT the number of turns is inversely proportional to the current but in a PT the number of turns is directly proportional to the voltage. In a CT the primary has one or more turns of heavy conductor and the secondary has a large number of turns of thin wires whereas in a PT the primary has a large number of turns of thin wires and the secondary has a few number of turns of comparatively thick wires.	Understand	CLO7	CAEE008.07
14	What do you mean by the ratio error and phase differences error of potential transformer	The amount by which the secondary voltage of a potential transformer differs in magnitude from exact proportionality to the primary terminal voltage is called the ratio error of a potential transformer. The angle by which the secondary voltage of a potential transformer differs in phase from	Understand	CLO7	CAEE008.07

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		the primary terminal voltage is called the phase difference error of a potential transformer.			
15	What will be the effect of open circuiting the secondary of a CT?	If the secondary of a CT is open circuited the whole current in the primary becomes magnetizing current and a dangerously high voltage will appear across the secondary which may cause insulation breakdown, damage to the magnetic property of its iron core, overheating and also death to life. For these reasons open circuiting of a CT should never be permitted.	Understand	CLO7	CAEE008.07
16	What do you mean by burden of a PT or CT	The maximum load in volt amperes (VA) which may be applied across the secondary terminals of PT or CT is known as 'burden' of a PT or CT It depends upon the number of instruments or relays connected and their individual ratings.	Understand	CLO7	CAEE008.07
17	What are the standard ratings of instrument transformers?	The standard secondary rating of PT is 110 volts and that of CT is 5 amps	Remember	CLO7	CAEE008.07
18	What precautions do you observe when working with instrument transformers?	When working with CT the secondary should be short circuited and grounded. No fuse should be inserted in the secondary circuit of CT because fuse may blow and produce an open circuit. When working with PT the secondary should never be short circuited. One end of the secondary should be grounded and fuse should be provided both on the primary and the secondary circuit. One end of the secondary should be grounded and fuse should be provided both on the primary and the secondary circuit.	Understand	CLO7	CAEE008.07
19	What is the working principle of potentiometer?	The principle of the potentiometer is that for a wire having uniform area of cross section and uniform composition, the potential drop is directly proportional to the length of wire.	Understand	4	CAEE008.04
20	What are the different types of potentiometers?	There are two major types: 1. Rotary: The most common of variable resistor or potentiometer is a rotary version. 2. Slider: Slider controls are those variable resistors that slide in a linear fashion, i.e. in a straight line.	Understand	4	CAEE008.04
21	Why potentiometer is better than voltmeter?	The terminal voltage of a cell is the potential difference between its electrodes. A voltmeter cannot be used to measure the emf of a cell because a voltmeter draws some current from the cell. To measure a cell's emf	Understand	4	CAEE008.04

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		a potentiometer is used since in a potentiometer measurement no current is flowing.			
22	What is Standardization of potentiometer?	Standardizing a potentiometer simply refers to the process of finding the pd per unit length of the potentiometer. The slide wire in the potentiometer circuit has a uniform cross sectional area, and therefore a uniform resistance	Remember	4	CAEE008.04
23	What is meant by calibration of potentiometer?	A potentiometer is an instrument for measuring voltage by comparison of an unknown voltage with a known reference voltage. Since the reference voltage can be produced from an accurately calibrated voltage divider, a potentiometer can provide high precision in measurement	Remember	5	CAEE008.05
24	How can we increase the sensitivity of a potentiometer?	Sensitivity of potentiometer can be increased by increasing the length of the potentiometer wire and by reducing the current in the circuit by using a rheostat. Both the methods help in decreasing the potential gradient, and thereby increasing the resistivity.	Understand	5	CAEE008.05
25	What is voltage ratio box?	The volt-ratio box measures the high voltage. The construction of the volt-ratio box is very simple. It consists the simple resistive potential divider which has many tapping on the input side. The volt-ratio box gives the accurate result of measure voltage. The operation of the volt-ratio box is simple.	Understand	5	CAEE008.05
26	What are the applications of DC potentiometer?	There are some applications of potentiometer are given below: The potentiometer is used as a voltage divider in the electronic circuit. The potentiometer is used in radio and television (TV) receiver for volume control, tone control and linearity control.	Understand	5	CAEE008.05
27	What is the difference between AC and DC potentiometer?	In AC potentiometer, one can use resistors or even inductors or capacitors as impedances which will drop voltages and provide a voltage less than applied voltage. But there is one major difference between their measurements. DC potentiometer only measures the magnitude of the unknown voltage.	Understand	5	CAEE008.05
28	What is the use of current transformers?	Current transformers used to Stepping up ac current, measuring and protection	Understand	6	CAEE008.06
29	What are the errors in C.Ts	There are two types of errors, e.g. ratio error and phase difference error. The ratio error is the amount by which the secondary current differs from exact proportionality to the primary current and is expressed as a percentage of the rated secondary current. The phase difference error is the angle by which the	Understand	7	CAEE008.07

