



Maratha Vidya Prasarak Samaj's

Rajarshi Shahu Maharaj Polytechnic, Nashik

Udoji Maratha Boarding Campus, Near Pumping Station, Gangapur Road, Nashik-13.

RSM POLY

Affiliated to MSBTE Mumbai, Approved by AICTE New Delhi, DTE Mumbai & Govt. of Maharashtra, Mumbai.

*Subject: ELECTRICAL AND
ELECTRONIC MEASUREMENT
(22325)*



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SYLLABUS

Chapter No.	Name of chapter	Marks With Option
1	Fundamentals of measurements	08
2	Measurement of voltage and current	24
3	Measurement of electrical power	12
4	Measurement of electric energy	18
5	Measuring instruments	40
Total Marks :-		102



BOARD THEORY

PAPER PATTERN

FOR EEM (22525)

Q.1		Attempt any FIVE	5*2=10
	a)	Fundamentals of measurements	
	b)	Fundamentals of measurements	
	c)	Measurement of electrical power	
	d)	Measurement of electric energy	
	e)	Measurement of electric energy	
	f)	Measurement of voltage and current	
	g)	Measurement of electrical power	
Q.2		Attempt any THREE	3*4=12
	a)	Fundamentals of measurements	
	b)	Measurement of voltage and current	
	c)	Measurement of voltage and current	
	d)	Measurement of voltage and current	
Q.3		Attempt any THREE	3*4=12
	a)	Measurement of voltage and current	



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	b)	Measurement of electrical power
	c)	Measurement of electrical power
	d)	Measurement of electric energy
Q.4		Attempt any FOUR 3*4=12
	a)	Measurement of electric energy
	b)	Measuring instruments
	c)	Measuring instruments
	d)	Measuring instruments
	e)	Measuring instruments
Q.5		Attempt any TWO 2*6=12
	a)	Measurement of voltage and current
	b)	Measuring instruments
	c)	Measuring instruments
Q.6		Attempt any TWO 2*6=12
	a)	Measurement of electric energy
	b)	Measuring instruments
	c)	i)Measuring instruments
		ii)Measuring instruments



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CLASS TEST - I

PAPER PATTERN

COURSE: - Electrical and Electronic Measurement (22325)

PROGRAMME: - Electrical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	fundamentals of measurements	co-325.1
2	measurement of voltage and current	co-325.2
3	measurement of electrical power	co-325.3

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
a)	Fundamentals of measurements	co-325.1
b)	Fundamentals of measurements	co-325.1
c)	Measurement of voltage and current	co-325.2
d)	Measurement of voltage and current	co-325.2
e)	Measurement of electrical power	co-325.3
f)	Measurement of electrical power	co-325.3
Q.2	Attempt any THREE 3*4=12 Marks	
a)	Fundamentals of measurements	CO-325.1
b)	Fundamentals of measurements	CO-325.1



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c)	Measurement of voltage and current	CO-325.2
d)	Measurement of voltage and current	CO-325.2
e)	Measurement of electrical power	CO-325.3
f)	Measurement of electrical power	CO-325.3



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CLASS TEST - II

PAPER PATTERN

COURSE: - Electrical and Electronic Measurement (22325)

PROGRAMME: - Electrical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
4	Measurement of electric energy	co-325.4
5	Measuring instruments	co-325.5

Q.1	Attempt any FOUR	4*2=8Marks	Course Outcome (CO)
a)	Measurement of electric energy		CO-325.4
b)	Measurement of electric energy		CO-325.4
c)	Measuring instruments		CO-325.5
d)	Measuring instruments		CO-325.5
e)	Measuring instruments		CO-325.5
f)	Measuring instruments		CO-325.5
Q.2	Attempt any THREE	3*4=12 Marks	
a)	Measurement of electric energy		CO-325.4
b)	Measurement of electric energy		CO-325.4
c)	Measuring instruments		CO-325.5



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d)	Measuring instruments	CO-325.5
e)	Measuring instruments	CO-325.5
f)	Measuring instruments	CO-325.5



COURSE OUTCOME

(CO)

COURSE: - Electrical and Electronic Measurement (22325)

PROGRAMME: - Electrical Engineering

CO.NO	Course Outcome
CO-325.1	Identify electrical measuring instrument
CO-325.2	Use voltmeter and ammeter for electrical measurement
CO-325.3	Use wattmeter for electrical power measurement
CO-325.4	Use energy meter for electrical energy measurement
CO-325.5	Use measuring instrument

1. Fundamental of Measurement

Position in Question Paper

Total Marks-08

Q.1. a) 2-Marks.

Q.1. b) 2-Marks.

Q.2. a) 4-Marks.

Descriptive Question

1. Define the term 'calibration' and state its need for measuring instruments
2. Distinguish between: (i) Absolute and secondary instruments (ii) Analog and digital instruments.
3. State the types of errors in measuring instruments and reasons of occurrence of errors
4. Define the following terms. (i) Precision (ii) Drift (iii) Resolution (iv) Back lash
5. State the essential requirements of indicating instruments
6. Differentiate between null and deflection type instruments
7. List any eight static characteristics of measuring instrument.
8. Describe gross error and instrumental error in measuring instruments.
9. State the necessity of measurement necessity?
10. State the meaning of the following: (i) Sensitivity (ii) Deflecting torque
11. State the desirable qualities of measuring instrument and explain any two in brief



MCQ Question

(Total number of Question=Marks*3=22*3=66)

Note: Correct answer is marked with **bold**.

- are integrating instruments?
 - Ammeters
 - Voltmeters
 - Wattmeters
 - Ampere-hour and Watt-hour meters**
- Resistances can be measured with the help of a

 - 1.Wattmeter
 - 2.voltmeter
 - 3.ammeter
 - 4.ohmmeter and resistance bridge**

- instruments indicate the instantaneous value of the electrical quantity being measured at the time at which it is being measured?
 - Absolute
 - Indicating**
 - Recording
 - Integrating
- The use of instruments is merely confined within laboratories as standardizing instruments.
 - absolute**
 - indicating
 - integrating
 - none of the above
- instruments measure the total quantity of electricity delivered at a particular time.
 - absolute
 - indicating
 - recording
 - integrating**
- According to application, instruments can be classified into and

 - switch board
 - portable
 - both 1 and 2**
 - moving coil

- The spring material used in a spring control device should have the following property:
 - should be non-magnetic
 - should have low specific resistance
 - should not be subjected to fatigue
 - all of the above**
- Which of the following properties a damping oil must possess?
 - must be a good insulator
 - should be non-evaporating



- c) should not have corrosive action upon the metal of the vane
d) the viscosity of the oil should not change with the temperature
e) **all of the above**
9. A device prevents the oscillation of the moving system and enables the latter to reach its final position quickly.
a) deflecting
b) controlling
c) **damping**
d) all of the above
10. An induction meter can handle current upto
a) 10 A
b) 30 A
c) 60 A
d) **100 A**
11. For handling greater currents induction wattmeter are used in conjunction with
a) potential transformer
b) **current transformer**
c) power transformer
d) all of the above
12. devices may be used for extending the range of the instruments?
a) shunts
b) multipliers
c) current transformers
d) potential transformer
e) **all of the above**
13. A moving-coil permanent-magnet instrument can be used as flux-meter by
a) using a low resistance shunt
b) using a high series resistance
c) **eliminating the control springs**
d) making control springs of large moment of inertia
14. A moving-coil permanent-magnet instrument can be used as by using a low resistance shunt.
a) **ammeter**
b) voltmeter
c) flux-meter
d) ballistic galvanometer
15. A potentiometer may be used for
a) measurement of resistance
b) measurement of current
c) calibration of voltmeter
d) **all of the above**
16. are not used on D.C. circuits.
a) Mercury motor meters
b) commutator motor meters
c) **induction meters**
d) none of the above
17. is an essential part of a motor meter .
a) an operating torque system
b) a barking device



