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]

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166. If a system has an open loop transfer function $\frac{1-s}{1+s}$, then the gain of the system at frequency of 1 rad/s will be

(*a*) 1 (*b*) $\frac{1}{2}$

(*c*) zero (*d*) -1

167. Non-linear system cannot be analysed by Laplace transform because

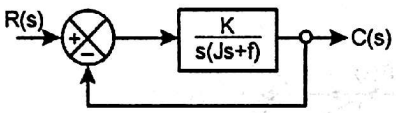
(*a*) it has no zero initial conditions

(*b*) superposition law cannot be applied

(*c*) non-linearity is generally not well defined

(*d*) all of these

168. For the system shown in the given figure, the damping factor 'ξ'and undamped natural frequency 'ω_n' are respectively



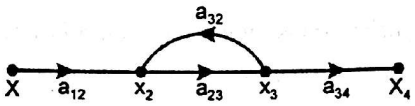
(*a*) $\frac{2\sqrt{KJ}}{f}$ and $\sqrt{\frac{J}{K}}$

(*b*) $\sqrt{\frac{K}{J}}$ and $\frac{f}{2\sqrt{KJ}}$

(*c*) $\frac{f}{2\sqrt{KJ}}$ and $\sqrt{\frac{K}{J}}$

(*d*) $\frac{2f}{\sqrt{KJ}}$ and $\sqrt{\frac{K}{J}}$

169. For the signal-flow graph shown in the given figure the value of x_2 is



(*a*) $a_{12}x_1$

(*b*) $a_{12}x_1 + a_{32}x_3$

(*c*) $a_{12}x_1 - a_{23}x_3 + a_{32}x_3$

(*d*) $-a_{23}x_3 - a_{34}x_4$

170. Error constant of system are a measure of

(*a*) steady-state response

(*b*) transient-state response

(*c*) relative stability

(*d*) steady-state as well as transient response

171. A control system with excessive noise is likely to sulfer from

(*a*) vibrations

(*b*) oscillations

(*c*) saturation in amplifying stages

(*d*) loss in gain

172. Which of the following is used for Nyquist plot?

(*a*) Pole zero plot

(*b*) Closed loop function

(*c*) Open loop function

(*d*) Characteristic equation

173. Consider the following statements regarding stability analysis of Routh-Hurwitz criterion:

1. For a system to be stable, all the coefficients of the characteristic equation must be present and be of the same sign.
2. If a system is to be stable, there should not be any sign change in the first column of the Routh's array.
3. The order of the auxiliary equation obtained from the elements of the Rouths' table is always odd.

Of these statements:

(*a*) 1 and 2 are correct

(*b*) 2 and 3 are correct

(*c*) 1 and 3 are correct

(*d*) 1, 2 and 3 are correct

174. A system has the following transfer function

$$G(s) = \frac{100(s+5)(s+50)}{s^4 + (s+10)(s^2+3s+10)}.$$

The type and order of the system are respectively

(*a*) 4 and 9 (*b*) 4 and 7

(*c*) 5 and 7 (*d*) 7 and 5

175. Which one of the following system is completely state controllable?

(*a*) $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix} u$

(*b*) $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u$

(*c*) $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$

(*d*) $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 2 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 2 \end{bmatrix} u$

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EXERCISE – II

1. If a capacitor is charged by a square wave current source, the voltage across the capacitor is
   (*a*) a square wave
   (*b*) triangular wave
   (*c*) step function
   (*d*) zero [BEL]

2. A system defined by $\frac{dy}{dt} + y = x$ is initially at rest for input $x = u \sin 2t$. The forced response is K sin $(2t - \theta)$. The value of θ is given by
   (*a*) $\tan\theta = 1$ (*b*) $\tan\theta = 2$
   (*c*) $\tan\theta = 1/2$ (*d*) $\theta = 0$ [BHEL]

3. The standing wave ratio of a 75-Ω transmission line used to feed a 300-Ω resistance load will be
   (*a*) 1 (*b*) 2
   (*c*) 3 (*d*) 4 [BHEL]

4. In case of delta connected circuit, when one resistor is open, the power will be
   (*a*) zero (*b*) reduced by 2/3
   (*c*) reduced by 1/3 (*d*) none of these [BHEL]

5. System function $H(s) = \frac{1}{s+2}$ for a signal cos 2*t*. The steady state response is
   (*a*) $\frac{1}{2}\cos 2t$
   (*b*) $\frac{1}{2\sqrt{2}} \cos(2t - 45°)$
   (*c*) $\frac{1}{2\sqrt{2}} \cos(2t + 45°)$
   (*d*) $\frac{1}{2\sqrt{2}} \cos 2t$ [BHEL]

6. Kirchoff's voltage law states that
   (*a*) the total voltage drop in a series circuit is always finite
   (*b*) the sum of emf and voltage drops in a closed mesh is zero
   (*c*) the sum of emf in a series circuit is zero
   (*d*) none of these [BHEL]

7. When a source is delivering maximum power to a load, the efficiency of the circuit
   (*a*) is always 50%
   (*b*) depends on the circuit parameters
   (*c*) is always 75%
   (*d*) none of these [BHEL]