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		secondary current differs in phase form the primary current and is expressed in minutes of arc.			
30	What materials are used for the core of a C.T.	Current transformers, are widely used in electrical devices and instruments. The core on which the secondary wire is wound plays a significant part in the performance of a CT. Core materials include silicon steel, ferrite, perm alloy, nanocrystalline, amorphous.	Understand	6	CAEE008.06
31	What are the differences between C.T.S and P.T.S	1) A C.T . is connected in series with the line whereas a P.T. is connected across the supply lines. (2) In a C.T the number of turns is inversely proportional to the current but in a P.T. the number of turns is directly proportional to the voltage. (3) In a C.T. the primary has one or more turns of heavy conductor and the secondary has a large number of turns of thin wires whereas in a P.T. the primary has a large number of turns of thin wires and the secondary has a few number of turns of comparatively thick wires.	Understand	7	CAEE008.07
32	What do you mean by the ratio error and phase differences error of potential transformer	The amount by which the secondary voltage of a potential transformer differs in magnitude from exact proportionality to the primary terminal voltage is called the ratio error of a potential transformer. The angle by which the secondary voltage of a potential transformer differs in phase from the primary terminal voltage is called the phase difference error of a potential transformer.	Understand	7	CAEE008.07
33	What will be the effect of open circuiting the secondary of a C.T?	If the secondary of a C.T. is open circuited the whole current in the primary becomes magnetizing current & a dangerously high voltage will appear across the secondary which may cause insulation breakdown, damage to the magnetic property of its iron core, overheating and also death to life. For these reasons open circuiting of a C.T. should never be permitted.	Understand	7	CAEE008.07
34	What do you mean by burden of a P.T or C.T?	The maximum load in volt amperes (VA) which may be applied across the secondary terminals of P.T. or C.T. is known as 'burden' of a P.T. or C.T. It depends upon the number of instruments or relays connected and their individual ratings.	Understand	7	CAEE008.07
35	What are the standard ratings of instrument transformers?	The standard secondary rating of P.T. is 110 volts and that of C.T. is 5 amps.	Remember	7	CAEE008.07
36	What precautions do you observe when working with instrument transformers?	When working with C.T. the secondary should be short circuited and grounded. No fuse should be inserted in the secondary circuit of C.T. because fuse may blow and produce an open circuit. When working with	Understand	7	CAEE008.07

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		P.T. the secondary should never be short circuited. One end of the secondary should be grounded and fuse should be provided both on the primary and the secondary circuit. One end of the secondary should be grounded and fuse should be provided both on the primary and the secondary circuit.			
37	How are the ratio error and the phase error of a c.t. improved?	The errors of a C.T. can be improved by the following methods By using high permeability and low loss magnetic material of the core. By reducing the length of the flux path in the core and increasing the area of the path with all joints reduced to a minimum or avoided altogether. By increasing the primary ampere-turns. By using one or two turns less in the secondary winding. By reducing the internal secondary burden as far as possible. By keeping the connected burden on the secondary as small as possible. By specifying the rated burden as near to the actual burden as possible.	Understand	7	CAEE008.07
38	What are the categories of current transformers and their applications?	There are two categories of C.Ts, e.g, Measuring current transformers are used with ammeters, wattmeters, KVA meters, KWH meters, power factor meters etc. Protective current transformers are used with over current relays, earth fault relays, differential protection, impedance protections etc.	Understand	7	CAEE008.07
UNIT – III					
1	Define Power.	Power is the rate (energy amount per time period) at which work is done or energy converted. The scientific unit of power is the watt (W), which is equal to one joule (energy amount) per second (time period)	Remember	CLO8	CAEE008.8
2	Explain the instrument used measuring power in any circuit	The wattmeter is an instrument for measuring the electric power in watts of any given circuit.	Understand	CLO8	CAEE008.8
3	Explain the construction of wattmeter	It consists of two coils i.e. pressure coil (parallel) and current coil (series). As the current coil is connected in series to the load, it measures the current flowing through the load and whereas the pressure coil which is connected across the load is used to measure the voltage across the load	Understand	CLO8	CAEE008.8
4	Explain Electrodynamometer wattmeter	The instrument whose working depends on the reaction between the magnetic fields of moving and fixed coils is known as the electro dynamo meter type wattmeter.	Understand	CLO8	CAEE008.8
5	Explain power factor	Power factors are usually stated as "leading" or "lagging" to show the sign of the phase angle. Capacitive loads are leading (current leads voltage), and	Understand	CLO8	CAEE008.8