- c) revolution registering device
d) **all of the above**
18. Induction type single phase energy meters measure electric energy in
- a) 1kW
b) **kWh**
c) VAR
d) none of the above
19. The pointer of an indicating instrument should be
- a) **very light**
b) very heavy
c) either 1 or 2
d) neither 1 nor 2
20. The household energy meter is
- a) an indicating instrument
b) a recording instrument
c) **an integrating instrument**
d) none of the above
21. The chemical effect of current is used in
- a) **D.C. ammeter hour meter**
b) D.D. ammeter
c) D.C. energy meter
d) none of the above
22. In majority of instruments, damping is provided by
- a) fluid friction
b) spring
c) **eddy currents**
d) all of the above
23. An ammeter is a instrument.
- a) **secondary instrument**
b) absolute instrument
c) recording instrument
d) integrating instrument
24. The switchboard instruments should be mounted in position.
- a) **vertical**
b) horizontal
c) either 1 or 2
d) neither 1 nor 2

2. Measurement of Voltage and Current

Position in Question Paper

Total Marks-24

Q.1. f) 2-Marks.

Q.2. a) 4-Marks.

Q.2. c) 4-Marks

Q.2. d) 4-Marks

Q.3. a) 4-Marks.

Q.5. a) 6-Marks.

-
1. What is the difference between conventional ammeter and clip-on ammeter
 2. Calculate the resistance of shunt required to make a milliammeter which gives maximum deflection for a current of 15 mA and which has a resistance of 5W, read upto 10 Amp.
 3. Describe with circuit diagram, the working of full wave rectifier type A.C Voltmeter.
 4. Explain with sketch, the construction and working principle of repulsion type moving iron instrument? Compare repulsion type MI instrument with attraction type MI instrument?
 5. State the advantages of PMMC instrument.
 6. Design multirange dc voltmeter of range 0-100 V. Assume full scale deflection current is 5mA and internal resistance of meter is 500 ohm
 7. Explain the working of PMMI meter with neat sketch.
 8. CT is used to extend the range of ammeter in an electrical circuit. Explain the effect of open circuited secondary on the function of CT
 9. State the full form of PMMC and PMMI.
 10. List out comparisons between CT's and PT's



11. A moving coil instrument gives full scale deflection of 24 mA. When a P.D. across it is 108 mV. Find the value of – (i) Series resistance for full scale deflection of 400 V.
(ii) Find the power consumption.
12. State the differences between analog instruments and digital instruments.
13. State the necessity of extension of Ammeter using shunt with mathematical derivation if necessary.
14. Explain clip-on ammeter.

MCQ Question

(Total number of Question=Marks*3=24*3=72)

Note: Correct answer is marked with **bold**.

1. An ohmmeter is a instrument.
 - a) moving iron
 - b) moving coil**
 - c) dynamometer
 - d) none of the above
2. should be used for an accurate measurement of low D.C. voltage.
 - a) small range moving coil voltmeter
 - b) D.C. potentiometer**
 - c) small range thermocouple voltmeter
 - d) none of the above
3. The best device to measure the true open circuit e.m.f. of a battery is
 - a) D.C. voltmeter
 - b) ammeter and a known resistance
 - c) D.C. potentiometer**
 - d) none of the above
4. A phase shifting transformer is used in conjunction with
 - a) D.C. potentiometer
 - b) Drysdale potentiometer**
 - c) A.C. co-ordinate potentiometer
 - d) Crompton potentiometer
5. In order to achieve high accuracy, the slide wire of a potentiometer should be
 - a) as long as possible**
 - b) as short as possible
 - c) neither too small nor too large
 - d) very thick
6. The stator of phase shifting transformer for use in conjunction with an A.C. potentiometer usually has a
 - a) single-phase winding
 - b) two-phase winding**
 - c) three-phase winding
 - d) none of the above



23. For reducing the errors in an induction instrument the alternating current to be measured has
- a) **Same frequency with which the instrument was calibrated**
 - b) High frequency compared with which the instrument was calibrated
 - c) Low frequency compared with which the instrument was calibrated
 - d) None of these
24. In induction voltmeter, split phase windings are obtained by connecting a
- a) High resistances in series with windings of both the magnets
 - b) **High resistance in series with the winding of one magnet and an inductive coil in series with the windings of other magnet**
 - c) An inductive coil in series with the winding of one magnet and a capacitance in series with the windings of other magnet
 - d) Inductive coils in series with the winding of both the magnets
25. A cylindrical type with split phase winding induction ammeters employs
- a) A rotating disc
 - b) **A hollow aluminum drum**
 - c) A single flux producing winding
 - d) Either (1) or (2)
26. Induction type instruments are generally used as
- a) Ammeter
 - b) Voltmeter
 - c) **All of these**
 - d) None of these
27. Damping torque is the torque which acts on
- a) Stationary system of the instrument
 - b) Moving system of the instrument only when it is stationary
 - c) **Moving system of the instrument only when it is moving**
 - d) Stationary system of the instrument only when the moving system is moving
28. In a moving coil voltmeter, the input resistance of the meter can be increased by
- a) Increasing the number of turns in the coil
 - b) Decreasing the number of turns in the coil
 - c) Using the same number of coil turns made up of high resistance material
 - d) **Both (1) & (3)**
29. The measurements which can be simplified by using X – Y recorders is / are
- a) Speed – torque characteristics of motors
 - b) Regulation curves of power supplies
 - c) Hysteresis curves
 - d) **All of these**
30. The transformer ratio of the transformer depends upon the



- a) Exciting current
b) Secondary current
c) Power factor of secondary circuit
d) **All of these**
31. Primary current in a current transformer is determined by
- a) **The load on the system**
b) The load on its own secondary
c) The load on its own primary
d) 4.All of these
32. The nominal ratio of a current transformer is
- a) Primary winding current/ Secondary winding current
b) **Rated primary winding current/ Rated secondary winding current**
c) Number of secondary winding turns / Number of turns of primary winding turns
d) All of the above
33. The transformation ratio in the case of a potential transformer is defined as the
- a) **Primary winding voltage / Secondary winding voltage**
b) Rated primary winding voltage / Rated secondary winding voltage
c) Number of turns of primary winding turns/ Number of turns of secondary winding turns
d) All of the above
34. The ratio and phase angle error in potential transformers may be reduced by
- a) Increasing the exciting current
b) Increasing the resistance and leakage reactance in the transformer
c) By not employing turns compensation
d) **None of the above**
35. Turns compensation is used in current transformers primarily for reduction of
- a) Phase angle error
b) Both ratio and phase angle error
c) **Ratio error, reduction in phase angle error is incidental**
d) None of the above
36. The burden of current transformers is expressed in terms of
- a) Secondary winding current
b) **VA rating of transformer**
c) Voltage, current and power factor of secondary winding circuit
d) None of the above
37. Due to which one of the following reasons bearing of PMMC Instrument are made of Jewel