8. The expression for current $i(t)$ and voltage $v(t)$ for an inductor is given as $v(t) = L\frac{di}{dt}$, where t represents the time. The above inductor is
   (*a*) linear-time invariant
   (*b*) linear-time varying
   (*c*) none-linear-time invariant
   (*d*) non-linear-time varying [NTPC]

9. In series LCR circuit, at resonance
   (*a*) current is maximum, power factor is zero
   (*b*) current is maximum, power factor is unity
   (*c*) current is maximum, power factor is unity
   (*d*) none of these [NTPC]

10. A network is said to be non-linear if it does not satisfy
    (*a*) super position condition
    (*b*) homogeneity condition
    (*c*) both (*a*) and (*b*)
    (*d*) associative condition [NTPC]

11. Which of the following is an active element of a circuit?
    (*a*) Resistance
    (*b*) Inductance
    (*c*) Ideal current source
    (*d*) Capacitance [NTPC]

12. Which of the following theorems enables a number of voltage (or current) source to be combined directly into a single voltage (or current) source?
    (*a*) Compensation theorem
    (*b*) Reciprocity theorem
    (*c*) Superposition theorem
    (*d*) Millman's theorem [NTPC]

13. The current in an RLC series circuit at resonance is
    (*a*) maximum
    (*b*) minimum
    (*c*) infinity
    (*d*) zero [BHEL]

14. Two coupled coils of L_1 = 0.8H and L_2 = 0.2H have a coupling coefficient of K = 0.9. The mutual inductance M is
    (*a*) 0.144 H (*b*) 0.23 H
    (*c*) 0.36 H (*d*) 0.43 H [BHEL]

15. For a 2-port netowrk, the output short circuit current was measured with a 1 V source at the input. The value of the current gives
    (*a*) h_{12} (*b*) y_{12}
    (*c*) h_{21} (*d*) y_{21} [BHEL]

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22. Which glass is resistant to heat and chemicals?
(a) Soda lime glass
(b) Silica glass
(c) Boro silicate glass
(d) Ceramic glass [Coal India Ltd.]

23. Which of the following alloy has equal percentage of constituents?
(a) Constantan (b) Duralumin
(c) Gunmetal (d) White metal [ESCORTS]

24. Which of the following is not a polymer?
(a) Polyvinyl acetate
(b) Dichlorodifluoromethane
(c) Polychroprene
(d) PVC [BHEL]

25. Above the Curie temperature, the hysteresis loop of a ferroelectric material can be described by a
(a) parabola
(b) cycloid
(c) straight line
(d) point [ES]

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

List-I
A. Electrostriction
B. Piezoelectric effect
C. Ferroelectricity
D. Dielectric

List-II
1. Polarisation is a linear function of the applied field
2. Polarisation in a non- linear function of the applied field
3. Mechanical distortion produces polarisation
4. Mechanical distortion does not produce polarisation

Codes:

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

[ES]

27. Two group IV elements have the same diamond cubic structure. The one withe larger..... expected to have the smaller energy gap.
(a) packing factor
(b) coordination number
(c) number of valance electrons
(d) atomic weight [ES]

28. Orientational polarization is
(a) inversely proportion to temperature and proportional to the square of the permanent dipole moment
(b) proportional to temperature as well as to square of the permanent dipole moment
(c) proportional to temperature and inversely proportional to the square of the permanent dipole moment
(d) inversely proportional to temperature as well as to the square of dipole moment

29. The mobility of electrons in a material is expressed in units of
(a) V/s (b) $m^2/V^{-1}s^{-1}$
(c) m^2/s (d) J/K [ES]

30. The processes that can be used to make the steel magnetically softer are
1. Annealing
2. Grain growth
3. Decarburization
4. Quenching
(a) 1, 2 and 3 (b) 2, 3 and 4
(c) 2 and 3 only (d) 3 and 4 only [ES]

31. The electrical conductivity of metal is typically of the order of (in $ohm^{-1} m^{-1}$)
(a) 10^7 (b) 10^5
(c) 10^{-4} (d) 10^{-6} [ES]

32. For a particular material the Hall coefficient was found to be zero. The material is
(a) intrinsic semi-conductor
(b) extrinsic semi-conductor
(c) metal
(d) insulator

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

List-I (*Type of magnetic material*)	List-II (*Orientation of individual dipole moments*)
A. Ferromagnetic	1. ↓ ↑ ↓ ↑
B. Anti-ferromagnetic	2. ↑ ↓ ↑ ↓
C. Ferrimagnetic	3. ↑ ↘ ↖ ↙
	4. ↑ ↑ ↑ ↑

Codes:

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

[ES]

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96. A dc source of 100V supplies a purely inductive load 0.1H The controller is a thyristor in series with the source and load. The latching current specified is 100 mA. The minimum width of the gating pulse to ensure thyristor on is
(a) 100μs (b) 100s
(c) 1 ms (d) 50μs [NTPC]

97. In SCR, the turn-ON time
(a) is independent of anode current I_A
(b) increases with increase of I_A
(c) varires as $1/I_A$
(d) varires as $1/\sqrt{I_A}$ [PGCIL]

98. A thyristor is triggered by a pulse train of 5 kHz. The duty ratio is 0.4. If the allowable average power is 100W the maximum allowable gate drive power is
(a) $100\sqrt{2}$W (b) 50 W
(c) 150 W (d) 250 W [BEL]

