ELECTRONICS & TELECOMMUNICATION ENGINEERING

PAPER-I

1. Match List I (Laws) with List II (Applications) and select the correct answer :
List - I
A. Ampere's law
B. Blot's law
C. Coulomb's law
D. Gauss' law
List-II
To find the
1. force on a charge
2. force due to a current carrying conductor
3. electric flux density at a point
4. magnetic flux density at a point

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

2. A solid cylindrical conductor of radius 'R' has a uniforms current density. The magnetic field 'H' inside the conductor at a distance 'r' from the axis of the conductor is
a. $I / 2\pi r$
b. $I / 4\pi r$
c. $Ir / 2\pi R^2$
d. $Ir/4\pi R^2$

3. Two coils have self-inductances of 0.09 H and 0.01H and a mutual inductance of 0.015 H. The coefficient of coupling between the coils is
a. 0.06
b. 0.5
c. 1.0
d. 0.05

4. The equation $\nabla . J = 0$ is known as
a. Poisson's equation
b. Laplace equation
c. Continuity equation
d. Maxwell equation

5. A transmission line has primary constants R, L, G and C, and secondary constants Z_0 and $\gamma(= \alpha + j\beta)$. If the line is lossless, then
a. $R = 0, G \neq 0$ and $\alpha = 0$
b. $R = 0, G = \infty$ and $\beta = |\gamma|$
c. $G = 0$ and $\alpha = \beta$
d. $R = 0, G = 0, a = 0$ and $\beta = |\gamma|$

6. A transmission line having 50Ω impedance is terminated in a load of (40 + j 30) Ω. The VSWR is
a. j0.033
b. 0.8 + j0.6
c. 1
d. 2

7. A (75 – j40) Ω load is connected to a coaxial line of $Z_0 = 75\Omega$ at 6 MHz. The load matching on the line can be accomplished by connecting
a. a short-circuited stub at the load
b. an inductance at the load
c. a short - circuited stub at a specific distance from the load
d. a capacitance at a specific distance from the load

8. Polystyrene has a relative permittivity of 2.7. If the wave is incident at an angle 'θ_i' of 30° from air onto polystyrene, the angle of transmission will be nearly
a. 0.2°
b. 2°
c. 18°
d. 48°

9. Match List I with List II and select the correct answer using the codes given below : (Notations have their usual meaning)
List I
A. Permeability
B. Force
C. Velocity of EM wave
D. Displacement density
List II
1. QE
2. $1/\sqrt{\mu_0 \varepsilon_0}$
3. $\mu_0 \mu_r$
4. $\sqrt{\mu / \varepsilon}$
5. εE

	A	B	C	D
a.	3	2	4	5

b.	3	1	2	5
c.	4	1	2	3
d.	4	2	5	3

10. Match List I (Antennas) with List II (Radiation patterns) and select the correct answer:

List I

A. Simple dipole

B. Omni-directional antenna

C. Loop antenna

List II

1. 

2. 

3. 

	A	B	C
a.	1	2	3
b.	2	1	1
c.	3	2	1
d.	1	1	2

11. A vertical wire of 1 m length carries a current of 1 A at 10 MHz. The total radiated power is nearly
   a. 0.13 W
   b. 0.88 W
   c. 7.3 W
   d. 73 W

12. A Yagi antenna has a driven antenna
   a. only
   b. with a reflector
   c. with one or more directors
   d. with a reflector and one or more directors

13. The Poynting vector $P = \overrightarrow{E} \times \overrightarrow{H}$ has the dimensions of
   a. Power/unit area
   b. Volts
   c. Power
   d. Volt/unit length

14. In a hundred-turn coil, if the flux through each turn is $(t^3 - 2t)$m Wb, the magnitude of the induced emf in the coil at a time of 4s is
   a. 46 mV
   b. 56 mV
   c. 4.6 V
   d. 5.6 V