- a) **To avoid wear and tear of the moving system**
b) To provide a small support
c) It can be easily replaced
d) To make the system robust
38. The function of shunt in an ammeter is to
- a) **by pass the current**
b) increase the sensitivity of the ammeter
c) increase the resistance of ammeter
d) none of the above
39. The multiplier and the meter-coil in a voltmeter are in
- a) **series** c) series-parallel
b) parallel d) none of the above
40. A moving iron instrument can be used for
- a) D.C. only c) **both D.C. and A.C.**
b) A.C. only d) none of the above
41. The scale of a rectifier instrument is
- a) **linear** c) either 1 or 2
b) non-linear d) neither 1 nor 2
42. To measure current at high frequency, we must use
- a) moving iron instrument c) **thermocouple instrument**
b) electrostatic instrument d) none of the above
43. The resistance in the circuit of the moving coil of a dynamometer should be
- a) zero c) **high**
b) low d) none of the above
44. A moving-coil permanent-magnet instrument can be used as _____ by using a low resistance shunt.
- a) **ammeter** c) flux-meter
b) voltmeter d) ballistic galvanometer
45. A moving-coil permanent-magnet instrument can be used as flux-meter
- a) by using a low resistance shunt
b) by using a high series resistance
c) **by eliminating the control springs**
d) by making control springs of large moment of inertia
46. Which of the following devices may be used for extending the range of instruments ?
- a) Shunts d) Potential transformers
b) Multipliers e) **All of the above**
c) Current transformers



47. An ammeter is a
- a) **secondary instrument**
 - b) absolute instrument
 - c) recording instrument
 - d) integrating instrument
48. The resistance in the circuit of the moving coil of a dynamometer wattmeter should be
- a) Almost zero
 - b) Low
 - c) **High**
 - d) None of the above
49. The ratio of maximum displacement deviation to full scale deviation of the instrument is called
- a) Static sensitivity
 - b) Dynamic deviation
 - c) **Linearity**
 - d) Precision or accuracy
50. If an instrument exhibits hysteresis then
- a) **It also displays dead space**
 - b) It will not display any dead space
 - c) Either (a) or (b)
 - d) None of these
51. In measuring instruments, spiral springs are provided to
- a) Lead current
 - b) Produce controlling torque
 - c) Produce damping torque
 - d) **Lead current and produce controlling torque**
52. Electrodynamic instruments can be used as
- a) Ammeter
 - b) Voltmeter
 - c) Wattmeter
 - d) **All of these**
53. The equivalent inductance of fixed coil and moving coil of electrodynamic instrument is given by
- a) **$L_1 + L_2 + 2M$**
 - b) $L_1 + L_2 - 2M$
 - c) $L_1 + L_2 + M$
 - d) $L_1 + L_2 - M$
54. The scale of electrodynamic instrument when it is used as ammeter and when it is used as voltmeter is
- a) Uniform, uniform
 - b) **Crowded near zero, crowded near zero**
 - c) Cramped near zero, cramped in the middle
 - d) Uniform, cramped near zero
55. In an electrodynamic instrument, the number of control springs present is / are
- a) **Two**
 - b) One
 - c) Four
 - d) Zero
56. Electrodynamic ammeter has current flowing through it of 20 A and torsional constant of controlling spring of 10^{-6} N – m / degree. If the mutual inductance changes uniformly at the rate of 0.0025 μ H / degree, then its angular deflection for full scale is
- a) 43.68 degree
 - b) **57.29 degree**
 - c) 68.32 degree
 - d) 69.69 degree



57. The deflection angle in hot wire instruments is
- Directly proportional to the current
 - Directly proportional to the square of current**
 - Inversely proportional to the current
 - Inversely proportional to the square of current
58. Hot – wire instruments are suitable for
- AC work only
 - DC work only
 - Both AC and DC work**
 - None of these
59. The resistances of the various arms of Wheatstone bridge are $P = 500 \text{ ohm}$, $Q = 50 \text{ ohm}$, $R = 1010 \text{ ohm}$ and $S = 100 \text{ ohm}$. The emf of the battery is 5 V and the current sensitivity of galvanometer is $8 \text{ mm} / \mu \text{ A}$. If the internal resistance of the galvanometer is 80 ohm then the deflection of galvanometer and the sensitivity of the bridge in terms of deflection per unit change of resistance are
- 151.2 mm, 30.24 mm / ohm**
 - 100 mm, 21.03 mm / ohm
 - 186 mm, 40.37 mm / ohm
 - 193 mm, 20.74 mm / ohm
60. A PMMC type voltmeter, having a full-scale reading of 250 V and an internal resistance of 400 kilo-ohms , is connected with the series resistance of 100 kilo-ohms . Calculate the sensitivity of the voltmeter (in Ohms/Volts).
- 2400
 - 2000**
 - 20000
 - 24000
61. Which of the following types of instrument can be used for D.C only?
- Moving iron attraction type
 - Moving Iron repulsion type
 - Permanent magnet type**
 - Hotwire type
62. A moving iron type ammeter has few turns of thick wire so that
- Resistance is less**
 - Sensitivity is high
 - Damping is effective
 - Scale is large
63. Which of the following types of instrument can't be used for D.C
- Moving iron-attraction type
 - Moving coil permanent magnets type
 - Hotwire type
 - Induction type**
64. A repulsion type ammeter when used on A.C circuit reads
- Peak value of current
 - R.M.S value of the current**
 - Mean value of current
 - Equivalent D.C value of the current
65. When the damping force is more than the optimum, the instrument will become
- Dead
 - Oscillating



- c) **Slow and lethargic** d) Fast and sensitive
66. In moving iron type ammeter the coils has
- a) A large number of turns of thick wire
 - b) Large number of turns of thin wire
 - c) Few turns of thin wire
 - d) **Few turns of thick wire**
67. In repulsion type instrument the force of repulsion is approximately proportional to
- a) Current
 - b) **Square of current**
 - c) The inverse of the current
 - d) The inverse of the square of the current
68. Commonly used instruments in power system measurement are
- a) **induction** c) rectifier
 - b) moving coil or iron d) electrostatic
69. If an instrument has cramped scale for larger values, then it follows
- a) square law c) uniform law
 - b) **logarithmic law** d) none of the above
70. E.m.f. of a Weston cell is accurately measured by
- a) **electrostatic voltmeter** c) isothermal voltmeter
 - b) hot wire voltmeter d) electrodynamic voltmeter
71. A sensitive galvanometer produces large deflection for a
- a) **small value of current** c) large value of voltage
 - b) large value of current d) none of the above
72. Alternating current is measured by
- a) **induction ammeter**
 - b) permanent magnet type ammeter
 - c) electrostatic ammeter
 - d) moving iron repulsion type voltmeter

3. Measurement of Electrical Power

Position in Question Paper

Total Marks-12

Q.1. c) 2-Marks.

Q.1. g) 2-Marks.

Q.3. b) 4-Marks.

Q.3. c) 4-Marks.

-
1. State the difference between unity P.F wattmeter and low P.F wattmeter
 2. A single phase wattmeter rated for 500 V; 5A is having full scale deflection of 1000 watt. What is multiplying factor of the wattmeter?
 3. A 3-phase, 500 volt motor load has a power factor of 0.4. Two wattmeter connected to measure the input. They show the input to be 30 KW. Find the reading of each wattmeter?
 4. List the various errors occurred in dynamometer type wattmeter and describe the way of compensating any one type of error.
 5. Explain with suitable diagram, the constructional detail and working of Dynamometer type wattmeter
 6. Draw the neat labeled circuit diagram for measurement of power in 3-phase circuit using two wattmeter method
 7. In a circuit, power is to be measured with a wattmeter having specification of 15A / 400V, 1500 watts full scale deflection. The reading of wattmeter was 750 watts. State the value of actual power consumed by the load.
 8. A wattmeter with its current coil in line R and pressure coil across Y and B reads 3.2kW for a balanced load of 0.6 lagging p.f. The supply voltage is 400 V. Determine the following : i) current ii) power and iii) reactive volt ampere of the load
 9. Represent the vector representation of power triangle.
 10. State the merits and demerits of power measurement using 2-wattmeter method.