99. In a pnpn diode, breakover condition is marked by
(a) a sudden decrease in current
(b) a sudden increase in current
(c) diode getting burnt off
(d) a sudden glow taking place [BEL]

100. A pnpn diode
(a) is always made of silicon
(b) is always made of germanium
(c) may be made of either silicon or germanium
(d) may be made of any semiconductor

101. A half-wave SCR controlled circuit with $R_L = 50\Omega$ conducts for 90° for an applied voltage of 300V sinusoidal rms. If the SCR voltage drop is negligible, the power dissipated by the load is
(a) 1800 W (b) 91 W
(c) 52.36 W (d) 0 W [NTPC]

102. After firing an SCR, if the gate pulse is removed, the SCR current
(a) remains the same
(b) reduces to zero
(c) rises up
(d) rises a little and then falls to zero [BHEL]

103. An SCS is a
(a) pnpn diode with three terminals
(b) pnpn diode with one gate
(c) pnpn diode with two gates
(d) pnpn diode made of germanium [BHEL]

104. A gate-turn-off (GTO) thyristor
(a) requires a special turn-off circuit like a thyristor
(b) can be turned off by removing the gate pulse
(c) can be turned off by a negative current pulse at the gate
(d) can be turned off by a positive current pulse at the gate [IAS]

105. In a thyristor dc chopper, which type of commutation results in best performance?
(a) voltage commutation
(b) current commutation
(c) load commutation
(d) supply commutation [GATE]

106. In a 3-phase half-wave diode rectifier, the ratio of average output voltage to per-phase maximum ac voltage is
(a) 0.955
(b) 0.827
(c) 1.654
(d) 1.169 [IAS]

107. Severe over-voltages are produced during arcing faults in a power system with the neutral
(a) isolated
(b) solidly earthed
(c) earthed through a low resistance
(d) earthed through an inductive coil [IAS]

108. In dc choppers, per unit ripple is maximum when then duty cycle is
(a) 0.2 (b) 0.5
(c) 0.7 (d) 0.9 [ES]

109. The $\frac{dv}{dt}$ protection of an SCR is achieved by using
(a) RL circuit in series with SCR
(b) RC circuit across SCR
(c) L in series with SCR
(d) RC circuit in series with SCR [IAS]

110. Natural commutation of a thyristor takes place when
(a) anode current becomes zero
(b) gate current becomes zero
(c) voltage across the device becomes zero
(d) voltage across the device becomes negative [BHEL]

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22. The direction of the magnetic lines of forces is
(a) from + to – charges
(b) from south to north poles
(c) from one end of the magnet to the other
(d) from north to south poles [PGCIL]

23. Which one of the following gives the approximate value of capacitance between two spheres, whose separation is very much larger than their radii R?

(a) $\frac{2\pi}{\epsilon_o R}$ (b) $2\pi\epsilon_o R$

(c) $\frac{2\pi\epsilon_o}{R}$ (d) $\frac{4\pi\epsilon_o}{R}$ [IOCL]

24. Which one of the following statements is correct? For a loss less dielectric medium, the phase constant for a travelling wave, β is proportional to

(a) ϵ_r (b) $\sqrt{\epsilon_r}$

(c) $\frac{1}{\epsilon_r}$ (d) $\frac{1}{\sqrt{\epsilon_r}}$ [IOCL]

25. With the increase in temperature, the insulating property of insulator
(a) weakens (b) gains
(c) remains same (d) none of these
[IOCL]

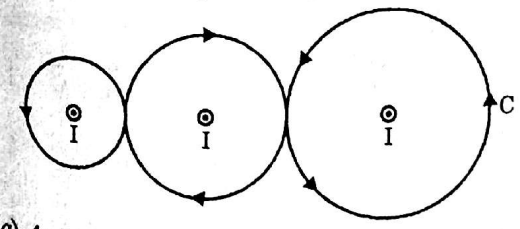
26. The unit normal to the equipotential surface, ϕ = constant c is, in general, given by

(a) ϕ (b) $-\frac{\nabla\phi}{|\nabla\phi|}$

(c) $\frac{\nabla\phi}{|\nabla\phi|}$ (d) $\pm\frac{\nabla\phi}{|\nabla\phi|}$ [IOCL]

27. When the load impedance is equal to the characteristic impedance of the transmission lines then the reflection coefficient and standing wave ratio are respectively
(a) 0 and 0 (b) 1 and 0
(c) 0 and 1 (d) 1 and 1 [PGCIL]

28. Three current carrying conductors are shown in the figure. The value of $|\phi B.dl|$ around the closed curve is



(a) $4\mu_0 I$ (b) $3\mu_0 I$
(c) $2\mu_0 I$ (d) $\mu_0 I$ [PGCIL]

29. The internal heating of a capacitor is usually attributed to
(a) leakage resistance
(b) dielectric charge
(c) electron movement
(d) plate vibration [NHPC]

30. The force with which the plates of a parallel plate capacitor having charge Q and area of each plate, A attract each other is
1. directly proportional to Q
2. directly proportional to Q^2
3. inversely proportional to A
(a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 1, 2 and 3 [NHPC]