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		inductive loads are lagging (current lags voltage). At low values of power factor, more apparent power needs to be transferred to get the same real power			
6	Why LPF wattmeter is used in no load test?	In open circuit test the secondary winding of transformer is kept open. As the secondary side is open the entire coil will be purely inductive in nature. So the power will be lagging due to inductive property of the circuit. So LPF (Low Power Factor) Wattmeter is used in open circuit test of transformer.	Remember	CLO8	CAEE008.8
7	What will be the readings on the wattmeters if the power factor of the load is zero?	The readings of the two wattmeters are equal and opposite while measuring power in a 3 phase induction motor.	Remember	CLO8	CAEE008.8
8	Define energy	Measure of the ability of a body or system to do work or produce a change, expressed usually in joules or kilowatt hours (kWh). No activity is possible without energy and its total amount in the universe is fixed	Remember	CLO10	CAEE008.10
9	What is an energy meter?	An electricity meter, electric meter, electrical meter, or energy meter is a device that measures the amount of <u>electric energy</u> consumed by a <u>residence</u> , a <u>business</u> , or an electrically powered device	Remember	CLO10	CAEE008.10
10	Define meter constant	Meter constant is the number of revolutions made in one kilowatt hour and it is a fixed value which is used when converting meter readings to actual energy use.	Remember	CLO10	CAEE008.10
12	What is the major cause of creeping error in an energy meter?	Over compensation for friction	Remember	CLO10	CAEE008.10
13	Explain the components of energy meter	Driving system, Moving system, Braking system, Registering system	Understand	CLO10	CAEE008.10
14	Define phantom loading.	In phantom loading shunt coil is energized by normal supply voltage where as the series coil is energized by separate supply source having low voltage but supply rated current, so that the power consumed by the series coil is lesser and finally power consumption in the calibration work is minimum.	Remember	CLO10	CAEE008.10
15	Explain how deflecting torque is produced in wattmeters	The deflecting torque is produced by the electromagnetic action of the current in the coil and the magnetic field.	Understand	CLO8	CAEE008.8
16	Explain causes low power factor?	The main cause of low Power factor is Inductive Load. As in pure inductive circuit, Current lags 90° from Voltage, this large difference of phase angle between current and voltage causes zero power factor	Understand	CLO8	CAEE008.8

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
17	What is the major cause of creeping error in an energy meter?	Over compensation for friction	Remember	10	CAEE008.10
18	Explain the components of energy meter	<ol style="list-style-type: none"> 1. Driving system 2. Moving system 3. Braking system 4. Registering system 	Understand	11	CAEE008.10
19	Define phantom loading.	In phantom loading shunt coil is energized by normal supply voltage where as the series coil is energized by separate supply source having low voltage but supply rated current, so that the power consumed by the series coil is lesser and finally power consumption in the calibration work is minimum.	Remember	10	CAEE008.10
20	Explain how deflecting torque is produced in wattmeters	The deflecting torque is produced by the electromagnetic action of the current in the coil and the magnetic field.	Understand	8	CAEE008.8
21	Explain causes low power factor?	The main cause of low Power factor is Inductive Load. As in pure inductive circuit, Current lags 90° from Voltage, this large difference of phase angle between current and voltage causes zero power factor	Understand	8	CAEE008.8
22	What will be the readings on the wattmeters if the power factor of the load is zero?	The readings of the two wattmeters are equal and opposite while measuring power in a 3 phase induction motor.	Remember	8	CAEE008.8
23	Define energy	Measure of the ability of a body or system to do work or produce a change, expressed usually in joules or kilowatt hours (KWH). No activity is possible without energy and its total amount in the universe is fixed	Remember	10	CAEE008.10
24	What is an energy meter?	An electricity meter, electric meter, electrical meter, or energy meter is a device that measures the amount of electric energy consumed by a residence, a business or an electrically powered device	Remember	10	CAEE008.10
25	Define meter constant	Meter constant is the number of revolutions made in one kilowatt hour and it is a fixed value which is used when converting meter readings to actual energy use.	Remember	10	CAEE008.10
26	Explain power factor	Power factors are usually stated as "leading" or "lagging" to show the sign of the phase angle. Capacitive loads are leading (current leads voltage), and inductive loads are lagging (current lags voltage). At low values of power factor, more apparent power needs to be transferred to get the same real power	Understand	8	CAEE008.8