11. Three identical coils each of $(4 + j5)$ Ω are connected in star across 415V, 3-phase 50 Hz supply find (i) V_{ph} (ii) I_{ph} (iii) Wattmeter readings W_1, W_2 .
12. State errors occurring in wattmeter and suggest method for overcoming such types of errors

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold**.

1. A dynamometer wattmeter can be used for
 - a) 1.D.C. only
 - b) 2.A.C. only
 - c) **3.both D.C. and A.C.**
 - d) 4.none of the above
2. An induction wattmeter can be used for
 - a) **D.C. only**
 - b) 2.A.C. only
 - c) 3.both D.C. and A.C.
 - d) 4.none of the above
3. In a 3-phase power measurement by two wattmeter method, the reading on one of the wattmeter is zero. The power factor of the load must be
 - a) unity
 - b) **0.5**
 - c) 0.3
 - d) zero
4. In a measurement system,
 - a) A single measurement components may have both random errors and systematic errors
 - b) A measurement system consists of several components with each component having separate errors
 - c) **Both the statement (1) & (2) are true**
 - d) Neither statement (1) nor statement (2) is true
5. If the degree of damping of an instrument should be adjusted to a value which is sufficient to enable the pointer to rise quickly to its deflected position without overshooting is called as
 - a) Overdamped
 - b) **Dead beat**
 - c) Underdamped
 - d) None of these
6. Due to overdamping, the instrument will become



- a) Slow
b) Lethargic
- c) Fast
d) Both (1) and (2)
7. If the resistance in a circuit is given by $80 \Omega \pm 0.2\%$ and the current flowing through it is $5A \pm 0.1\%$, then the uncertainty in the power will be
- a) $\pm 0.2 \%$
b) $\pm 0.4 \%$
c) $\pm 0.6 \%$
d) $\pm 0.8 \%$
8. The two wattmeters used for the measurement of power input read 50 kW each. What will be the readings of the two wattmeters if the power factor is changed to 0.8 leading keeping the total input power same?
- a) **28.35W, 71.65W**
b) 31.25W, 73.71W
c) 33.33W, 73.33W
d) 38.35W, 75.5W
9. Random errors in a measurement system are due to
- a) Environmental changes
b) Use of uncalibrated instrument
c) Poor cabling practices
d) Unpredictable effects
10. Calibration of instrument is an important consideration in measurement system. The errors due to instruments being out of calibration can be rectified by
- a) **Increasing the frequency of recalibration**
b) Increasing the temperature coefficient
c) Increasing the susceptibility of measuring instrument
d) Decreasing the frequency of recalibration
11. The undesirable characteristics of a measuring system is
- a) Drift
b) Dead zone
c) Non linearity
d) All of these
12. If the instrument is used in wrong manner while application, then it will results in
- a) Systematic error
b) Instrument error
c) Random error
d) Environmental error
13. Suitable method for the reduction of systematic errors is / are
- a) Instrument must be designed carefully
b) By introducing an equal and opposite environmental input for compensating the effect of environmental input in a measurement system
c) By adding high gain feedback to measurement system
d) All of these
14. The systematic errors of an instrument can be reduced by making
- a) **The sensitivity of instrument to environmental input as low as possible**
b) The sensitivity of instrument to environmental input as high as possible
c) Systematic errors does not depend on the sensitivity of instrument
d) None of these



15. The magnitude of environment – induced variation from the specified calibration condition is quantified by
- a) Sensitivity drift
 - b) Zero drift
 - c) Backlash
 - d) **Both (1) & (2)**
16. If the reading of the two wattmeters is equal and opposite while measuring power in a 3 phase induction motor then the power factor of the load will be
- a) Unity
 - b) **Zero**
 - c) 0.5 lagging
 - d) 0.5 leading
17. A wattmeter consist of
- a) Current coil
 - b) Pressure coil
 - c) **Both A and B**
 - d) None of these
18. Hysteresis of an instrument means
- a) **The change in the same reading when input is first increased and then decreased**
 - b) The reliability of the instrument
 - c) The repeatability of the instrument
 - d) The inaccuracy due to change in temperature
19. In which part of the scale does the pointer indicate more accurately
- a) In the first third of the cycle
 - b) In the first half of the cycle
 - c) **In about middle of the scale**
 - d) In the last third of the cycle
20. A DC wattmeter essentially consist of
- a) Two ammeters
 - b) Two voltmeters
 - c) **A voltmeter and an ammeter**
 - d) A current and potential transformer
21. Watt is equal to one
- a) **joule per second**
 - b) meter per second
 - c) ampere per second
 - d) farad per second
22. If the instrument is to have a wide range, the instrument should have
- a) Linear scale
 - b) Square-law scale
 - c) Exponential scale
 - d) **Logarithmic scale**
23. If the resistance of an electric bulb is 500Ω and voltage across its ends is 250 V then power consumed by it is
- a) 130 W
 - b) **125 W**
 - c) 120 W
 - d) 200 W
24. If a light bulb is switched on for 20 s and it consumes 2400 J of electrical energy then its power is
- a) **60 W**
 - b) 70 W
 - c) 80 W
 - d) 90 W



25. The amount of energy supplied by the current in unit time is called
- a) electric energy
 - b) friction
 - c) resistance
 - d) Electric power**
26. (Electrical energy/time) is equal to
- a) potential difference
 - b) flow of light
 - c) flow of heat
 - d) electric power**
27. During load test on 3 phase induction motor, the readings of the two wattmeters are -5.5 kW and +12.5 kW respectively. If the line voltage is 420 V then the line current will be
- a) 38.91 A
 - b) 41.02 A
 - c) 42.10 A
 - d) 43.94 A**
28. If the reading of the two wattmeters is equal and opposite while measuring power in a 3 phase induction motor then the power factor of the load will be
- a) Unity
 - b) Zero**
 - c) 0.5 lagging
 - d) 0.5 leading
29. In L - C connected wattmeter, compensated coil is used. The error in the wattmeter is due to power consumed by the
- a) Current coil
 - b) Potential coil**
 - c) Inductor
 - d) Capacitor
30. If the reading of one wattmeter is four times the other wattmeter while measuring the input power of 3 phase induction motor then the power factor of the load will be
- a) 0.56
 - b) 0.69**
 - c) 0.74
 - d) 0.81
31. What will be the power factor of an inductive load if the reading of the two wattmeters connected to measure input power of a 3 phase induction motor is 6: 3?
- a) 0.86**
 - b) 0.89
 - c) 0.91
 - d) 0.95
32. The readings of the two wattmeter used for the measurement of power input to a 3 phase induction motor are 850 W and 250 W respectively. The power factor of the motor is
- a) 0.73**
 - b) 0.76
 - c) 0.79
 - d) 0.85
33. The scale of induction wattmeter extends over
- a) 70 degree
 - b) 120 degree
 - c) 180 degree
 - d) 300 degree**
34. In induction type wattmeter both current and pressure coils are required. For obtaining the required phase difference
- a) Shaded pole principle is used
 - b) Two separate ac magnets are used**



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- c) Only one ac magnets are used
 - d) All of these
35. Which of the following devices may be used for extending the range of instruments ?
- a) Shunts
 - b) Multipliers
 - c) Potential transformers
 - d) All of the above**
36. For handling greater currents induction wattmeters are used in conjunction with
- a) potential transformers
 - b) power transformers**
 - c) either of the above
 - d) none of the above

4. Measurement of Electric Energy

Position in Question Paper

Total Marks-18

Q.1. a) 2-Marks

Q.1. d) 2-Marks.