15. Consider the following statements regarding a plane wave propagating through free space.

The direction of field

1. 'E' is perpendicular to the direction of propagation
2. 'H' is perpendicular to the direction of propagation
3. 'E' is perpendicular to the direction of field 'H'

Which of these statements are correct?
   a. 1 and 2
   b. 2 and 3
   c. 1 and 3
   d. 1, 2 and 3

16. If the velocity of electro magnetic wave in free space is 3×10 m/s, the velocity in a medium with ε_r of 4.5 and μ_r of 2 would be
   a. 1×10^8 m/s
   b. 3×10^8 m/s
   c. 9×10^8 m/s
   d. 27×10^8 m/s

17. Phase velocity 'v_p' and the group velocity 'v_g' in a waveguide ('c' is velocity of light) are related as
   a. $v_p v_g = c^2$
   b. $v_p + v_g = c$
   c. v_p / v_g = a constant
   d. $v_p + v_g$ = constant

18. A cavity resonator can be represented by
   a. an LC circuit
   b. an LCR circuit
   c. a lossy inductor
   d. a lossy capacitor

19. The cut-off wavelength λ_c for TE_{20} mode for a standard rectangular waveguide is
   a. 2/a
   b. 2a
   c. a
   d. $2a^2$

20. A cylindrical cavity operating in TE_{111} mode has a 3dB bandwidth of 2.4 MHz and its quality factor is 4000. Its resonant frequency would be
   a. 9.6 GHz
   b. $9.6/\sqrt{2}$ GHz
   c. $9.6/\sqrt{3}$ GHz
   d. $9.6/\sqrt{6}$ GHz

21. If $\overrightarrow{H} = 0.1 \sin(10^8 \pi t + \beta y) a_z$ A/m for a place wave propagating in free space, then the time average Poynting vector is

a. $(0.6\pi \sin^2 \beta y)\, a_y$ W/m^2

b. $-0.6\pi\, a_y$ W/m^2

c. $1.2\pi\, a_y$ W/m^2

d. $-1.2\pi\, a_y$ W/m^2

22. If the height of transmitting and receiving antennas in a LOS system are 49m and 9m respectively then the distance up to which communication may be possible is about
a. 40 km
b. 110 km
c. 400 km
d. 1100 km

23. The skip distance is
a. same for each layer
b. independent of frequency
c. independent of the state of ionisation
d. independent of transmitted power

24. The dimension of flux density is
a. $MT^{-1}Q^{-1}$
b. $MT^{-2}Q^{-2}$
c. $MT^{1}Q^{1}$
d. $MT^{-1}Q^{-2}$

25. Match List I (Instrument) with List II (Property/use) and select the correct answer :
List I
A. PMMC
B. Moving iron
C. Thermocouple
D. Electrostatic type
List II
1. Square law type scale
2. Very goad high frequency response
3. Linear scale over the entire range
4. Voltmeter

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

26. A coil would behave as
a. an inductor at high frequencies
b. a capacitor at very low frequencies
c. a capacitor at very high frequencies
d. a resistor at high frequencies

27. A series LCR circuit with R = 10 Ω, $|X_L|$ = 20 Ω, and $|X_C|$ = 20 Ω is connected across an supply of 200 Vrms. The rms voltage across the capacitor is
a. $200 \angle -90°$ V
b. $200 \angle 90°$ V
c. $400 \angle 90°$ V
d. $400 \angle -90°$ V

28. An ammeter of range 0.25 A has a guaranteed accuracy of 1% of full-scale reading. The current measured by the ammeter is 5 A. The limiting error in the reading is
a. 2%
b. 2.5%
c. 4%
d. 5%

29. An inductor tunes at 200 kHz with 624 pF capacitor and at 600 kHz with 60.4 pF capacitor. The self-capacitance of the inductor would be
a. 8.05 pF
b. 10.05 pF
c. 16.10 pF
d. 20.10 pF