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
27	Why LPF wattmeter is used in no load test?	In open circuit test the secondary winding of transformer is kept open. As the secondary side is open; the entire coil will be purely inductive in nature. So the power will be lagging due to inductive property of the circuit. So LPF (Low Power Factor) wattmeter is used in open circuit test of transformer.	remember	8	CAEE008.8
28	Explain electro dynamometer wattmeter	The instrument whose working depends on the reaction between the magnetic field of moving and fixed coils is known as the electro dynamometer wattmeter. It uses for measuring the power of both the ac and dc circuits	Understand	8	CAEE008.8
29	Define power.	Power is the rate (energy amount per time period) at which work is done or energy converted. The scientific unit of power is the watt (W), which is equal to one joule (energy amount) per second (time period)	Remember	8	CAEE008.8
30	Explain the instrument used measuring power in any circuit	The wattmeter is an instrument for measuring the electric power in watts of any given circuit.	Understand	8	CAEE008.8
31	Explain the construction of wattmeter	It consists of two coils i.e. pressure coil (parallel) and current coil (series). As the current coil is connected in series to the load, it measures the current flowing through the load and whereas the pressure coil which is connected across the load is used to measure the voltage across the load	Understand	8	CAEE008.8
UNIT - IV					
1	Classify resistances from the point of view of measurements	Low (less than 1 ohm), medium(between 1 ohm and 100 kohm), high(more than 100 ohm)	Understand	CLO11	CAEE008.11
2	Explain Bridge in measurement?	A bridge circuit is one kind of electrical circuit wherein the two branches of the circuit are linked to a third branch which is connected in between the first two branches at some middle point along them. A bridge circuit is mainly used to measure resistance	Understand	CLO11	CAEE008.11
3	Summarize advantage of bridge circuit	The advantage of using a bridge circuit to measure resistance is that the voltage of the power source is irrelevant	Understand	CLO11	CAEE008.11
4	Name the bridge used for measurement of inductance	The bridge used to measure inductance is Hay's bridge.	Remember	CLO12	CAEE008.12

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
5	Name the bridge used for measurement of self inductance of the coil	The bridge used to measure inductance is Anderson's Bridge.	Remember	CLO12	CAEE008.12
6	Explain the use of Schering Bridge	The Schering Bridge is an electrical circuit used for measuring the insulating properties of electrical cables and equipment. It is an AC bridge circuit, developed by Herald Schering. It has the advantage that the balance equation is independent of frequency.	Understand	CLO13	CAEE008.13
7	What are the advantages of Schering bridge?	The balance equation is independent of frequency. It is used for measuring the insulating properties of electrical cables and equipment's. It can measure small capacitors at low voltages precisely	Remember	CLO13	CAEE008.13
8	Define Owens's bridge	The bridge which measures the inductance in terms of capacitance is known as Owens's bridge	Remember	CLO13	CAEE008.13
9	Explain the use of Wien bridge	Wien's bridge is used for precision measurement of capacitance in terms of resistance and frequency. It was also used to measure audio frequencies	Understand	CLO13	CAEE008.13
10	Why capacitor is used in Anderson Bridge?	AC bridges are often used to measure the value of unknown impedance (self/mutual inductance of inductors or capacitance of capacitors)	Remember	CLO11	CAEE008.12
11	Explain Maxwell bridge	A Maxwell bridge is a modification to a Wheatstone bridge used to measure an unknown inductance in terms of calibrated resistance and inductance or resistance and capacitance	Understand	CLO11	CAEE008.12
12	What is the advantage of Anderson Bridge over Maxwell Bridge?	Fixed capacitor is used, whereas other bridges use a variable capacitor. The bridge is used for accurate determination of inductance in the millimeter range. This bridge also gives an accurate result for determination of capacitance in terms of inductance	Remember	CLO11	CAEE008.12
13	Define AC bridge	The bridge used for measuring the value of unknown resistance, inductance and capacitance, is known as the AC Bridge	Remember	CLO11	CAEE008.11
14	Explain De Sauty's bridge?	De Sauty Bridge measures an unknown capacitance in term of a standard capacitance by comparing two capacitance's Two ratio arm of this bridge consist pure resistor and two consist capacitor where one is of known value and another is standard capacitor.	Understand	CLO13	CAEE008.13
15	Explain the application of Kelvin Double Bridge	Kelvin Double Bridge is nothing but a modification of Wheatstone bridge and used for measuring of low resistance to a good precision	Understand	CLO11	CAEE008.11
16	Explain Owen's bridge?	The bridge which measures the inductance in terms of capacitance is known as Owen's bridge. It works on the principle of comparison	Understand	CLO13	CAEE008.13