Q.3 d) 4-Marks.

Q.4 a) 4-Marks.

Q.6. a) 6-Marks.

1. State the various errors in single phase electronic energy meter.
2. State any two advantages of electronic energy meter?
3. Describe with circuit diagram, the calibration of single phase electronic energy meter using direct loading?
4. Describe with block diagram working of single phase electronic energy meter.
5. Explain with block diagram the construction and working principle of three phases electronic energy meter?

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold**.

1. The adjustment of position of shading bands, in an energy meter is done to provide
 - a) **friction compensation**
 - b) creep compensation
 - c) braking torque
 - d) none of the above
2. Electronic instruments are preferred because they have
 - a) **No indicating part**
 - b) Low resistance in parallel circuit
 - c) Very fast response
 - d) High resistance in series circuit
3. The frequency and supply voltage of induction wattmeters are
 - a) **Constant, constant**
 - b) Constant, variable
 - c) Variable, constant
 - d) Variable, variable



4. To avoid wastage of power during calibration in dynamometer type wattmeter
 - a) **Phantom loading is used**
 - b) Brake magnet is used
 - c) Spring is used
 - d) Capacitance is used
5. Magnitude of flux in an energy meter varies _____
 - a) **due to abnormal currents and voltages**
 - b) due to high resistance and inductance values
 - c) due to changes in the transformer turns
 - d) due to the induced e.m.f in the windings
6. Phase angles in an energy meter cannot be incorrect.
 - a) True
 - b) **False**
7. Energy meter creeps _____
 - a) due to change in supply
 - b) due to reversal in polarity of voltage
 - c) **due to asymmetry in magnetic circuit**
 - d) due to turns ratio of transformer
8. Supply voltage in an energy meter is _____
 - a) constant always
 - b) zero always
 - c) depends on the load
 - d) **can fluctuate**
9. How is the flux of shunt coil related to voltage?
 - a) **flux is proportional to square of voltage**
 - b) directly proportional
 - c) inversely proportional
 - d) independent of each other
10. How can temperature effect be compensated in an energy meter?
 - a) through heat sinks
 - b) **by a temperature shunt**
 - c) by using resistance
 - d) by using a coolant
11. Disc rotates slowly in some energy meters.
 - a) **True**
 - b) False
12. Creeping is avoided by _____
 - a) reversing the polarity of the voltage
 - b) **drilling two diametrically opposite holes**
 - c) holding the disc
 - d) increasing the friction
13. In some energy meters, creeping can be avoided by _____
 - a) attaching small gold pieces
 - b) attaching small aluminium pieces
 - c) **attaching small iron pieces**
 - d) attaching small zinc pieces
14. An electronic energy meter makes use of _____



- a) IC
b) Transformer
- c) CRO
d) Multimeter
15. Measurement of energy involves _____
a) inductance and capacitance measurement
b) power consumption and time duration
c) resistance measurement and voltage drop
d) current consumption and voltage drop
16. Average power is _____
a) product of voltage and current
b) product of average current and voltage
c) product of instantaneous voltage and current
d) product of absolute voltage and current
17. What is the role of a multiplier?
a) it multiplies the voltage and current
b) divides the alternating voltage and current
c) supplies instantaneous voltage and current
d) multiplies alternating voltage and current
18. Frequency of oscillation in an electronic energy meter depends on _____
a) output current of multiplier
b) output voltage of multiplier
c) output power of multiplier
d) input resistance of multiplier
19. Analog signal is converted _____
a) into oscillations
b) into digital
c) into pulses
d) into current
20. An electronic energy meter is advantageous compared to conventional ones.
a) True
b) False
21. Energy meter can be directly used in measurement.
a) True
b) False
22. Creeping in an energy meter can be found using _____
a) creep adjustment
b) **preliminary light load adjustment**
c) full load u.p.f adjustment
d) light load adjustment
23. preliminary light load adjustment involves _____
a) applying rated voltage across current coil
b) making use of a light load
c) applying rated voltage across pressure coil
d) adjusting the light load
24. Creep adjustment involves _____
a) adjusting the creep
b) exciting the current coil

- c) adjusting the turns ratio d) exciting the pressure coil
25. light load adjustment involves _____
- a) **applying rated voltage across the pressure coil**
 - b) adjusting a light load
 - c) applying rated current across the transformer
 - d) applying rated voltage across the current coil
26. Low power factor adjustment involves _____
- a) adjusting the power factor at lower loads
 - b) **applying rated voltage to pressure coil and a p.f. of 0.5 for current coil**
 - c) only applying rated voltage to pressure coil
 - d) only a p.f. of 0.5 for the current coil
27. Full load u.p.f adjustment involves _____
- a) adjusting the loads at unity power factor
 - b) applying rated voltage to pressure coil and a p.f. of unity for current coil
 - c) **only applying rated voltage to pressure coil**
 - d) only a p.f. of unity for the current coil
28. Most common form of A.C. meters met with in every day domestic and industrial installations are
- a) mercury motor meters
 - b) commutator motor meters
 - c) **induction type single phase energy meters**
 - d) all of the above
29. The adjustment of position of shading bands, in an energy meter is done to provide
- a) **friction compensation**
 - b) creep compensation
 - c) braking torque
 - d) none of the above
30. In an energymeter braking torque is produced to
- a) safe guard it against creep
 - b) brake the instrument
 - c) bring energy meter to stand still
 - d) **maintain steady speed and equal to driving torque**
31. Various adjustments in an energy meter include
- a) light load or friction
 - b) lag and creep
 - c) overload and voltage compensation
 - d) **all of the above**
32. Two holes in the disc of energymeter are drilled at the opposite sides of the spindle to
- a) improve its ventilation



- b) **eliminate creeping at no load**
c) increase its deflecting torque
d) increase its braking torque
33. Which of the following instruments indicate the instantaneous value of the electrical quantity being measured at the time at which it is being measured ?
a) Absolute instruments
b) **Indicating instruments**
c) Recording instruments
d) Integrating instruments
34. _____ instruments are those which measure the total quantity of electricity delivered in a particular time.
a) Absolute
b) Indicating
c) Recording
d) **Integrating**
35. Most common form of A.C. meters met with in every day domestic and industrial installations are
a) mercury motor meters
b) commutator motor meters
c) **induction type single phase energy meters**
d) all of the above
36. Which of the following meters are not used on D.C. circuits
a) Mercury motor meters
b) Commutator motor meters
c) **Induction meters**
d) None of the above
37. Which of the following is an essential part of a motor meter ?
a) An operating torque system
b) A braking device
c) Revolution registering device
d) **All of the above**
38. A potentiometer may be used for
a) measurement of resistance
b) measurement of current
c) calibration of voltmeter
d) **all of the above**
39. The disc of an instrument using eddy current damping should be of
a) conducting and magnetic material
b) non-conducting and magnetic material
c) **conducting and non-magnetic material**
d) none of the above