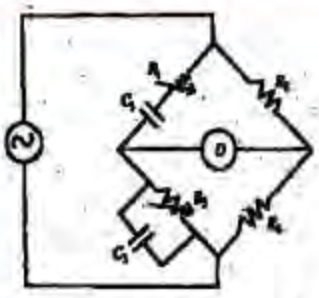
30. "The current internationally recognised unit of time and frequency is based on the cesium clock, which gives an accuracy better than 1 μs per day." This statement is related to
a. Working standards
b. International standards
c. Primary standards
d. Secondary standards

31. The bandwidth of a CRO is from 0 to 20 MHz. The fastest rise time which a square wave can have, in order that it is accurately reproduced by the CRO is
a. 0.175 μs
b. 17.5 ns
c. 35 ns
d. 52.5 ns

32. A dc voltage of 1V is applied to the X-plates to a CRO and an ac voltage 2 sin 100 t is applied to the Y-plates. The resulting display on the CRO screen will be a
a. vertical straight line
b. horizontal straight line
c. sine wave
d. slant line

33. In a distortion factor meter, the filter at the front end is used to suppress
a. odd harmonics
b. even harmonics
c. fundamental component
d. dc component

34.



The Wein bridge circuit shown in the above figure can be used as a frequency measuring device, provided

a. $R_2/R_4 = 2$
b. $R_4/R_2 = 2$
c. $R_2/R_4 = 4$
d. $R_2/R_4 = 3$

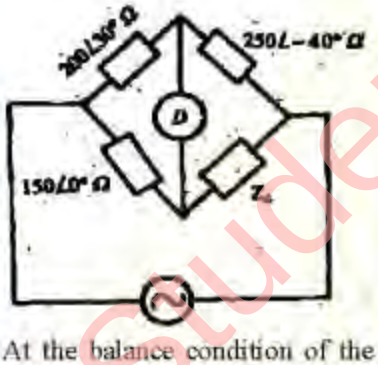
35. The equations under balance condition for a bridge are

$R_1 = R_2R_3/R_4$ and $L_1 = R_2R_3R_4$.

where R_1 and L_1 are unknown quantities. Which one of the following sets of parameters should be chosen as variables in order to achieve converging balance?

a. R_2 and R_3
b. R_2 and C_4
c. R_4 and C_4
d. R_3 and C_4

36.



At the balance condition of the ac bridge shown in the above figure the value of Z_4 would be

a. $120 \angle 70° \Omega$
b. $187.5 \angle -10° \Omega$
c. $187.5 \angle -70° \Omega$
d. $333.3 \angle -70° \Omega$

37. Wagner's earth in ac bridge circuits is used to eliminate the effect of

a. stray electrostatic fields
b. stray electromagnetic fields
c. inter-component capacitances
d. parasitic capacitance to earth

38. Radiation pyrometers are used for the measurement of temperature in the 'range of

a. – 200° C to 500° C
b. 0° C to 500° C
c. 500° C to 1200° C
d. 1200° C to 2500° C

39. Magnetic flux can be measured by

a. capacitive pick-up
b. inductive pick-up
c. resistive pick-up
d. Hall-effect pick-up

40. A semiconductor based temperature transducer has a temperature coefficient of –2500 μ V/° C. This transducer indeed is a

a. thermistor
b. forward - biased pn junction diode reverse - biased pn junction diode
c. FET

41. The function of the reference electrode in a pH meter is to

a. produce a constant voltage
b. provide temperature compensation
c. provide a constant current
d. measure average pH value

42. Pirani gauge is used for the measurement of pressure in the range of

a. 10^{-9} mm to 10^{-5} mm of Hg
b. 10^{-5} mm to 10^{-1} mm of Hg
c. 10 mm to 10^{3} mm of Hg
d. 10^{5} mm to 10^{8} mm of Hg

