Preface

In the recent years PSUs like CIL, HAL, BSNL, AAI, BHEL, BEL, SAIL, GAIL, IOCL, HPCL, ONGC and other Government Sectors like DMRC, DRDO, ISRO, Staff Service Selection are preferring to hire *Engineers* for various positions *which has resulted* in a large job opportunities for Engineering graduates. Moreover there are more than 37 PSUs hire through the GATE score card. As these PSUs also offer job security and decent perks, many candidates are attracted towards it, gradually increasing the competition level. The campus recruitment tests for all private companies also include a test on technical questions and a large number of such questions are asked in the interview.

Unlike other competitive examinations, preparing for GATE and vacancy based exams of these PSUs is not an easy task as each exam has its own pattern, syllabus and trend. Most of these exams like to throw surprises based on the vacancies, leaving students amazed during their exam preparation with very less time for preparation. However, you can certainly guarantee yourself a smooth journey if you start early and plan it well. As the technical section of these exams hold the maximum scoring scope; it is very important to pay enough attention to this section.

This series focuses on the technical section of various exams conducted by PSUs such as CIL, HAL, BSNL, AAI, BHEL, BEL, SAIL, GAIL, IOCL, HPCL, ONGC and other Government Sectors like DMRC, DRDO, ISRO and Railways for the Engineers. These books help to prepare for all the exams at a single go which saves time instead of preparing separately for each PSU's exam. This work is a revision of one of the best selling series in this segment. In order to make students thorough with the variety of questions, the series provides them with questions segregated into two sections. The first section includes a set of conceptual questions under each topic and the second section provides previous year's questions of exams such as GATE, IES and various PSUs exams. Each question in the later section has been tagged with the exam name to make the preparation all the more easier. This combination of conceptual questions and previous year's questions would completely solve the purpose of the students for a quick practice with complete preparation for the exam. The books in this series can also be helpful to clear the technical section of various campus recruitment tests.

GKP has also launched an Android App to provide you an update on all upcoming vacancies in the technical segment and it also has a lot of added content to aid your preparation.

We hope this little effort of ours will be helpful in achieving your dreams. If you have any suggestions on improvement of this book, you can write to us at gkp@gkpublications.com.

All the best!

Contents

1 CHAPTER

Electrical and Electronic Measurements

EXERCISE – I

1. The dimension of force in SI system are
   (a) LMT^{-1} (b) LMT^{-2}
   (c) LMT (d) LMT^{2}
2. The dimension of power is
   (a) $ML^{2}T^{-2}$ (b) $ML^{2}T^{-3}$
   (c) $M^{2}LT^{-3}$ (d) $M^{2}LT^{-2}$
3. The dimension of torque in SI unit is
   (a) $ML^{2}T^{2}$ (b) $ML^{2}T^{-2}$
   (c) $ML^{-2}T^{-2}$ (d) $M^{2}L^{2}T^{-2}$
4. For defining standard metre, wave length of which material is considered
   (a) Helium (b) Neon
   (c) Xenon (d) Krypton
5. The number of basic SI units is
   (a) 4 (b) 5
   (c) 6 (d) 7
6. Supplementary units added to the basic SI units are
   (a) 2 (b) 3
   (c) 4 (d) 7
7. Farad is the unit of
   (a) inductance
   (b) voltage
   (c) current
   (d) capacitance
8. The unit newton/coulomb is the unit of
   (a) electric field intensity
   (b) electric flux density
   (c) electro-motive force
   (d) capacitance
9. The dimension of magnetic flux denisty is
   (a) IMT^{2} (b) $I^{-1}MT^{-2}$
   (c) IMT^{-1} (d) $I^{-1}MT^{-1}$
10. Electrolyte solution in a standard saturated weston cell is
    (a) cadmium sulphite
    (b) potassium sulphate
    (c) magnesium sulphate
    (d) zinc sulphate
11. The emf of a saturated Weston cell drops by increase in temperature at a rate of
    (a) 4μVm°C (b) 40μVm°C
    (c) 4mVm°C (d) 40mVm°C
12. The internal resistance of a saturated Weston standard cell is of the order of
    (a) a fraction of ohm
    (b) a few ohm
    (c) practically zero ohm
    (d) a few kilo-ohm
13. Purely mechanical instruments can be used for dynamic measurements because they have
    (a) high inertia
    (b) large time constant
    (c) high response time
    (d) all of these
14. The span of a zero = centered voltmeter having a scale from 10 V to 10 V is
    (a) 0V (b) – 10 V
    (c) 10V (d) 20 V
15. The resolution of an indicating instrument is
    (a) the smallest change in the output reading due to drifting of pointer
    (b) the smallest change in the applied stimulers that will indicate the detectable change in the deflection
    (c) the difference between various readings for the same applied stimulus
    (d) none of these
16. In which part of the scale does the pointer indicate most accurately
    (a) In the first third of the scale
    (b) In the first half of the scale
    (c) In about middle of the scale
    (d) In last third of the scale
17. The desirable static characteristics of a measuring system is/are
    (a) accuracy (b) sensitivity
    (c) reproducibility (d) all of these