40. Electric companies charge for
- a) energy
 - b) power
 - c) resistance
 - d) **units**
41. 1 minute, 1kW electric fire uses 10 times as much energy as a
- a) 1W LED light
 - b) 10W LED light
 - c) **100W bulb**
 - d) 0.1W RC Car
42. Some appliances cost more because they need more
- a) power
 - b) space
 - c) **energy**
 - d) electricity
43. A unit of electricity is called
- a) kilowatt
 - b) joules-hour
 - c) **kilowatt-hour**
 - d) watt-minute
44. Electricity meter records the amount of
- a) used power
 - b) **used electricity**
 - c) used resistance
 - d) unit
45. The eddy current torque on a metallic disc rotating between poles of permanent magnet in energy meter is directly proportional to the angular velocity of the disc.
- a) **True**
 - b) False
46. Eddy current error does not exist in
- a) DC moving iron instruments
 - b) AC moving iron instruments
 - c) **(a) and (b) both**
 - d) None of the above
47. The movement of the moving element of an electrical indicator is dependent of
- a) Restoring torque
 - b) Number of turns of the coil
 - c) Resistance of the indicator circuit
 - d) **(a), (b) and (c)**
48. Which of the following instruments will have poorest overloading capacity?
- a) Moving coil instruments
 - b) Induction type instruments
 - c) Permanent magnet instruments
 - d) **Hotwire instruments**
49. Which of the following dimensions are for electrical charge?
- a) LT-2
 - b) MLT-2
 - c) **$\epsilon^{1/2} L^{3/2} M^{1/2} T^{-1}$**
 - d) LT-1
50. The meter constant of single phase energy meter is expressed in terms of
- a) **Revolutions/kWh**
 - b) kW/kWh
 - c) Amps/kW
 - d) Volts/kWh
51. If voltage supply to the energy meter is more than the rated value, energy meter will run
- a) **Slow**
 - b) Fast



- c) Either of the above
d) None of the above
52. Aluminium is selected as the material for rotating disc of energy meter because
- a) It is good conductor
b) It is light
c) It is indigenously available
d) **All of the above reasons**
53. Most common form A.C. meters met with in every day domestic and industrial installations are
- a) Mercury motor meters
b) Commutator motor meters
c) **Induction type single phase energy meters**
d) All of the above
54. Meter ranges are so selected that the indications are obtained near the
- a) Top of the scale
b) Bottom of the scale
c) **Middle of the scale**
d) None of the above

5. Measuring Instruments

Position in Question Paper

Total Marks-40

Q.4 a) 4-Marks.

Q.4 c) 4-Marks

Q.4 d) 4-Marks

Q.4 e) 4-Marks

Q.5 b) 6-Marks.

Q.5 c) 6-Marks.

Q.6.b) 6-Marks.

Q.6.c) 6-Marks.

1. Describe with block diagram; working of signal generator and state atleast two applications of signal generator.
2. What is Trivector meter? Describe the constructional details of Trivector meter?
3. Describe how the following measurements can be made with the use of CRO: (i) Voltage measurement (ii) Time period measurement
4. Describe with block diagram, the working of function generator.
5. Draw a block diagram of CRO and state the function of each block.
6. State the applications and advantages of tri vector meter.
7. Explain with neat sketch: (i) Earth resistance measurement using earth tester (ii) High resistance measurement using megger
8. Give the classification of resistances stating their values.
9. State the working principle of phase sequence indicator.
10. Describe with a neat sketch the construction of ferromagnetic type frequency meter.
11. Explain the working of Synchroscope with neat sketch.
12. State/Describe the construction and working of western type frequency meter with labelled diagram

MCQ Question

(Total number of Question=Marks*3=40*3=120)



Note: Correct answer is marked with **bold**.

1. To measure a very high resistance, we should use
 - a) Kelvin's double bridge
 - b) Wheat stone bridge
 - c) **Megger**
 - d) none of the above
2. The electric power t a Meggar is provided by
 - a) battery
 - b) **permanent magnet D.C. generator**
 - c) A.C. generator
 - d) any of the above
3. In a Meggar cntrolling torque is providec by
 - a) spring
 - b) gravity
 - c) **coil**
 - d) eddy current
4. The operating voltage of a Meggar is aboutV.
 - a) 6 V
 - b) 12 V
 - c) 40 V
 - d) **4.100 V**
5. Murray loop test can be used for location of
 - a) ground fault on a cable
 - b) short circuit fault on a cable
 - c) **both the ground fault and short-circuit fault**
 - d) none of the above
6. A universal RLC bridge uses
 - a) Maxwell bridge configuration for measurement of inductance and De Santy's bridge for measurement of capacitance
 - b) **Maxwell Wein bridge configuration for measurement of inductance and De Santy's bridge for measurement of capacitance**
 - c) Maxwell Wein bridge configuration for measurement of inductance and Wein bridge for measurement of capacitance
 - d) None of the above
7. The measurements on high voltage capacitors, the suitable bridge is
 - a) Wein bridge
 - b) Modified De Santy's bridge
 - c) **Schering bridge**
 - d) 4.none of the above
8. Wagner earthing device is used to eliminate errors due to
 - a) **electrostatic coupling**
 - b) electromagnetic coupling
 - c) both 1 and 2
 - d) none of the above
9. Mutual inductance can be measured by using
 - a) Anderson bridge
 - b) **Maxwell's bridge**



- c) **Heaviside bridge** d) 4.any of the above
10. The full range of audibility in audio frequency oscillator is
- a) 0 to 20 Hz c) 20 Hz to 20 kHz
b) **20 Hz to 2 kHz** d) 20 Hz to 20 MHz
11. A liquid crystal display requires
- a) **An AC drive** c) Both AC and DC drive
b) A DC drive d) None of these
12. The detectors used in optical sensors are
- a) Photodiodes c) **Only (1) and (2)**
b) Phototransistors d) All the above
13. Optical sensors used for the displacement measurement works on the principal that
- a) Intensity of light increases with distance
b) **Intensity of light decreases with distance**
c) Intensity of light remains constant with distance
d) 4.Intensity of light increases with time
14. Capacitance sensor can measure very small displacement. It can be formed by varying
- a) Separation c) Permittivity
b) Area d) **Either (1) or (2) or (3)**
15. The ionization gauge an instrument used for the measurement of
- a) **Very low pressure** c) High pressure
b) Medium pressure d) Very high pressure
16. Dead weight gauge is used for the measurement of pressure of
- a) About 1000 bar c) About 5000 bar
b) About 2000 bar d) **About 7000 bar**
17. Bourdon tube is used for the measurement of gauge pressure of
- a) Gas c) **Only (1) and (2)**
b) Liquid fluid d) All the above
18. The resistances of potential transformer winding is minimized by using
- a) **Thick conductors and small length of turns**
b) Thin conductors and small length of turns
c) Thin conductors and large length of turns
d) Thick conductors and large length of turns
19. The nominal ratio for a current transformer is given by
- a) **rated primary winding current/rated secondary winding current**
b) number of turns in the primary winding/number of turns in the secondary winding