31. Magnetic flux density at a point distance R due to an infinitely long linear conductor carrying a current I is given by

(a) $B=\frac{I}{2\pi R}$ (b) $B=\frac{\mu I}{2R}$

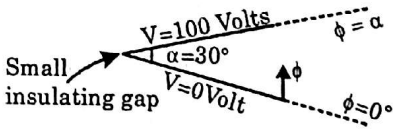
(c) $B=\frac{\mu I}{2\pi R}$ (d) $B=\frac{\mu I}{2\pi R^2}$ [NTPC]

32. Maxwell's divergence equation for the magnetic field is given by

(a) $\vec{\nabla}\times B=0$ (b) $\vec{\nabla}.B=0$

(c) $\vec{\nabla}\times B=\rho$ (d) $\vec{\nabla}.B=\rho$ [NTPC]

33. Two infinite radial planes with interior angle 30° are held at potentials 0V and 100V as shown in the given figure. If the potential V is a function of ϕ alone, then the equation of the equipotential surface corresponding to V= 30V will be small insulating gap



(a) $\phi=15°$
(b) $\phi=12°$
(c) $\phi=9°$
(d) $\phi=6°$ [ES]

34. The line integral of the vector potential A around the boundary of a surface S represents
(a) flux through in the surface S
(b) flux density in the surface S
(c) magnetic density
(d) current density [GATE]

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17. A thermal protection switch is able to protect against
(a) over load (b) over voltage
(c) temperature (d) short circuit [NTPC]

18. Resistance switching is used in
(a) bulkoil circuit breakers
(b) minimum oil circuit breakers
(c) air-blast circuit breakers
(d) all types of breakers [NTPC]

19. Earthing is necessary to give protection against
(a) voltage fluctuation
(b) overloading
(c) danger of electric shock
(d) high temperature of the conductors [NTPC]

20. In India least share of power is provided by
(a) Thermal power plant
(b) Hydro-electric power plants
(c) Nuclear power plants
(d) Diesel power plants [BHEL]

21. Which type of plant has the minimum running cost per Kwh of energy generated
(a) Hydro-electric plant
(b) Thermal power plant
(c) Nuclear power plant
(d) Diesel power plant [BHEL]

22. What type of insulator will be used if the direction of the transmission line is to be changed?
(a) Pin-type (b) Suspension type
(c) Strain type (d) Shakle type [BHEL]

23. For a transmission line, the constant A, B, C and D are related as
(a) $AD-BC=1$ (b) $BC-AD=1$
(c) $\sqrt{AD-BC}=0.5$ (d) $\sqrt{AD-BC}=1.2$ [BHEL]

24. Which voltage determines the insulations strength of an EHV line?
(a) Switching over voltage
(b) Lighting over voltage
(c) Power frequency over voltage
(d) None of these [BHEL]

25. The coefficient of reflection of voltage for a short circuit line is
(a) 1.0 (b) -1.0
(c) 0 (d) 2.0 [BHEL]

26. Ferranti effect on long overhead lines is experienced when
(a) the line is lightly loaded
(b) the power factor is unit
(c) the power factor is leading
(d) corona effect is dominant [BHEL]

27. In AC transmission line, difference in phase of voltage at the two ends of the line is due to
(a) resistance of line (b) system voltage
(c) reactance of line (d) insulators [BHEL]

28. A synchronous machine has higher capacity for
(a) leading *p.f*
(b) lagging *p.f*
(c) it does not depend upon the *pf* of the machine
(d) none of these [BHEL]

29. More efficient plants are used as
(a) base load stations
(b) peak load stations
(c) both (a) and (b)
(d) none of these [BHEL]

30. For a 500 Hz frequency excitation, a 50 km long power line will be modelled as
(a) short line
(b) medium line
(c) lone line
(d) data not insufficient for decision [GATE]

31. Skin effect does not depend on
(a) A nature of material
(b) Size of wire
(c) Supply frequency
(d) Ambient temperature [BHEL]

32. An ACSR conductor has specification as 48/7, which of the following statements is correct for the conductor?
(a) The conductor has 48 strands
(b) The conductors has 55 strands
(c) The conductors has 48 aluminium and 7 steel strands
(d) The conductor has 48 steel and 7 aluminium strands [BHEL]

33. In the underground cable system
(a) there are less changes of faults to occur
(b) it is difficult to locate fault and repair
(c) fault does not occur at all
(d) fault occur very rare and difficult to locate and repair [BHEL]

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75. In a 3-phase induction motor, a deep bar rotor is used to obtain
(a) more operating efficiency
(b) more starting torque
(c) more pull-out torque
(d) reduced rotor core loss [NHPC]

76. Scott-connected transformers can convert
(a) 3 to 2 phases (b) 2 to 3 phases
(c) both (a) and (b) (d) 2 to 4 phase [IOCL]

77. A synchronous generator has higher power handling capacity of operating at
(a) a leading p.f.
(b) a lagging p.f.
(c) it does not depend upon the p.f. of the generator
(d) it depends upon the load p.f. as generator has no p.f. of its own [ES]

78. Most suitable motor for tape recorder will be
(a) *ac* series motor
(b) reluctance motor
(c) hysteresis motor
(d) 1-phase induction motor [ES]