18. The reliability of an instrument refers to
    (*a*) measurement of changes due to temperature variation
    (*b*) degree to which repeatability continues to remain within specified limits
    (*c*) the life of the instrument
    (*d*) the extent to which the characteristics remain linear

19. The efficiency of an instrument is defined as the ratio of the measured quantity at full scale of the power taken by the instrument at
    (*a*) one-fourth scale
    (*b*) half scale
    (*c*) three-fourth scale
    (*d*) full scale

20. To measure 2 volts, if one selects 0 – 100 volts range voltmeter which is accurate within ± 1%, the error in his/her measurement may be upto
    (*a*) ±0.02% (*b*) ±1%
    (*c*) ±2% (*d*) ±50%

21. A thermometer is calibrated from 150°C to 200°C. The accuracy specified is ±0.25%., the maximum static error in the measurement is
    (*a*) ±0.5°C (*b*) 0.375°C
    (*c*) ±0.125°C (*d*) ±0.0125°C

22. The degree of reproductively among several independent measurements of same true value under reference conditions is known as
    (*a*) accuracy (*b*) precision
    (*c*) linearity (*d*) calibration

23. The errors committed by a person in the measurement are
    (*a*) gross errors
    (*b*) random errors
    (*c*) instrumental errors
    (*d*) environmental errors

24. The current I through a resistance R is measured with uncertainties
    $I = 4A \pm 0.5\%, R = 100\Omega \pm 0.2\%$
    The uncertainty in measurement of power is
    (*a*) 1600W ± 0.1%
    (*b*) 1600W ± 0.02%
    (*c*) 1600W ± 0.05%
    (*d*) 1600W ± 1.2%

25. A temperature probe having a first order response with a time constant of 1 second is given a step input from 50° to 0°C. The temperature in °C after 0.6 second is
    (*a*) 18.4 (*b*) 25
    (*c*) 27.4 (*d*) 45

26. Which of the following is absolute instrument?
    (*a*) Power factor meter
    (*b*) Ammeter
    (*c*) Wattmeter
    (*d*) Tangent galvanometer

27. An instrument which gives total quantity of energy passed through in a given time is called
    (*a*) integrating instrument
    (*b*) indicating instrument
    (*c*) recording instrument
    (*d*) digital instrument

28. Which of the following types of instrument is an integrating instrument?
    (*a*) Powor factor meter
    (*b*) Energy meter
    (*c*) Wattmeter
    (*d*) Frequency meter

29. The torque produced in an indicating instrument by utilizing magnetic, electrodynamic, thermal, chemical and electrostatic effect is known as
    (*a*) controlling torque
    (*b*) deflecting torque
    (*c*) damping torque
    (*d*) restoring torque

30. The controlling torque in a spring controlled meter is proportional to
    (*a*) θ (*b*) θ^2
    (*c*) $1/\theta$ (*d*) $1/\theta^2$

31. At a steady deflected position of an indicating instrument, the moving system is subjected to
    (*a*) deflecting torque only
    (*b*) deflecting and controlling torque
    (*c*) deflecting, controlling and damping torque
    (*d*) damping and controlling torque

32. An instrument gives maximum deflection for any amount of quantity passed through it. Which of following pair is present?
    (*a*) Deflecting and controlling force
    (*b*) Deflecting and damping force
    (*c*) Damping and controlling force
    (*d*) Damping, controlling and deflecting force

33. Which of the following set of torques is provided in deflection galvanometer?
    (*a*) Deflecting and controlling
    (*b*) Controlling and damping
    (*c*) Deflecting and damping
    (*d*) Deflecting, controlling and damping

34. A hair spring attached to the moving system is used
(a) damping torque
(b) controlling torque
(c) balancing torque
(d) deflecting torque

35. The movement of the moving element of an electrical indicator is dependent on
(a) restoring torque
(b) number of turns on the coil
(c) resistance of the indicator circuit
(d) all of these

36. Three force responsible for reduction of oscillations of the pointer in an ammeter is
(a) controlling force (b) damping force
(c) deflecting force (d) none of these

37. If the damping torque is more than the critical damping, the instrument is called
(a) underdamped
(b) overdamped
(c) under critically damped
(d) over critically damped