- c) number of turns in the secondary winding/number of turns in the primary winding
d) rated secondary winding current/rated primary winding current
20. Moving iron power factor meter are suitable for 3 phase balanced circuits. It consists of
- a) One control spring
b) Two control spring
c) Three control spring
d) **4.No control spring**
21. If the frequency of electrodynamic power factor meter is doubled then its reading will become.....
- a) Twice of the original reading
b) Half of the original reading
c) Four times of the original reading
d) **Remains unaffected**
22. A moving iron frequency meter consists of
- a) Two inductive circuits connected in parallel
b) **One inductive and one non inductive circuit connected in parallel**
c) Two non inductive circuits connected in parallel
d) One inductive and one non inductive circuit connected in series
23. The electrodynamic frequency meters have
- a) **Linear scale and their readings does not depends on voltage**
b) Linear scale and their readings depends on voltage
c) Non linear scale and their readings does not depends on voltage
d) Non linear scale and their readings depends on voltage
24. The earth resistance can be measured by
- a) Fall of potential method
b) Using an earth tester
c) **Only (1) and (2)**
d) All the above
25. Electrical equipments are generally earthed through an electrode to avoid shocks when someone touches the body of the equipment. The earth resistance is effected by
- a) Depth of electrodes buried in the soil
b) Shape and material of earth electrodes
c) Specific resistance of the soil surrounding the electrode
d) **All of these**
26. When a voltmeter – ammeter method is applied for the measurement of resistance, the voltmeter reads a value of 8.28 V and the ammeter reading is 4.14 mA. Then the value of the resistance will be
- a) 2 k Ω
b) 20 k Ω
c) **200 k Ω**
d) 2000 k Ω
27. In AC bridges, the Wagner earth devices are used to
- a) Remove all the earth capacitances from the bridge circuit
b) Remove harmonics



principal of

- a) Linear inductance
 - b) Non – linear inductance
 - c) **Mutual inductance**
 - d) Linear capacitance
36. The instruments used for the measurement of pressure is / are
- a) Bellows
 - b) Diaphragms
 - c) Fiber optic pressure sensors
 - d) **All of these**
37. A capacitive pressure sensor has a typical measurement uncertainty of
- a) One
 - b) Two
 - c) Three
 - d) **Four**
38. If an instrument transformer is used to extend the ranges of AC instrument, then its reading will depend on
- a) R
 - b) L
 - c) All of these
 - d) **None of these**
39. Vibration galvanometer are generally used
- a) For measuring electric charges
 - b) **As null – point detectors in ac bridges**
 - c) As null – point detectors in dc bridges
 - d) For measuring power
40. For the measurement of unknown inductance in terms of known capacitance, the suitable ac bridges are
- a) Maxwell and Schering bridge
 - b) Maxwell and Wien's bridge
 - c) **Maxwell and Hay's bridge**
 - d) Hay's and Wien's bridge
41. The Wien's bridges is suitable for the measurement of frequency of the range of
- a) Less than 100 Hz
 - b) **100 Hz to 100 kHz**
 - c) 1 kHz to 100 MHz
 - d) More than 100 MHz
43. For the measurement of low resistances, Kelvin's double bridge has high accuracy because:
- a) **It has two set of ratio arms which eliminates effect of resistance of connecting lead**
 - b) It has a null indicating galvanometer
 - c) It has two null indicator
 - d) It has four sets of ratio arms which eliminates the effect of resistance of connecting lead
44. Swamping resistance is a resistance made up of
- a) **Alloy of manganin and copper**



- b) Alloy of aluminium and copper
c) Alloy of nickel and cobalt
d) Alloy of manganin and aluminium
45. Schering bridges are used for the measurement of
- a) Unknown capacitance
b) Dielectric loss
c) Power factor
d) All of these
e) **None of these**
46. The AC Bridge which is used for the measurement of frequency is
- a) Schering bridge
b) **Wien bridge**
c) Hay's bridge
d) Anderson bridge
47. The bridge suitable for the measurement of capacitance is / are
- a) Anderson's bridge
b) Hay's bridge
c) Owen's bridge
d) **None of these**
48. Which of the following instrument can be used in A.C. bridges for less frequencies up to 200 Hz only
- a) Head phone
b) Tunable amplifier detector
c) **Vibration galvanometer**
d) All of the above
49. Which of the following bridge is used in strain gauge measurement
- a) Kelvin bridge
b) **Specially design bridge**
c) Kelvin double bridge
d) Carey-foster bridge
50. A Megger is basically a
- a) Moving iron type instrument
b) **Moving coil type instrument**
c) Hot wire instrument
d) Electrolytic instrument
51. Maxwell inductance capacitance bridge is used for measurement of inductance of
- a) Low Q coils only
b) **Medium Q coils only**
c) High Q coils only
d) Low and Medium Q coils only
52. The most commonly used null deflector in a power frequency ac bridge is a:
- a) **Vibration galvanometer**
b) D'Arsanval galvanometer
c) Ballistic galvanometer
d) All of the above
53. T Loss of charge method is used to measure
- a) Low Resistance
b) **High Resistance**
c) Low Inductance
d) High Inductance eachometer
54. Megger is an instrument used for the measurement of:
- a) **High resistance and insulation resistance**
b) Medium resistance
c) Low resistance
d) Leakage current
55. Anderson bridge is used to measure of:



- a) **Inductance** c) Time period
b) Capacitance d) Resistance and capacitance
56. Kelvin double bridge is best suited for the measurement of:
a) Inductance c) **Low resistance**
b) Capacitance d) High resistance
57. The material used to make standard resistance is:
a) **Manganin** c) Nichrome
b) Aluminum d) Platinum
58. Inductance is measured by which one of the following
a) Wien bridge c) **Maxwell bridge**
b) Schering bridge d) Owen bridge
59. If a wheat stone bridge is in balance condition then
a) A heavy current flows through the galvanometer
b) **No current flows through the galvanometer**
c) The current in each of the four arms R1, R2, R3 and R4 are same
d) A low current flows through the galvanometer
60. The value of resistance of an earthing electrode depends upon
a) Shape and material of electrode
b) Depth to which electrode is driven into earth
c) Specific resistance of soil
d) **All of the above**
61. From the point of view of safety, the resistance of earthing electrode should be
a) **Low**
b) High
c) Medium
d) The value of resistance of earth electrode does not affect the safety
62. ----- is a instrument which measures the insulation resistance of an electrical circuit relative to earth and one another
a) Tangent galvanometer c) Current transformer
b) **Megger** d) None of the above
63. The controlling torque in a megger is provided by
a) Springs
b) Weights attached to the moving system
c) **It does not need any controlling torque**
d) None of the above
64. The operating voltage of a megger is about
a) 6V c) 400V
b) 120V d) **500V**
65. The electrical power to a megger is provided by
a) Battery c) A.C generator
b) **Permanent magnet DC generator** d) Any of the above
66. For measuring a very high resistance we should use
a) Kelvins double bridge



- b) Wheatstone bridge
c) **Megger**
d) None of the above
67. A bridge circuit works at a frequency of 2 kHz. The following can be used as detectors for detection of null conditions in the bridge
a) Vibration galvanometer and head phones
b) **Head phones and tunable amplifiers**
c) Vibration galvanometer and tunable amplifiers
d) Vibration galvanometer, head phones and tunable amplifiers
68. Electronic instruments are preferred because they have
a) **No indicating part**
b) Low resistance in parallel circuit
c) Very fast response
d) High resistance in series circuit
69. An accurate voltmeter must have an internal impedance of
a) Very low value
b) Low value
c) Medium value
d) **Very high value**
70. A 100 V voltmeter has full-scale accuracy of 5%. At its reading of 50 V it will give an error of
a) 10%
b) 5%
c) **2.5%**
d) 1.25%
71. Transformers used in conjunction with measuring instruments for measuring purposes are called
a) Measuring transformers
b) Transformer meters
c) Power transformers
d) **Instrument transformers**
72. The rating of instrument transformer may be expressed in
a) kW
b) kVAR
c) **kVA**
d) Horse power
73. The errors introduced by an instrument fall in which category
a) Systematic errors
b) Random errors
c) **Gross errors**
d) Environmental errors
74. Which one of the following instruments is commonly used to measure primary current of a transformer connected to mains
a) Electrostatic meter
b) Current transformer
c) **Moving coil type meter**
d) Moving iron meter
75. How can a milli-ammeter be used as a voltmeter
a) **By connecting a low resistance in parallel with the instrument**
b) By connecting a high resistance in parallel with the instrument
c) By connecting a low resistance in series with the instrument
d) By connecting a high resistance in series with the instrument
76. A 10MHz CRO has