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
17	Define AC bridge	The bridge uses for measuring the value of unknown resistance, inductance and capacitance is known as the a.c Bridge	Remember	11	CAEE008.11
18	Explain De Sauty's bridge?	De Sauty Bridge measures an unknown capacitance in term of a standard capacitance by comparing two capacitance's Two ratio arm of this bridge consist pure resistor and two consist capacitor where one is of known value and another is standard capacitor.	Understand	13	CAEE008.13
19	Explain the application of Kelvin double bridge	Kelvin double bridge is nothing but a modification of Wheatstone bridge and used for measuring of low resistance to a good precision	Understand	11	CAEE008.11
20	Explain Owens's bridge?	The bridge which measures the inductance in terms of capacitance is known as Owens's bridge. It works on the principle of comparison	Understand	13	CAEE008.13
21	What is the advantage of Anderson bridge over Maxwell bridge	Fixed capacitor is used, whereas other bridges use a variable capacitor. The bridge is used for accurate determination of inductance in the millimeter range. This bridge also gives an accurate result for determination of capacitance in terms of inductance	Remember	12	CAEE008.12
22	Define Owens's bridge	The bridge which measures the inductance in terms of capacitance is known as Owens's bridge.	Remember	13	CAEE008.13
23	Explain the use of Wien bridge	Wien's bridge is used for precision measurement of capacitance in terms of resistance and frequency. It was also used to measure audio frequencies.	Understand	13	CAEE008.13
24	Why capacitor is used in Anderson bridge?	AC bridges are often used to measure the value of unknown impedance (self/mutual inductance of inductors or capacitance of capacitors.	Remember	12	CAEE008.12
25	Explain Maxwell bridge	A Maxwell bridge is a modification to a wheatstone bridge used to measure an unknown inductance in terms of calibrated resistance and inductance or resistance and capacitance.	Understand	12	CAEE008.12
26	Name the bridge used for measurement of inductance	Hay's bridge	Remember	12	CAEE008.12
27	Name the bridge used for measurement of self inductance of the coil	Anderson's bridge	Remember	12	CAEE008.12
28	Explain the use of Schering bridge	The Schering bridge is an electrical circuit used for measuring the insulating properties of electrical cables and equipment. It is an a.c bridge circuit, developed by Harald Schering. It has the advantage that the balance equation is independent of frequency.	Understand	13	CAEE008.13