38. Air friction damping is used in the instrument which is
(a) moving iron
(b) moving coil
(c) induction
(d) hot wire

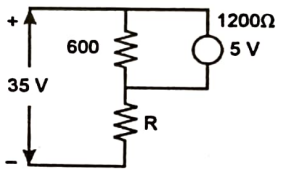
39. The controlling torque in gravity controlled meter is proportional to
(a) cos θ
(b) sin θ
(c) tan θ
(d) θ

40. The purpose of providing a mirror behind the pointer in a measuring instrument is
(a) the scale is illuminated through mirror
(b) with the help of mirror it can be seen weather the pointer is bend or not
(c) The mirror is semi-transparent 50 as the allow the observation of the interior of the instrument
(d) Reading errors due to inclined observations are eliminated by removing parallax between the pointer and its image in the mirror

41. The internal resistance of the milli-ammeter must be very low for
(a) high sensitivity
(b) high accuracy
(c) maximum voltage drop across the meter
(d) minimum effect on the current in the circuit

42. Consider the following statements.
The causes of error in the measurement of temperature using a thermistor are
1. selfheating
2. poor sensitivity
3. non-linear characteristics
Of these statements
(a) 1, 2 and 3 are correct
(b) 1 and 2 are correct
(c) 2 and 3 are correct
(d) 1 and 3 are correct

43. A 35V dc supply is connected across a combined resistance of 600 ohms and an unknown resistance of R ohms in series. A Voltmeter having a resistance of 1.2 μ Ω is connected across 600 ohms resistor and reads 5V. The resistance R will be



(a) 120 ohms (b) 500 ohms
(c) 1.7 K ohms (d) 2.4 K ohms

44. The important characteristics of a frequency counter are given below:
1. Time base accuracy
2. Least significant bit count
3. Gain of the input amplifier.
The more important characteristic(s) responsible for the overall accuracy of frequency measurement using the counter would include
(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 2 alone

45. Which of the following will improve the mutual coupling between primary and secondary circuits?
(a) Transformer oil of high break down voltage
(b) High reluctance magnetic core
(c) Winding material of high resistivity
(d) Low reluctance magnetic core

46. In a dual beam oscilloscope
(a) there are two separate vertical input and two separate horizontal inputs
(b) there are two separate vertical inputs and there is only one set of horizontal deflection plates
(c) there is only one vertical input but there are two separate horizontal deflection plates
(d) there is only one vertical and one horizontal input

47. A resistance of 105 ohms is specified using significant figures as indicated below:

1. 105 ohms
2. 105. ohms
3. 0.000105 Mega ohms

Among these,

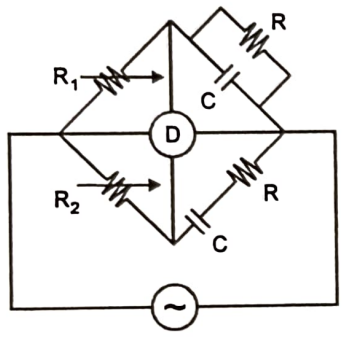
(*a*) 1 represents greater precision than 2 and 3

(*b*) 2 represents greater precision but 1 and 3 represent same precision

(*c*) 2 and 3 represent same precision

(*d*) none of these

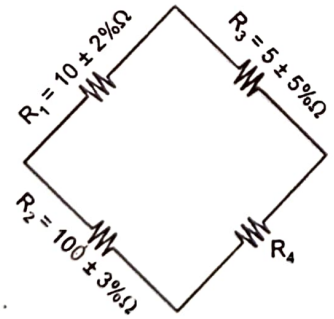
48. The given figure shows that the bridge connection for frequency measurement. C and R are variables and ganged together. For balanced condition, the expression for frequency is $f = \dfrac{1}{2\pi CR}$ when



(*a*) $R_1 = R_2$ (*b*) $R_1 = 2R_2$

(*c*) $R_1 = \dfrac{R_2}{2}$ (*d*) $R_1 = 3R_2$

49. The arms of a wheatstone bridge are shown in the given figure. For the balanced conditions, the least tolerance value of R_4 will be



(*a*) $50 \pm 2\%\,\Omega$

(*b*) $50 \pm 3\%\,\Omega$

(*c*) $50 \pm 5\%\,\Omega$

(*d*) $50 \pm 10\%\,\Omega$

50. A strain gauge bridge measures the strain in a cantilever where the gauge is fixed. With strain ϵ, the gauge resistance increases form 110 Ω to 110.52 Ω. If the gauge factor is 2.03, then the strain in the cantilever will be

(*a*) 2.32×10^{-3}

(*b*) $3\,15 \times 10^{-3}$

(*c*) 3.81×10^{-3}

(*d*) 433×10^{-3}

51. Match List-I with List-II and select the correct answer using the codes given below the Lists:

List-I	List-II
A Low value of R	1. Scherring bridge
B. High-Q inductor	2. Maxwell bridge
C. Low-Q inductor	3. Kelvin double bridge
D. High voltage capacitors	4. Hay bridge