79. If the supply voltage decreases by 4%, the torque in 3-phase 1 M would be decrease by
(a) 4% (b) 10%
(c) 7.84% (d) 8% [NHPC]

80. Synchronous machine with high value of SCR has
(a) bigger size
(b) smaller size
(c) machine size independent of SCR
(d) none of these [NHPC]

81. For a full pitch winding, the generated voltages in both coil sides are
(a) exactly in phase
(b) in quadrature
(c) exactly 180° out of phase
(d) approximately 180° out of phase [PGCIL]

82. In a coal mine, Ward-Leonard method of speed control as shown in the given figure is used to lift coal from the pit through a crane and bucket arrangement. After lifting the coal to desired level and emptying at the dumping ground, the bucket has to be lowered into the pit. The action to be taken at this stage is to reverse the
(a) direction of current in F_2 and slowly increased it
(b) current in F_3 and slowly decrease it
(c) supply terminal of M_1
(d) direction of current in F_1 and slowly increase it [ES]

83. At 50 Hz operation, a single-phase transformer has hysteresis loss of 200 W and eddy current loss of 100 W. Its core loss at 60 Hz operation will be
(a) 432 W (b) 408 W
(c) 384 W (d) 360 W [ES]

84. A 220/440 V, 50 Hz operation, a single-phase transformer operators on 220 V, 40 Hz supply with secondary winding. Then
(a) the eddy current loss and hysteresis loss of the transformer decrease
(b) the eddy current loss and hysteresis loss of the transformer increase
(c) the hysteresis loss of the transformer increases while eddy current loss remains the same
(d) the hysteresis loss remains the same whereas eddy current loss decreases [GATE]

85. A synchronous motor on load draws a current at a leading power factor angle ϕ. If the internal power factor angle- which is phase angle between excitation e.m.f. and current in time phasor diagram - is Ψ then the air gap excitation m.m.f. lags the armature m.m.f. by
(a) Ψ (b) $\frac{\pi}{2}+\Psi$
(c) $\frac{\pi}{2}-\Psi$ (d) $\Psi+\phi$ [GATE]

86. Transformer zero voltage regulation occurs at
(a) unity power factor
(b) leading p.f.
(c) lagging p.f.
(d) zero p.f. leading [BHEL]

87. Electromagnetic torque in rotating machine is present when
(a) air gap is uniform
(b) stator winding alone carries current
(c) rotor winding alone carries current
(d) both stator and rotor winding carry current [BHEL]

88. Transformer at no-load behaves like
(a) a resistor, pf = 1.0
(b) an inductive reactor, pf = 0.2 lagging
(c) a capacitive reactor, pf = 0.2 leading
(d) an inductive reactor, pf = 0.8 lagging [BHEL]

89. In an ideal transformer, the no-load primary current I_o
(a) lags behind V_1 by slightly less than 90°
(b) is in phase with V_1
(c) lead V_1 by 90°
(d) lags V_1 by an angle lying between 0° and 90° [BEL]

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97. In a line-of-sight system, the receiving and transmitting antenna heights are respectively 10 m and 100 m above the surface of the earth. The range of the system will be approximately

(a) 20 km
(b) 30 km
(c) 40 km
(d) 50 km [ES]

98. In case of communication involving micro-wave communication system, repeaters are used approximately at a distance of 20 to 25 km. These repeaters are used to

(a) filter out the noise at each repeater place
(b) amplify the signal
(c) multiplex the signal
(d) keep the signal at the line of sight and to provide direction [ES]

99. Which one of the following pairs is NOT correctly matched?

(a) DSB-SC modulation : Balanced modulator
(b) PCM : Pre-emphasis
(c) FM : Reactance modulator
(d) SSB modulation : Weaver's method [ES]

100. A Fortran line is segmented columnwise for specific purposes. Match List-I (purpose) with List-II (column numbers used) and select the correct answer using the codes given below the Lists:

List-I	List-II
A. Statement number	1. 6
B. Arithmetic statement	2. 1 to 80
C. Continuation mark	3. 7 to 72
D. Data	4. 1 to 5

Codes:

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

[ES]

Section (Q. 101-120) : *The following items consist of two statement, one labelled the "Assertion A" and the other labelled Reason R. You are to examine these two statements carefully and decide if the Assertion A and the Reason R are individually true and if so, whether the reason is a correct explanation of the Assertion. Select your answers to these items using the codes given below and mark your answer sheet accordingly:*

Codes:

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT a correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

101. **Assertion (A):** The degree of modulation of ratio-frequency voltage present at the input terminals of the diode is less than the degree of modulation of the original radio frequency signal in AM detector.

Reason (R): It depends primarily on the ratio of the source impedance of the radio frequency voltage to the diode load impedance. [ES]

102. **Assertion (A):** PSK is inferior to FSK.

Reason (R): PSK requires less bandwidth than FSK. [ES]

103. **Assertion (A):** A 3-phase thyristorised full converter feeding a purely resistive load with delayed firing angel of thristors will draw reactive power from the ac supply.

Reason (R): The ac supply current at delayed firing angle will be non-sinusoidal and its fundamental component would large the supply voltage. [ES]

104. **Assertion (A):** In a high frequency transm-ission line, when a voltage is placed across the line at the sending end, the voltage and current in the line change with distance.