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
29	What are the advantages of Schering bridge?	The balance equation is independent of frequency. It is used for measuring the insulating properties of electrical cables and equipment's. It can measure small capacitors at low voltages precisely	Remember	13	CAEE008.13
30	Classify resistances from the point of view of measurements	1. Low (less than 1 ohm) 2. Medium(between 1 ohm and 100 kohm) High(more than 100 ohm)	Understand	11	CAEE008.11
31	Explain Bridge in measurement?	A bridge circuit is one kind of electrical circuit wherein the two branches of the circuit are linked to a third branch which is connected in between the first two branches at some middle point along them. A bridge circuit is mainly used to measure resistance	Understand	11	CAEE008.11
32	Summarise Advantage of bridge circuit	The advantage of using a bridge circuit to measure resistance is that the voltage of the power source is irrelevant	Understand	11	CAEE008.11
UNIT - V					
1	Define the term transducer	It is a device which converts a non electrical quantity into an electrical quantity	Remember	CLO14	CAEE008.14
2	State the advantages of LVDT.	The advantages of LVDT are linearity infinite resolution, high output, high sensitivity, ruggedness, less friction, less hysteresis, less power consumption	Remember	CLO15	CAEE008.15
3	Summarize common transducers	Variable resistor, variable inductor, variable capacitor, synchros and resolvers	Remember	CLO7	CAEE008.14
4	Define pressure transducer?	It is a device which converts the pressure into mechanical displacement which is later converted in to electrical quantity using a secondary transducer.	Remember	CLO15	CAEE008.15
5	Give commonly used pressure sensitive devices?	The commonly used pressure sensitive devices are bourdon tubes, bellows and diaphragms.	Remember	CLO15	CAEE008.15
6	What are the major advantages of RTD?	Advantages for RTDs include stable output over a long period of time, ease of recalibration, and accurate readings over narrow temperature spans.	Remember	CLO15	CAEE008.15
7	What are the major advantages of a thermocouple?	Advantages of the thermocouple include a wide range from -300°F to 2300°F, fast response time (under a second in some cases), low initial cost and durability. Overall, thermocouples are able to withstand rugged applications.	Remember	CLO15	CAEE008.15
8	What are the major differences between a thermocouple and an RTD?	The most notable difference between a thermocouple and an RTD is the principle of operation and manufacturing. A thermocouple is made of two dissimilar metals joined so that a potential difference generated between the	Remember	CLO15	CAEE008.15

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		points of contact is a measure of the temperature. An RTD operates on the principle that electrical resistance of certain metals changes in a predictable way depending on the rise or fall in temperature. The two measurement tools each have their own advantages and disadvantages			
9	Explain the working of a thermocouple	A thermocouple is a device used extensively for measuring temperature. A thermocouple is comprised of at least two metals joined together to form two junctions. One is connected to the body whose temperature is to be measured; this is the hot or measuring junction. The other junction is connected to a body of known temperature; this is the cold or reference junction. Therefore the thermocouple measures unknown temperature of the body with reference to the known temperature of the other body	Remember	CLO15	CAEE008.15
10	What is a RTD?	A Resistance Thermometer or Resistance Temperature Detector is a device which used to determine the temperature by measuring the resistance of pure electrical wire. This wire is referred to as a temperature sensor. If we want to measure temperature with high accuracy, RTD is the only one solution in industries. It has good linear characteristics over a wide range of temperature.	Remember	CLO15	CAEE008.15
11	What is piezoelectricity	Piezoelectricity is the electric charge that accumulates in certain solid materials (such as crystals, certain ceramics) in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure	Remember	CLO15	CAEE008.15
12	What is a piezoelectric sensor?	A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge. A piezoelectric disk generates a voltage when deformed.	Remember	CLO15	CAEE008.15
13	Explain the functions of horizontal and vertical plates	Horizontal and vertical plates are provided between electron gun and screen to deflect the beam according to the input signal.	Understand	CLO16	CAEE008.16
14	Explain cathode ray oscilloscope(CRO)	A CRO is an electronic device with a CRT as its main component and other associated circuits consisting of a power supply unit, a saw tooth wave generator, and horizon and vertical amplifiers.	Understand	CLO16	CAEE008.16
15	Summarize the advantages of CRO	CRO is an electronic device that gives graphical representation of alternating quantities under examination. The CRO gives very accurate measurements and is free from the errors introduced by the moving parts. It is also from damping mechanisms and other inertia containing parts.	Remember	CLO16	CAEE008.16