Codes:

	A	B	C	D
(*a*)	1	2	4	3
(*b*)	1	4	2	3
(*c*)	3	2	4	1
(*d*)	3	4	2	1

52. The current through the current coil of a wattmeter is given by,

$i = (1 + 2 \sin \omega t)\,A$

and the voltage across the pressure coil is,

$v = (2 + 3 \sin 2\omega t)\,V.$

The wattmeter will read

(*a*) 8.00 W

(*b*) 5.05 W

(*c*) 2.0 W

(*d*) 1.0 W

53. A dc supply of 35 V is connected across 600 ohm resistance in series with an unknown resistance. A voltmeter having an impedance of 1.2 k Ω is connected across 600 ohm resistance which reads 5V. The unknown resistance is of

(*a*) 500 Ω

(*b*) 1.7 kΩ

(*c*) 2.2 kΩ

(*d*) 2.4 kΩ

54. A circuit draws a current I when a single phase ac voltage V is applied to it. If the power factor is cos ϕ, then the dimensions of VI cos ϕ would be

(*a*) ML^3T^{-2} (*b*) ML^2T^3

(*c*) ML^3T^3 (*d*) ML^2T^{-3}

EXPLANATIONS

EXERCISE – I

1. Force = mass × acceleration

$= MLT^{-2}$

2. $\text{Power} = \frac{\text{Work}}{\text{Time}} = \frac{ML^2T^{-2}}{T}$

$= ML^2T^{-3}$

3. Torque = force × distance

$= MLT^{-2} \times L$

$= ML^2T^{-2}$

9. We have charge, $Q = IT$

$$\text{emf, } E = \frac{\text{Work done}}{\text{Charge}}$$

$= ML^2T^{-3}I^{-1}$

Flux is given by, $E = N\frac{d\phi}{dt}$

$\therefore [\phi] = ML^2T^{-3}I^{-1}$

Now, flux density, $B = \frac{\text{Flux}}{\text{Area}} = [MT^{-2}I^{-1}]$

20. $\text{Error} = 100 \times \frac{1}{100}$

$= \pm 1V$

When measuring 2V,

$$\text{Relative error} = \pm \frac{1}{2} \times 100$$

$= \pm 50\%$

21. Maximum static error $= \pm \frac{0.25 \times 200}{100}$

$= \pm 0.5°C$

24. $P = I^2R$

$\therefore \frac{dP}{P} = 2\frac{dI}{I} + \frac{dR}{R}$

$= \left(2 \times \frac{0.5}{100} + \frac{0.2}{100}\right) \times 100$

$\frac{dP}{P} = \pm 1.2\%$

And $P = 4 \times 4 \times 100 = 1600W$

25. $\theta = \theta_o + (\theta_e - \theta_o) \exp(-t/T)$

$= 0 + (50 - 0)\, e^{-(0.6/1)}$

$= 27.4$

43. Equivalent resistance of 600 ohm and 1200 ohm

$$= \frac{600 \times 1200}{1800} = 400 \text{ ohm}$$

We have $\frac{R}{35-5} = \frac{400}{5}$

$\Rightarrow$ $R = 2400 \text{ ohms} = 2.4 \text{ k}\Omega$

48. Under balanced condition, we have

$$R_1\left(R + \frac{1}{j\omega c}\right) = R_2 \frac{\frac{1}{j\omega c}}{R + \frac{1}{j\omega c}}$$

$$\Rightarrow \frac{R_1(j\omega cR + 1)}{j\omega c} = \frac{R_2R}{j\omega cR + 1}$$

$\Rightarrow R_1(-c^2\omega^2R^2 + 1 + j\omega cR) = jR_2c\omega R$

$\therefore 2c\omega RR_1 = C\omega RR_2$

$\Rightarrow R_1 = \frac{R_2}{2}$

and $c^2\omega^2R^2 + 1 = 0$

$\Rightarrow \omega = \frac{1}{Rc}$

$\therefore \phi = \frac{1}{2\pi Rc}$

49. Under balanced condition

$R_1R_4 = R_2R_3$

$\therefore R_4 = \frac{R_2R_3}{R_1}$

$= \frac{5 \times 100}{10} = 50\Omega$

Relative limiting error in unknown resistance

$$\frac{dR_4}{R_4} = \pm\left(\frac{dR_2}{R_2} + \frac{dR_1}{R_1} + \frac{dR_3}{R_3}\right)$$