- a) MHz sweep
b) MHz vertical oscillator
77. An oscilloscope indicates
a) **Peak to peak value of voltage**
b) DC value of voltage
78. The resistance can be measured most accurately by
a) Voltmeter-ammeter method
b) **bridge method**
79. A universal RLC bridge uses
a) Maxwell bridge configuration for measurement of inductance and De Santas bridge for
b) measurement of capacitance
c) **Maxwell Wein bridge for measurement of inductance and modified De Santy's bridge for measurement of capacitance**
d) Maxwell Wein bridge for measurement of inductance and Wein bridge for measurement of capacitance
e) Any of the above.
80. For measurements on high voltage capacitors, the suitable bridge is
a) Wein bridge
b) Modified De Santy's bridge
c) **Schering bridge**
d) Any of the above
81. In a Weston synchronoscope, the fixed coils are connected across
a) bus-bars
b) **incoming alternator**
c) a lamp
d) none of the above
82. A Weston synchronoscope is a
a) moving coil instrument
b) moving iron instrument
c) **dynamometer instrument**
d) none of the above
83. In a Weston synchronoscope, the fixed coils are connected across
a) bus-bars
b) **incoming alternator**
c) a lamp
d) none of the above
84. The power factor of a single phase load can be calculated if the instruments available are
a) one voltmeter and one ammeter
b) **one voltmeter, one ammeter and one wattmeter**
c) one voltmeter, one ammeter and one energy meter
d) any of the above
85. Most sensitive galvanometer is
a) elastic galvanometer
b) vibration galvanometer
c) Duddlb galvanometer
d) **spot ballistic galvanometer**
86. Instrument transformers are
a) potential transformers
b) current transformers
c) **both (a) and (b)**
d) power transformers
87. To display heartbeats, waveforms and measuring voltages we use
a) cystoscope
b) gastroscope
c) microscope
d) **cathode-ray oscilloscope**



88. The number of electrons reaching the screen determines the screen's
- a) size
 - b) **brightness**
 - c) frequency
 - d) amplitude
89. In an electron gun, to accelerate the electrons, the anode is connected to 90. The more negative potential in the electron gun, the more electrons will be
- a) **repel**
 - b) attract
 - c) destroy
 - d) formed
91. To deflect electrons to desired positions on the screen of a television tube, we use
- a) circuit breaker
 - b) electric current
 - c) electromagnets
 - d) **fuse**
92. The cathode of a C.R.O. is usually coated with
- a) A. Alkali metals
 - b) B. Tungsten or thorium oxide
 - c) C. Copper oxide
 - d) **D. Barium or strontium oxide**
93. By making use of a CRO _____
- a) **many characteristics of a signal can be measured**
 - b) only a few characteristics of a signal can be measured
 - c) no characteristics of a signal can be measured
 - d) signal can only be displayed
94. How is the waveform adjusted?
- a) by adjusting the voltage
 - b) **through shift controls**
 - c) by reducing the current
 - d) by means of a galvanometer
95. How is error in measurement reduced?
- a) using r.m.s value
 - b) using absolute value
 - c) **using peak to peak value**
 - d) using a voltmeter
96. CRO is voltage measuring device.
- a) **True**
 - b) False
97. Period of a waveform is obtained by which of the following relation?
- a) $T = \text{number of divisions occupied by 1 cycle} \times (\text{time})$
 - b) $T = \text{number of divisions occupied by 1 cycle} \times (1/\text{division})$
 - c) **$T = \text{number of divisions occupied by 1 cycle} \times (\text{time}/\text{division})$**
 - d) $T = \text{number of divisions occupied by 1 cycle}$
98. How is frequency related to time period?
- a) square proportional
 - b) not related
 - c) **directly proportional**
 - d) inversely proportional
99. The input impedance of C.R.O. is
- a) A. Zero
 - b) B. Around 100 ohms
 - c) C. Around 1000 ohms
 - d) **D. Around one mega-ohms**
100. How many types of acquisition methods are there in a digital storage oscilloscope?
- a) **3**
 - b) 6
 - c) 2
 - d) 4
101. What is an earth electrode?



- a) electrode that is connected to earth
b) material used for earthing
c) electrode connected to the circuit
d) electrode which is connected to the mains
102. earth electrode provides _____
a) high resistance
b) medium resistance
c) **low resistance**
d) very high resistance
103. How is the condition of an earth electrode measured?
a) by measuring the voltage
b) by measuring the current
c) by measuring the power
d) by measuring resistance
104. Phase sequence indicator gives the maximum value of phase voltages.
a) True
b) False
105. Synchronization of A.C. supply means _____
a) different phase sequence
b) **same phase sequence**
c) zero phase
d) using a transformer
106. How many types of phase sequence indicators are there?
a) 1
b) 5
c) **2**
d) 10
107. A rotating phase sequence indicator consists of _____
a) 1 coil
b) 2 coils
c) 5 coils
d) 3 coils
108. Disc rotation is determined by _____
a) the supply voltage
b) **an arrow**
c) the turns ratio
d) the load current
109. Which of the following signals are generated by Wien-bridge oscillators?
a) Square wave
b) **Sine wave**
c) Triangular wave
d) Pulse wave
110. In a Wien-bridge oscillator for obtaining 160Hz frequency output what will be the capacitor value if resistance is selected as 1KΩ?
a) 10 μF
b) **1 μF**
c) 1 nF
d) 10 nF
111. In a Wien-bridge oscillator, frequency of oscillation and capacitor value have ____
a) Direct proportionality
b) **Inverse proportionality**
c) Equality
d) No relation
112. Which of the following device is a non-linear device?
a) Resistance
b) **Diode**
c) Op-amp
d) Capacitor
113. In RC phase shift oscillator, one R-C bridge provides _____ phase shift.
a) 30°
b) **60°**
c) 90°
d) 180°
114. Which of the following oscillators have higher stability at a higher frequency?



- a) Wien-bridge oscillator
b) RC phase shift oscillator
- c) **Crystal oscillator**
d) All of the mentioned
115. Which of the following can be considered as oscillation frequency controlling element in RC phase shift oscillator?
- a) Resistance
b) Capacitor
- c) **Both resistor and capacitor**
d) None of the mentioned
116. Connection of the various parts of a circuit to earth has a _____
- a) medium resistance
b) high resistance
- c) very high resistance
d) **very low resistance**
117. Specific resistance of soil is _____
- a) **changes from soil to soil**
b) is constant
c) depends on the circuit connected to it
d) depends on the supply voltage
118. Cathode ray oscilloscope uses _____
- a) **Wide band amplifier**
b) Narrow band amplifier
- c) Zero band amplifier
d) None of the mentioned
119. Wide band amplifiers are most commonly _____
- a) **Single ended**
b) Double ended
- c) Unpredictable
d) None of the mentioned
120. Megger is a _____
- a) source of e.m.f
b) **source to measure high resistance**
c) type of a null detector
d) current carrier