Reason (R): A transmission line consists of continuous conductors with a cross-sectional configuration that is constant throughout their lengths. [IAS]

105. **Assertion (A):** For continuous communi-cation purposes, satellites are normally placed in geostationary orbit.

Reason (R) : In satellite communication, uplink and downlink frequencies are different. [ES]

106. **Assertion (A):** FM systems employ pre-emphasis and deemphasis.

Reason (R) : Preemphasis and deemphasis in FM provide better protection to lower amplitude modulating signals. [ES]

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17. In IC electronic system [BEL]
(a) cost of printed circit is negligible
(b) it is most economical to use types with the optimum complexity so as to get the low cost per gate
(c) the total system is same irrespective of type used
(d) it is desirable to use simple gate type mounted as printed circuit board

18. IC's are economical for use in logic systems because
(a) of the quanity of repeat circuits used
(b) binary circuits are possible only with IC's
(c) the diffusion process is simpler
(d) privated circuit board are inexpensive [BEL]

19. V_{PO} is the pinch off voltage for $V_{GS} = 0$ in an FET. When the gage is reverse biased by V_{GS} the pinch off voltage
(a) will be less than V_{PO}
(b) will be more than V_{PO}
(c) will be the same as V_{PO}
(d) does not depend on V_{GS} [BEL]

20. Which of the following transistor is affected by static electricity? [BEL]
(a) npn transistor (b) IFET
(c) UJT (d) MOSFET

21. Power transistors are invariable provided with [IOCL]
(a) heat sink (b) metallic casing
(c) soldered connections (d) fan for heat removal

22. The JFET can operate in [IOCL]
(a) depletion mode only
(b) enhancement mode only
(c) either depletion or enhancement mode at a time
(d) both depletion and enhancement modes simultaneously

23. In the audio frequency range, as the frequency increases, the noise factor [IOCL]
(a) decreases to a minimum and then increases
(b) increases to a maximum and then decreases
(c) increases continuously
(d) decrease continuously

24. In an ideal balanced differential amplifier, the common-mode gain is [NHPC]
(a) double of that of single-ended amplifier
(b) half of that of single-ended differential amplifier
(c) very high
(d) zero

25. The gain of an amplifier will be more affected by change in transistor parameter in case of [NHPC]
(a) positive feedback (b) negative feedback
(c) zero feedback (d) none of these

26. The highest voltage gain can be obtained from a
(a) CC (b) CE [NTPC]
(c) CB (d) both CE and CB

27. In a MOSFET if gate voltage V_{gs} is increased then
(a) mobile charge carrier density decreases
(b) channel conductivity increases
(c) channel widens
(d) channel conductivity decreases [NTPC]

28. In a feedback amplifier, feedback improves the signal to noise ratio for noise signal
(a) internally generated in the amplifier
(b) present with the amplifier input
(c) both internally generated and present with the input
(d) present at the output [BHEL]

29. When a signal is applied to a narrow band amplifier, then distortion produced in the output is due to
(a) use of transformer coupling
(b) loss of the low frequency components
(c) loss of the high frequency components
(d) phase distortion in the amplifier [BHEL]

30. The 3*d*B cut off frequency of atransistor amplifier is the frequency at which
(a) the current gain increases by 3*d*B
(b) the current gain becomes 3*d*B
(c) the current gain becomes 0.707 of its midrange value
(d) the power gain decreases by 3*d*B [BHEL]

31. When a P-N junction is forward biased
(a) the width of the deplection layer is decreased
(b) the width of deplection layer is increased
(c) the width of the depletion layer remains the same
(d) none of these [BEL]

32. Low frequency response of an RC coupled amplifier can be improved by
(a) increasing the coupling capacitors only
(b) increasing the by-pass capacitors only
(c) increasing the by-pass capacitor as well as coupling capacitor
(d) decreasing the by-pass capacitor [BEL]

33. An op-amp has a differential gain of 10^3 and a CMRR of 100. The output voltage of the op-amp with inputs of 120 μV and 80 μV will be [BEL]
(a) 26 *m*V (b) 41 *m*V
(c) 100 *m*V (d) 200 *m*V

34. In JFET, if the gate voltage V_{gs} is made more negative, then
(a) channel conductivity increases
(b) deplication region decreases
(c) channel conductivity decreases
(d) channel current increases [BEL]

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9. Stack pointer in the 8085 microprocessor is a
   (*a*) 16 bit register that point to stack memory locations
   (*b*) 16 bit accumulator
   (*c*) memory location in the stack
   (*d*) flag register used for the stack [BHEL]

10. Consider the following set in instructions:
   STC
   CMC
   MOV A, B
   RAL
   MOV B, A
   This set of instructions
   (*a*) doubles the number in Register by *B*
   (*b*) divides the number in Register by 2
   (*c*) multiples B by A
   (*d*) adds A and B [BHEL]

11. The *TRAP* is one of the interrupts available in *INTEL* 8085. Which one of the following statements is true of *TRAP*?
   (*a*) It is a level triggered. [NTPC]
   (*b*) It is negative edge triggered.
   (*c*) It is positive edge triggered.
   (*d*) It is both positive edge triggered and level triggered.