$= \pm(3 + 5 + 1) = \pm 10\%$

50. We have,

$$\text{Gauge factor, } G = \frac{\Delta R/R}{\text{Strain}}$$

$\therefore \text{Strain} = \frac{0.52}{110 \times 2.03} = 2.32 \times 10^{-3}$

52. Here, $i = 1 + 2\sin\omega t$,

$v = 2 + 3\sin 2\omega t$

$P = Vi$

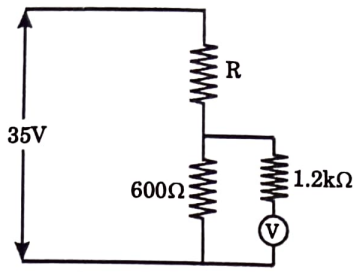
$\therefore = (1 + 2\sin\omega t)(2 + 3\sin 2\omega t)$

$= 2 + 4\sin\omega t + 3\sin 2\omega t + 6\sin\omega t \sin 2\omega t$

Wattmeter gives average values of power, hence

$P = 2W$

53.



Combined resistance of 1.2 μΩ and 600Ω

$$= \frac{1200 \times 600}{1800} = 400\,\Omega$$

Voltage across combined resistance = 5V

∴ Voltage across unknown resistance

$$= 35 - 5 = 30\,V$$

∴ Unknown resistance,

$$R = \frac{30}{5} \times 400 = 2.4\,k\Omega$$

54. We have,

$$\text{Power} = VI\cos\phi$$

Now, $$\text{Power} = \frac{\text{Work done}}{\text{Time}} = \frac{ML^2T^{-2}}{T}$$

$$= ML^2T^{-3}$$

Hence dimension of $VI\cos\phi = ML^2T^{-3}$

56. $$F = \frac{1}{4\pi\varepsilon 0}\frac{Q_1Q_2}{r^2}$$

$\because$ $q = it$

$\therefore$ $[Q] = [AT]$

$[F] = MLT^{-2}$

$[v] = L$

$\therefore$ $$[\epsilon] = \frac{A^2T^2}{MLT^{-2}L^2} = M^{-1}L^{-3}T^4A^2$$

58. To reconstruct original signal, minimum sampling frequency should be atleast twice the original signal frequency.

∴ Sampling frequency

$$= 2 \times 2 \times 10^6$$

$$= 4 \times 10^6 \text{ samples/s}$$

60. To avoid autioliasing and to limit band width of the analog signal to less than half sampling frequency in order to eliminate frequency folding.

∴ Cut-off frequency of the low pass filter should be less than $\frac{1000}{2} = 500$ Hz

62. $$\frac{f_y}{f_x} = \frac{3f}{f} = 3 = \frac{\text{Number of vertical tangency}}{\text{Number of horizontal tangency}}$$

65. Rms value of current $= \sqrt{\frac{1}{T}\int_0^T i^2(t)\,dt}$

$$= \left[\frac{1}{T}\int_o^{T/2}\left(\frac{20}{T}t\right)^2 dt + \int_{T/2}^{T}\left(\frac{20t}{T} - 20\right)^2 dt\right]^{1/2}$$

$$= \left[\frac{400}{3} + \frac{400}{2} - 300\right]^{1/2} = 5.77$$

66. At balance we have

$$\frac{z_1}{z_2} = \frac{z_3}{z_x}$$

$$\Rightarrow \quad z_x = \frac{z_2z_3}{z_1}$$

$$\Rightarrow \quad z_x = \frac{R_2R_3}{R_1}(R_1C_1j\omega + 1)$$

$$\Rightarrow \quad R_x + j\omega L_x = \frac{R_2R_3}{R_1} + j\omega R_2R_3C_1$$

$$\therefore \quad L_x = R_2R_3C_1$$

74. To measure 100V, the voltmeter choosen should be such that its rated voltage should be equal to the voltage to be measured and this should have highest possible resistance.

77. $$\text{Resolution} = \frac{9.999}{9999} = 1 \times 10^{-3}V = 1\,mV$$

80. We have, $r_{cc} = 0.01\Omega$

$r_{vc} = 1000\Omega$

We can connect current coil and voltage coil can be connected. The wattmeter reads high by an amount equal to power loss in current coil in one case and in voltage coil in the other. Hence power loss in two connections are