43. The most Light sensitive transducer for conversion of light into electrical power is the

a. Photodiode (b) solar cell
b. photoconductive cell (d) photovoltaic cell

44. In an amplitude modulated system, if the total power is 600 W and the power in carrier is 400 W, then the modulation index is

a. 0.5
b. 0.75
c. 0.9
d. 1

45. The bandwidth of a 'N' bit binary coded PCM signal for modulating a signal having bandwidth of 'f Hz is

a. $\frac{f}{N}$ Hz
b. $\frac{f}{N^2}$ Hz
c. Nf Hz
d. N^2f Hz

46. Time division multiplexing requires
a. constant data transmission
b. transmission of data samples
c. transmission of data at random
d. transmission of data of only one measureand

47. The difference between the number of atoms in a unit cell of a bcc crystal and an fcc crystal is
a. 1
b. 2
c. 4
d. 6

48. If a small amount of Cu is added to a Ni conductor, then the
a. resistivity of Ni will increase at all temperatures because Cu is a better conductor than Ni
b. residual resistivity of Ni at low temperature will increase as Cu atoms act as defect centres
c. resistivity of Ni will increase at all temperatures as Cu destroys the periodicity of Ni and acts as defects
d. resistivity of Ni remains unaltered as Cu atoms give the same number of free electrons as Ni atoms

49. For the n - type semiconductor with $n = N_D$ and $p = n_i^2 / N_D$, the hole concentration will fall below the intrinsic value because some of the holes
a. drop back to acceptor impurity states
b. drop to donor impurity states
c. virtually leave the crystal
d. recombine with the electrons

50. Match list I (Magnetic materials) with list II (Dipole arrangement in external field) and select the correct answer:
List I
A. Paramagnetic
B. Ferromagnetic
C. Antiferromagnetic
D. Ferrimagnetic
List II
1. All dipoles are aligned in one preferred direction and have equal magnitudes
2. Half of the dipoles are aligned in opposite direction arid have equal magnitudes
3. Half of the dipoles (with equal magnitudes) are aligned in opposite direction to other half having equal but lower magnitudes
4. All dipoles have equal magnitudes but are randomly oriented

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

51. For an insulating material, dielectric strength and dielectric loss should be respectively
a. high and high
b. low and high
c. high and low
d. low and low

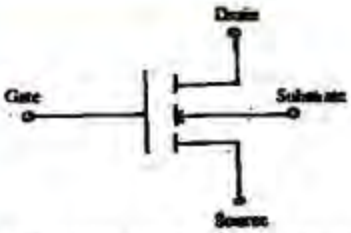
52. Match List I (Optical devices) with List II (Electrical/optical characteristics) and select the correct answer :
List I
A. LASER
B. Solar cell
C. Photo diode
D. LED
List II
1. Emits monochromatic light of low intensity
2. Consumes electrical power due to the incident light
3. Delivers power to a load
4. Emits monochromatic light of high intensity

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

53. Which one of the following is the best definition of a superconductor?
a. It is a material showing perfect conductivity and Meissner below a critical temperature
b. It is a conductor having zero resistance
c. It is a perfect conductor with highest diamagnetic susceptibility
d. It is a perfect conductor but becomes resistive when the current density through it exceeds a critical value

54. If a coil has diameter 'd', number of turns 'N' and form factor 'F' then the inductance of the coil is proportional to
a. N^2dF
b. Nd^2F
c. N^2d^2 / F
d. $N^2 d/F$

55.



The above figure shows the circuit symbol of

a. FET
b. PMOSFET
c. CMOSFET
d. NMOSFET

56. The ac resistance of a forward-biased p-n junction diode operating at a bias voltage 'V' and carrying current 'I' is

a. zero
b. a constant value independent of V and I
c. V/I
d. $\Delta V/\Delta I$

57. Match List I with List II and select the correct answer:

List I

A. Drift current
B. Einstein's equation
C. Diffusion current
D. Continuity equation

List II

1. Law of conservation of charge
2. Electric field
3. Thermal voltage
4. Concentration gradient

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

58. Consider the following statements :

If an electric field is applied to an n-type semiconductor bar, the electrons and holes move in opposite directions due to their opposite charges. The net current is

1. due to both electrons and holes with electrons as majority carriers.
2. the sum of electron and hole currents.
3. the difference between electron and hole current.