12. If we use 3 bits in the instruction word to indicate if an index register is to be used and if necessary, which one is to be used, then the number of index registers to be used in the machine will be
   (*a*) 3 (*b*) 6
   (*c*) 7 (*d*) 8 [NTPC]

13. Which of the following are required for a multimedia PC?
   1. CD-ROM drive, speaker and sound card.
   2. Modem and network card.
   3. Hardware needed to display videos and animation.
   4. Software needed to display videos and animation.
   Select the correct answer using the codes given below:
   Codes:
   (*a*) 1, 2 and 3 (*b*) 1, 2, 3 and 4
   (*c*) 1, 2 and 4 (*d*) 1, 3 and 4 [NTPC]

14. A personal computer has typically [NTPC]
   (*a*) 5 to 10 kilobytes of main memory
   (*b*) 10 to 100 kilobytes of main memory
   (*c*) 100 to 256 kilobytes of main memory
   (*d*) 256 kilobytes to 1 megabyte of main memory

15. In a 8085 microprocessor, the following sequence of instructions is executed:
   STC
   CMC
   MOVE A, B
   RAL
   MOVE B, A
   After the last instruction, the output will
   (*a*) rotate the contents of the accumulator and store it in B
   (*b*) get the contents of B register into accumulator and rotate it to left by one bit
   (*c*) double contents of *B* register
   (*d*) manipulate carry in A and B [NTPC]

16. In 8085 microprocessor system, the direct addressing instruction is
   (*a*) MOV A, B (*b*) MOV B, OAH
   (*c*) MOV C, M (*d*) STA addr [NTPC]

17. In 8085 microprocessor, the value of the most significant bit of the result following the execution of any arithmetic or Boolean instruction is stored in the
   (*a*) carry status flag
   (*b*) auxiliary carry status flag
   (*c*) sign status flag
   (*d*) zero status flag [BEL]

18. The highest priority in 8085 microprocessor system is
   (*a*) RST 7.5 (*b*) RST 6.5
   (*c*) INTR (*d*) TRAP [BEL]

19. How many address lines are needed to address each memory location in a 2048 × 4 memory chip?
   (*a*) 10 (*b*) 11
   (*c*) 8 (*d*) 12 [IOCL]

20. An advantage of memory interlacing is that
   (*a*) a larger memory is obtained
   (*b*) effective speed of the memory is increased
   (*c*) the cost of the memory is reduced
   (*d*) a non-volatile memory is obtained [IOCL]

21. If an original MIB microcomputer operates at 5 MHz with an B bit bus and a newer version operates at 20 MHz with a 32 bit bus, compute (approximately) the maximum speed-up possible
   (*a*) 2 (*b*) 4
   (*c*) 6 (*d*) 16 [IOCL]

22. Consider the following statements:
   1. A total of about one million bytes can be directly addressed by the 8086 microprocessor.
   2. The 8086 has thirteen 16-bit registers.
   3. The 8086 has eight flags.
   4. Compared to 8086 the 80286 provides a higher degree of memory protection.
   Of these statements:
   (*a*) 2, 3 and 4 are correct
   (*b*) 1, 3 and 4 are correct
   (*c*) 1, 2 and 4 are correct
   (*d*) 1, 2 and 3 are correct [BHEL]

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53. A discrete-time signal x[n] has Fourier transform $X(e^{j\omega})$. Match List-I with List-II and select the correct answer using the code given below the lists :

List - I (*Signal*)	List - II (*Fourier Transform*)
A. $x[-n]$	1. $X^*(e^{-j\omega})$
B. $nx[n]$	2. $X(e^{-j\omega})$
C. $x^*[n]$	3. $e^{-j\omega}X(e^{j\omega})$
D. $x[n-1]$	4. $j\frac{d}{d\omega}X(e^{j\omega})$

Codes :

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

[IES]

54. What is the laplace transform of a delayed unit impulse function $\delta(t-1)$?

(*a*) 1

(*b*) zero

(*c*) exp (–*s*)

(*d*) *s* [IES]

55. A real signal x(t) has Fourier transform X(f). Which one of the following is correct?

(*a*) Magnitude of X(*f*) has even symmetry while phase of X(*f*) has odd symmetry

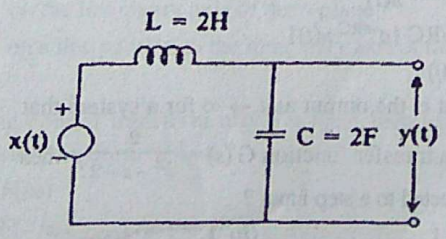
(*b*) Magnitude of X(*f*) has odd symmetry while phase of X(*f*) has even symmetry

(*c*) Both magnitude and phase of X(*f*) have even symmetry

(*d*) Both magnitude and phase of X(*f*) have odd symmetry

[IES]

56. Consider the circuit shown below :



$x(t)$: Input voltage

$y(t)$: Output voltage

What is the natural response of this system ?

(*a*) A sinusoid with constant amplitude

(*b*) A growing sinusoid

(*c*) Zero

(*d*) A decaying sinusoid

[IES]

57. The relation between input $x(t)$ and output $y(t)$ of a continuous-time system is given by

$$\frac{dy(t)}{dt} + 3y(t) = x(t).$$

What is the forced response of the system when $x(t) = k$ (a constant) ?