(*a*) $I_c^2 r_{cc} = 20^2 \times 0.01 = 4W$

(*b*) $\frac{V^2}{1000} = 0.9W$

Percentage errors are

(*i*) $\frac{4}{600} \times 100 = 0.66$

(*ii*) $\frac{0.9}{600} \times 100 = 0.15$

84. Gauge factor $= \frac{\Delta R/R}{\Delta L/L}$

But we have $\frac{\Delta L}{L} = \frac{100}{2 \times 10^{-5}}$

ANSWERS

EXERCISE – I

1. (b)	2. (d)	3. (a)	4. (d)	5. (a)	6. (d)	7. (a)	8. (b)	9. (d)	10. (a)
11. (b)	12. (a)	13. (b)	14. (b)	15. (a)	16. (a)	17. (a)	18. (b)	19. (b)	20. (c)
21. (b)	22. (b)	23. (a)	24. (c)	25. (a)	26. (a)	27. (b)	28. (d)	29. (a)	30. (c)
31. (b)	32. (c)	33. (b)	34. (b)	35. (d)	36. (c)	37. (a)	38. (d)	39. (a)	40. (a)
41. (d)	42. (b)	43. (d)	44. (d)	45. (b)	46. (a)	47. (b)	48. (c)	49. (c)	50. (c)
51. (b)	52. (b)	53. (c)	54. (d)	55. (d)	56. (c)	57. (a)	58. (b)	59. (d)	60. (b)
61. (c)	62. (d)	63. (a)	64. (b)	65. (b)	66. (a)	67. (d)	68. (b)	69. (d)	70. (b)
71. (d)	72. (b)	73. (a)	74. (c)	75. (b)	76. (c)	77. (c)	78. (c)	79. (d)	80. (d)
81. (d)	82. (d)	83. (c)	84. (b)	85. (d)	86. (d)	87. (c)	88. (b)	89. (c)	90. (a)
91. (a)	92. (b)	93. (d)	94. (c)	95. (c)	96. (a)	97. (d)	98. (d)	99. (b)	100. (c)
101. (b)	102. (d)	103. (d)	104. (d)	105. (c)	106. (b)	107. (c)	108. (c)	109. (a)	110. (a)
111. (b)	112. (b)	113. (b)	114. (b)	115. (d)	116. (c)	117. (c)	118. (c)	119. (b)	120. (a)
121. (d)	122. (a)	123. (c)	124. (a)	125. (a)	126. (a)	127. (b)	128. (b)	129. (b)	130. (a)
131. (b)	132. (d)	133. (c)	134. (a)	135. (c)	136. (a)	137. (a)	138. (d)	139. (d)	140. (a)
141. (a)	142. (d)	143. (c)	144. (d)	145. (d)	146. (d)	147. (d)	148. (c)	149. (b)	150. (c)
151. (c)	152. (a)	153. (b)	154. (c)	155. (a)	156. (b)	157. (b)	158. (d)	159. (d)	160. (a)
161. (d)	162. (d)	163. (c)	164. (c)	165. (d)	166. (a)	167. (a)	168. (c)	169. (b)	170. (a)
171. (c)	172. (c)	173. (a)	174. (b)	175. (c)	176. (a)	177. (c)	178. (c)	179. (a)	180. (c)
181. (c)	182. (a)	183. (c)	184. (c)	185. (d)	186. (b)	187. (a)	188. (a)	189. (d)	190. (d)
191. (d)	192. (c)	193. (b)	194. (c)	195. (b)	196. (c)	197. (a)	198. (c)	199. (d)	200. (a)
201. (d)	202. (a)	203. (b)	204. (c)	205. (c)	206. (c)	207. (b)	208. (b)	209. (d)	210. (d)
211. (c)	212. (b)	213. (a)	214. (a)	215. (c)	216. (a)	217. (c)	218. (d)	219. (b)	220. (b)
221. (d)	222. (c)	223. (d)	224. (a)	225. (c)	226. (a)	227. (d)	228. (d)	229. (a)	230. (b)
231. (d)	232. (a)	233. (b)	234. (c)	235. (b)					