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
16	What is Sweep time?	Sweep time is time duration during which the beam is swept from left to right on the screen of a CRT by the linearly increasing sawtooth voltage.	Remember	CLO16	CAEE008.16
17	Explain the function of electron gun assembly in CRT	The sole function of an electron gun assembly in a CRO is to provide a narrow and sharply focused electron beam which is accelerated towards the phosphor screen	Understand	CLO16	CAEE008.16
18	Define Lissajous pattern	Lissajous pattern is a pattern that results from applying periodic signals to the deflection plates of a CRO.	Remember	CLO16	CAEE008.16
19	Define transducer?	It is a device which converts a non electrical quantity into an electrical quantity	Understand	14	CAEE008.14
20	. Mention some of the transducers	Variable resistor, variable inductor, variable capacitor, Synchros and resolvers	Understand	14	CAEE008.14
21	State the advantages of LVDT.	The advantages of LVDT are :- (i)Linearity (ii)Infinite resolution (iii)High output (iv)High sensitivity (v)Ruggedness (vi)Less friction (vii)Less hysteresis (viii)Less power consumption	Understand	15	CAEE008.15
22	What is the pressure transducer?	It is a device which converts the pressure into mechanical displacement which is later converted into electrical quantity using a secondary transducer.	Understand	15	CAEE008.15
23	Give commonly used pressure sensitive devices?	The commonly used pressure sensitive devices are Bourdon tubes, bellows and diaphragms.	Understand	15	CAEE008.15
24	What are the major advantages of a thermocouple?	Advantages of the thermocouple include a wide range from -300°F to 2300°F, fast response time (under a second in some cases), low initial cost and durability. Overall, thermocouples are able to withstand rugged applications.	Understand	15	CAEE008.15
25	What are the major advantages of RTD?	Advantages for RTD s include stable output over a long period of time, ease of recalibration, and accurate readings over narrow temperature spans.	Understand	15	CAEE008.15
26	What are the major differences between a thermocouple and an RTD?	The most notable difference between a thermocouple and an RTD is the principle of operation and manufacturing. A thermocouple is made of two dissimilar metals joined so that a potential difference generated between the points of contact is a measure of the temperature. An RTD, operates on the principle that electrical resistance of certain metals changes in a predictable	Understand	15	CAEE008.15

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		way depending on the rise or fall in temperature. The two measurement tools each have their own advantages and disadvantages			
27	What is a thermocouple & how does it work?	A thermocouple is a device used extensively for measuring temperature. A thermocouple is comprised of at least two metals joined together to form two junctions. One is connected to the body whose temperature is to be measured; this is the hot or measuring junction. The other junction is connected to a body of known temperature; this is the cold or reference junction. Therefore the thermocouple measures unknown temperature of the body with reference to the known temperature of the other body	Understand	15	CAEE008.15
28	What is the working principle of a thermocouple?	<ol style="list-style-type: none"> 1. Seebeck effect 2. Peltier effect Thomson effect	Remember	15	CAEE008.15
29	What is a RTD?	A Resistance Thermometer or Resistance Temperature Detector is a device which used to determine the temperature by measuring the resistance of pure electrical wire. This wire is referred to as a temperature sensor. If we want to measure temperature with high accuracy, RTD is the only one solution in industries. It has good linear characteristics over a wide range of temperature.	Understand	15	CAEE008.15
30	What is piezoelectricity?	Piezoelectricity is the electric charge that accumulates in certain solid materials (such as crystals, certain ceramics) in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure.	Understand	15	CAEE008.15
31	What is a piezoelectric sensor?	A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge. A piezoelectric disk generates a voltage when deformed.	Understand	15	CAEE008.15
32	What is cathode ray oscilloscope(CRO)	A CRO is an electronic device with a CRT as its main component and other associated circuits consisting of a power supply unit, a sawtooth-wave generator, horizon and vertical amplifiers.	Understand	16	CAEE008.16
33	How CRO is superior to ordinary measuring device	CRO is an electronic device that gives graphical representation of alternating quantities under examination. The CRO gives very accurate measurements and is free from the errors introduced by the moving parts. It is also from damping mechanisms and other inertia containing parts.	Understand	16	CAEE008.16

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
34	For what horizontal and vertical plates are provided	Horizontal and vertical plates are provided between electron gun and screen to deflect the beam according to the input signal.	Understand	16	CAEE008.16
35	For what electron gun assembly is provided in CRT	The sole function of an electron gun assembly in a CRO is to provide a narrow and sharply focused electron beam with is accelerated towards the phosphor screen	Understand	16	CAEE008.16
36	What is Sweep time	Sweep time is time duration during which the beam is swept from left to right on the screen of a CRT by the linearly increasing saw tooth voltage.	Understand	16	CAEE008.16
37	What is Lissajous pattern	Lissajous pattern is a pattern that results from applying periodic signals to the deflection plates of a CRO.	Understand	16	CAEE008.16
38	How focussing is achieved	Focusing is achieved by various sets of plated forming a sort of electronic lens. In general, there are three sets of plates. Voltages at anode 1 and 2 are kept fixed while it is variable on the third anode. By varying the voltage on the third anode, the spot may be focused.	Understand	16	CAEE008.16

Signature of the Faculty

Signature of the HOD