Which of these statements is/are correct?

a. 1 alone
b. 1 and 2
c. 2 alone
d. 3 alone

59. Consider the following circuit configurations:

1. Common emitter
2. Common base
3. Emitter follower
4. Emitter follower using Darlington pair

The correct sequence in increasing order of the input resistances of these configurations is

a. 2, 1, 4, 3
b. 1, 2, 4, 3
c. 2, 1, 3, 4
d. 1, 2, 3, 4

60. Match List I with List II and select the correct answer:

List I (Devices)

A. Silicon diode
B. Germanium diode
C. LED
D. PIN diode

List II (Property)

1. High frequency applications
2. Very low reverse bias saturation current
3. Low forward bias voltage drop
4. Cut-off wavelength

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

61. The depletion layer across a $p^+ - n$ junction lies

a. mostly in the p^+ – region
b. mostly in the n – region
c. equally in both the p^+ and n–regions
d. entirely in the p^+ –region

62. A transistor has a current gain of 0.99 in the CB mode. Its current gain in the CC mode is

a. 100
b. 99
c. 1.01
d. 0.99

63. Match List-I (Biasing of the junctions) with List II (Functions) and select the correct answer :

List I

A. E-B junction forward bias and C-B junction reverse bias
B. Both E-B and C-B junctions forward bias
C. E-B junction reverse bias and C-B junction forward bias

D. Both E-B and C-B junctions reverse bias

List II

1. Very low gain amplifier
2. Saturation condition
3. High gain amplifier
4. Cut-off condition

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

64. Match List I (Structures/characteristics) with List II (Reasons) in respect of JFET and select the correct answer :

List I

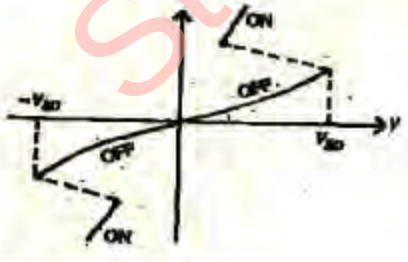
A. n-channel JFET is better than p-channel JFET
B. Channel is wedge shaped
C. Channel is not completely closed at pinch-off
D. Input impedance is high

List II

1. Reverse bias increases along the channel
2. High electric field near the chain and directed towards source
3. Low leakage current at the gate terminal
4. Better frequency performance since $\mu_n >> \mu_p$

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

65.



The above graph depicts

a. drain characteristic of a MOSFET
b. drain characteristic of an IGBT
c. volt-ampere characteristic of a triac
d. volt-ampere characteristic of an SCR

66. Consider the following statements :

A four-layer PNPN device having two gate leads can be turned on by applying a

1. positive current pulse to the cathode gate
2. positive current pulse to the anode gate
3. negative current pulse to the anode gate
4. negative current pulse to the cathode gate

Which of these statements is/are correct?

a. 1 alone
b. 1 and 3
c. 2 alone
d. 2 and 4

67. Almost all resistors are made in a monolithic integrated circuit

a. during the emitter diffusion
b. while growing the epitaxial layer
c. during the base diffusion
d. during the collector diffusion

68. Assertion (A) : $BaTiO_3$ is a piezoelectric material and is used in a record player.

Reason (R) : In a piezoelectric transducer, stress induces polarization and an electric field strains the material.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

69. Assertion (A) : Hall crystal can be used as a multiplier of two signals.

Reason (R) : Hall voltage is proportional to the currents or voltages applied in perpendicular directions across the Hall crystal.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

70. Assertion (A) : The hybrid it π- model of a transistor can be reduced to its h-parameter model and vice-versa.

Reason (R) : Hybrid π and h-parameter models are inter-related as both of them describe the same transistor.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