EXERCISE – II

1. (c)	2. (d)	3. (b)	4. (b)	5. (c)	6. (b)	7. (b)	8. (b)	9. (c)	10. (a)
11. (d)	12. (c)	13. (c)	14. (a)	15. (a)	16. (c)	17. (c)	18. (d)	19. (b)	20. (c)
21. (c)	22. (b)	23. (d)	24. (b)	25. (d)	26. (d)	27. (c)	28. (a)	29. (c)	30. (b)
31. (a)	32. (c)	33. (a)	34. (d)	35. (a)	36. (c)	37. (c)	38. (c)	39. (b)	40. (c)
41. (a)	42. (b)	43. (d)	44. (a)	45. (c)	46. (b)	47. (a)	48. (d)	49. (a)	50. (d)
51. (c)	52. (d)	53. (d)	54. (b)	55. (c)	56. (b)	57. (a)	58. (b)	59. (b)	60. (a)
61. (c)	62. (a)	63. (a)	64. (a)	65. (c)	66. (b)	67. (a)	68. (c)	69. (b)	70. (a)
71. (a)	72. (a)	73. (b)	74. (d)	75. (c)	76. (c)	77. (a)	78. (b)	79. (c)	80. (a)
81. (a)	82. (b)	83. (a)	84. (c)	85. (b)	86. (d)	87. (c)	88. (a)	89. (d)	90. (a)
91. (d)	92. (a)	93. (c)	94. (a)	95. (b)	96. (b)	97. (a)	98. (b)	99. (b)	100. (b)
101. (b)	102. (a)	103. (b)	104. (b)	105. (b)	106. (d)	107. (c)	108. (c)	109. (a)	110. (a)
111. (a)	112. (a)	113. (b)	114. (a)	115. (a)	116. (d)	117. (b)	118. (c)	119. (c)	120. (d)
121. (d)	122. (c)	123. (d)	124. (a)	125. (c)	126. (a)	127. (c)	128. (b)	129. (b)	130. (c)
131. (d)	132. (a)	133. (b)	134. (c)	135. (a)	136. (b)	137. (c)	138. (b)	139. (c)	140. (b)
141. (d)	142. (b)	143. (d)	144. (d)	145. (d)	146. (a)	147. (d)	148. (d)	149. (c)	150. (a)
151. (b)	152. (b)	153. (d)	154. (a)	155. (d)	156. (d)	157. (a)	158. (a)	159. (b)	160. (b)
161. (d)	162. (b)	163. (b)	164. (a)	165. (c)	166. (c)	167. (a)	168. (c)	169. (a)	170. (b)
171. (a)	172. (d)	173. (c)	174. (c)	175. (a)	176. (a)	177. (d)	178. (d)	179. (d)	180. (d)
181. (a)	182. (c)	183. (c)	184. (b)	185. (d)	186. (d)	187. (c)	188. (b)	189. (a)	190. (a)
191. (a)	192. (d)	193. (d)	194. (d)	195. (a)	196. (b)	197. (c)	198. (c)	199. (a)	200. (a)
201. (b)	202. (c)	203. (d)	204. (a)	205. (d)	206. (a)	207. (a)	208. (a)	209. (c)	210. (c)
211. (a)	212. (b)	213. (c)	214. (a)	215. (c)	216. (c)	217. (a)	218. (a)	219. (b)	220. (c)
221. (c)	222. (d)	223. (b)	224. (a)	225. (a)					

EXERCISE – II

1. The deflection depends on the average value in
   (*a*) Moving-iron meter
   (*b*) Rectifier meter
   (*c*) Hot-wire meter
   (*d*) Moving-coil meter [NTPC]

2. Some wire-wound resistors have bifilar winding. This type of winding is used to
   (*a*) increase the thermal stability
   (*b*) reduce the tolerance
   (*c*) reduce the inductance of winding
   (*d*) double the power rating of the resistors [NTPC]

3. The practical unit of energy is kWh. The unit of energy in the SI is the joule. The number of joules in kWh is
   (*a*) 3.6
   (*b*) 3.6×10^{6}
   (*c*) 3.6×10^{-6}
   (*d*) none of these [BHEL]

4. The secondary winding of a current transformer is open when current is flowing in the primary. Then,
   (*a*) there will be high current in primary
   (*b*) there will be very high secondary voltage
   (*c*) the transformer will burn out immediately
   (*d*) the meter will burn out [NTPC]

5. Ionic wind voltmeter is used for measuring
   (*a*) low voltage
   (*b*) interwinding capacitance
   (*c*) leakage inductance
   (*d*) high voltage [BHEL]

6. Consider the following statements regarding an electromagnetic flowmeter;
   1. A.C. excitation is used to avoid polarisation of the fluid.
   2. The meter calibration is changed as the viscosity of the fluid changes.
   3. Stainless steel pipes can be used for measuring the flow of fluids of high conductivtiy.

   Of these statements,
   (*a*) 1, 2 and 3 are correct
   (*b*) 1 and 2 are correct
   (*c*) 2 and 3 are correct
   (*d*) 1 and 3 are correct [NTPC]

7. A Hall-effect transducer with Hall coefficient $K_H = -1 \times 10^{-8}$ is required to measure a magnetic field of 10,000 gauss. A 2 mm bismuth slab is used as the transducer with a current of 3 A. The output voltage of the transducer will be
   (*a*) -15×10^{-6} V (*b*) -7.5×10^{-6} V
   (*c*) -20×10^{-6} V (*d*) -22.5×10^{-6} V [BHEL]

8. Schering bridge is used to
   (*a*) determine dielectric loss
   (*b*) determine the inductance
   (*c*) measure low resistance
   (*d*) measure mutual inductance [NTPC]

9. Which of the following instruments can be used for measurement of alternating current only?
   (*a*) Permanent magnet type ammeter
   (*b*) Induction type ammeter
   (*c*) Moving-iron voltmeter
   (*d*) Moving-iron ammeter [NTPC]