(*a*) k (*b*) $k/3$

(*c*) $3k$ (*d*) 0 [IES]

58. The discrete time signal x(n) is defined by

$$x(n) = \begin{cases} 1 & n = 1 \\ -1 & n = -1 \\ 0 & n = 0 \quad \text{and} [n] > 1 \end{cases}$$

Which one of the following is the composite signal $y(n) = x(n) + x(-n)$ for all integer values of n ?

(*a*) 0 (*b*) 2

(*c*) ∞ (*d*) $-\infty$ [IES]

59. Which one of the following is the mathematical representation for the average power of the signal $x(t)$?

(*a*) $\frac{1}{T}\int_0^T x(t)dt$

(*b*) $\frac{1}{T}\int_0^T x^2(t)dt$

(*c*) $\frac{1}{T}\int_{-T/2}^{T/2} x(t)dt$

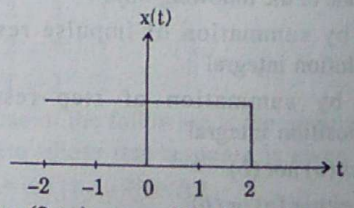
(*d*) $\underset{T\to\infty}{\text{Lt}}\ \frac{1}{T}\int_{-T/2}^{T/2} x^2(t)dt$ [IES]

60. Which one of the following systems described by the following input-output relations is non-linear ?

(*a*) $y(n) = nx(2n)$ (*b*) $y(n) = x(n^2)$

(*c*) $y(n) = n^2x(n)$ (*d*) $y(n) = x^2(n)$ [IES]

61. The mathematical model of the signal shown below is



(*a*) $x(t) = u(2+t)$ (*b*) $x(t) = u(t-2)$

(*c*) $x(t) = u(2-t)$ (*d*) $x(t) = u(t-1)$ [IES]

62. Number of state variables of discrete time system, described by

$$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n]$$

is

(*a*) 2 (*b*) 3

(*c*) 4 (*d*) 1 [IES]

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(b) allow the instruction, data or stack portion of a program to be more than 64K bytes long by using more than one code, data or stack segment
(c) facilitate the use of separate memory area for a program, its data and the stack
(d) all of these [GATE]

32. The set of commands which give directions to the assembler during the assembly process but are not translated into machine instructions are called
(a) mnemonics (b) directives
(c) identifiers (d) operands [IOCL]

33. Intel 80286 microprocessor was designed to serve as the CPU in a multitasking operating systems as it has
(a) 8 MHz operating frequency
(b) real address mode to support lower microprocessors of the same family
(c) protection and virtual memory capability
(d) signals to interface with co-processor [BHEL]

34. Intel 80486 offers high performance than 80386 because
(a) no chip memory management is present on 80486
(b) multitasking support is provided by 80486 and not by 80386
(c) 80386 has no chip cache memory available
(d) all of these [NTPC]

35. RISC is characterised by
(a) hardwire control design with no micro codes
(b) fixed instruction format
(c) executing most of the instructions in a signal clock cycle
(d) all of these [GATE]

36. The theoretical dividing line between Reduced Instruction Set Computing (RISC) chips and Complex Instruction Set Computing (CISC) chips is
(a) number of pins in the chip
(b) number of address and data lines
(c) instruction execution rate to be one instruction per clock cycle
(d) none of these [BHEL]

37. The microprocessor contains ROM chip which contains
(a) control function
(b) arithmetic functions
(c) instructions to execute data
(d) memory functions [NTPC]

38. The process of causing an unplanned branching operation to occur, usually initiated by external system is called
(a) debugging (b) masking
(c) interrupt (d) iteration [IOCL]

39. An instruction register is storage for
(a) location of data in memory
(b) location of instruction in memory
(c) binary code for the operation to be performed
(d) address of the next instruction to be executed [ES]

40. A program counter is a storage register for
(a) location of data in memory
(b) location of instruction in memory
(c) binary code for the operation to be performed
(d) address of the next instruction to be executed [ES]

41. Stack pointer is a register which comes into use
(a) whenever a data is read from the memory
(b) whenever a data is written into the memory
(c) whenever the output variable is sent out of the CPU
(d) whenever an interrupt or high priority call comes from external devices [NTPC]

42. In microprocessor architecture, flag indicates
(a) number of microprocessor
(b) name of the manufacturer
(c) internal status of the CPU
(d) bit-size of the microprocessor [NTPC]

43. A microprocessor is a minimum combination of
(a) μP and clock
(b) μP, clock and ROMs
(c) μP, clock, RAMs and ROMs
(d) μP, clock, RAM, ROM, PIA and ACIA [IOCL]

44. ACK indicates reception of
(a) correct data
(b) incorrect data
(c) insufficient data
(d) sufficient data [IOCL]

45. Accumulation is a device which
(a) stores a number
(b) adds two numbers
(c) adds and stores previously stored number to another number
(d) none of these [BHEL]

46. Address usually is
(a) alphabetical (b) numerical
(c) alpha-numerical (d) none of these [BHEL]

47. The basic elements of a microprocessor are
(a) ALU, memory
(b) ALU, control unit
(c) ALU, memory, I/O device
(d) ALU, control unit, memory [NTPC]

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