10. Electrodynamometer can be used also to measure
    (*a*) Time, frequency, flux
    (*b*) Flux, power, voltage
    (*c*) Power, power factor, reactive power
    (*d*) Power, power factor, reactive power, frequency [BHEL]

11. A single pulse has a
    (*a*) single frequency component
    (*b*) continuous frequency spectrum
    (*c*) spectrum of even harmonics
    (*d*) spectrum of odd harmonics [BHEL]

12. V_{RN}, V_{YN} and V_{BN} are the instantaneous line to neutral voltages and i_R, i_Y and i_B are instantaneous line currents in a balanced three-phase circuit the computation
    $$V_{RN}(i_Y - i_B) - (V_{YN} - V_{BN})\, i_R$$
    will yield a quantity proportional to
    (*a*) active power
    (*b*) power factor
    (*c*) reactive power
    (*d*) complex power [GATE]

13. A milliammeter can be used as
    (*a*) voltmeter and ammeter
    (*b*) wattmeter
    (*c*) ohmmeter
    (*d*) frequency meter [NTPC]

30. Among the measuring instruments for current and voltage the instrument that can be used as a secondary standard is

(*a*) Thermocouple (*b*) Electrodynamometer

(*c*) Moving iron (*d*) Electrostatic **[NTPC]**

31. The full-scale deflection current of an ammeter is 1 mA and its internal resistance is 100 ohms. If this meter is to have full deflection at 5 A, what is the value of the shunt resistance to be used?

(*a*) 49.99 ohms (*b*) 1/49.99 ohm

(*c*) 1 ohm (*d*) 2 ohms **[BHEL]**

32. In a moving-iron meter, the deflecting torque is proportional to

(*a*) square of the current through the coil

(*b*) current through the coil

(*c*) sine the measurand

(*d*) square-root of the measurand **[BHEL]**

33. An oscilloscope indicates

(*a*) peak to peak value of voltage

(*b*) d.c. value of voltage

(*c*) r.m.s value

(*d*) average value **[BHEL]**

34. The resistance of a 125 ohm strain gauge changes by one ohm for 4000 micro strain. The gauge factor of the strain gauge is

(*a*) 1.5 (*b*) 2.0

(*c*) 2.5 (*d*) 3 **[BEL]**

35. In a dynamometer, wattmeter used for polyphase measurement, the two power readings are equal and opposite,

(*a*) The load is reactive

(*b*) The load is resistive

(*c*) The load is inductive

(*d*) The load is capacitive **[BEL]**

36. When using ohmmeter, applied voltage is to be disconnected from the circuit because

(*a*) voltage source will increase resistance

(*b*) current will decrease resistance

(*c*) the ohmmeter has its own internal battery

(*d*) none of these **[BEL]**

37. When ac voltage is connected to a* PMMC meter, then

(*a*) meter will get damaged

(*b*) reading is zero

(*c*) pointer will oscillate to and fro

(*d*) pointer will not move at all **[NTPC]**

38. The advantage of Hay's bridge over Maxwell's inductance-capacitance bridge is because

(*a*) its equations for balance do not contain any frequency term

(*b*) it can be used for measurement of inductance of high Q coils

(*c*) it can be used for measurement of inductance of low Q coils

(*d*) none of these **[NTPC]**

39. Sensitivity inaccuracy of a recording instrument means

(*a*) the amount of input required to produce unit pen deflection

(*b*) the smallest signal required to produce detectable output

(*c*) the maximum error in sensitivity displayed by a pen

(*d*) degree to which the instrument is not sensitive enough to repeat readings **[PGCIL]**

40. 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 these **[PGCIL]**

41. A Merz Price Maximum Demand Inducto Indicates

(*a*) maximum demand

(*b*) average maximum demand over a specified period of time

(*c*) maximum energy consumption

(*d*) all of these **[PGCIL]**

42. The power in a 3 phase four wire circuit can be measured by using

(*a*) 2 wattmeters (*b*) 4 wattmeters

(*c*) 3 wattmeters (*d*) 1 wattmeter **[IOCL]**

43. Thermocouple instruments can be used for a frequency range

(*a*) upto 100 Hz

(*b*) upto 5000 Hz

(*c*) upto 1 MHz

(*d*) 50 MHz and above **[IOCL]**

44. A metal strain gauge factor of two, its nominal resistance is 120 ohms. If it undergoes a strain of 10^{-5}, the value of change of resistance in response to the strain is

(*a*) 240 ohms

(*b*) 2×10^{-5}

(*c*) 2.4×10^{-3} ohms

(*d*) 1.2×10^{-3} ohms **[GATE]**