71. Assertion (A) : When light falls at the junction of a p-n photo diode, its P side becomes positive and N side becomes negative.
Reason (R) : When a photo diode is short-circuited, the current in the external circuit flows from the P-side to the N-side.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

72. Assertion (A) : Prescalers are used in digital counters to extend the frequency range.
Reason (R) : Prescalers are simple dividing circuits and as such do not have the high frequency limitation of digital counters.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

73. Assertion (A) : CRTs, used in TV receivers are of electrostatic deflection type and those used in oscilloscopes are of magnetic deflection type.
Reason (R) : TV receivers need a large screen to view pictures, whereas accuracy is the main consideration in oscilloscopes.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

74. Assertion (A) : Alnico is commonly used for electromagnets.
Reason (R) : Alnico has low hysteresis loss.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

75. Assertion (A) : The solution of Poisson's equation is the same as the solution of Laplace's equation.
Reason (R) : Laplace's equation is a special case of Poisson's equation for source-free regions.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

76. Assertion (A) : The functions given by $Z(s)=\frac{K's(s^2+2)(s^2+10)}{(s^2+1)(s^2+6)}$ represents an L-C driving point impedance function.
Reason (R) : Poles and zeroes interlace on the imaginary axis of the complex s-plane.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

77. Assertion (A) : The fundamental loop of a linear directed graph contains four twigs and two links corresponding to a given tree.
Reason (R) : In a linear directed graph, a link form is a closed loop.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

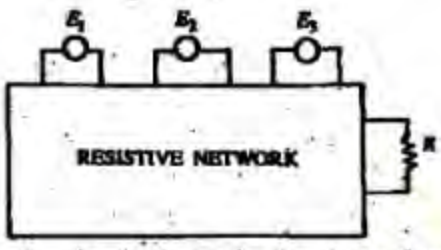
78. Assertion (A) : The 'zero - state' response of a linear constant-parameter continuous-time system can have components having the 'natural frequencies' of the system.
Reason (R) : The 'forced frequency' components in the response of the state for any given input may not add up to the given zero initial value of the state. The 'natural frequency' components may be needed to bridge the gap.
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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

79. Assertion (A) : When a linear time-invariant system having a system function H(s) is driven by an input $x(t) = e^{s_0 t}$ the force part of the output is $H(s_0)e^{s_0 t}$.

Reason (R) : In the partial fraction expansion of the Laplace transform of the output, the term corresponding to the pole at s_0 is $\frac{H(s_0)}{s-s_0}$. The inverse transform $\frac{H(s_0)}{s-s_0}$ is $H(s_0)\, e^{s_0 t}$.

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 the correct explanation of A
c. A is true but R is false
d. A is false but R is true

80.



In the circuit shown in the above figure, the power consumed in the resistance R is measured when one source is acting at a time, these values are 18 W, 50 W and 98 W. When all the sources are acting simultaneously, the possible maximum and minimum values of power in R will be

a. 98 W and 18 W
b. 166 W and 18 W
c. 450 W and 2 W
d. 166 W and 2 W

81. In a two-terminal network, the open-circuit voltage measured at the given terminals by an electronic voltmeter is 100 V. A short-circuit current measured at the same terminals by an ammeter of negligible resistance is 5 A. If a load resistor of 80 Ω is connected at the same terminals, then the current in the load resistor will be

a. 1 A
b. 1.25 A
c. 6 A
d. 6.25 A

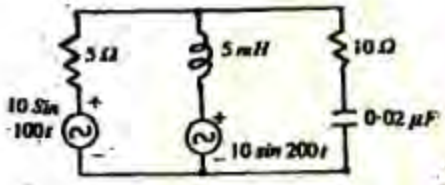
82. Consider the following statements :

1. Tellegen's theorem is applicable to any lumped network
2. The reciprocity theorem is applicable to linear bilateral networks
3. Thevenin's theorem is applicable to two-terminal linear active networks
4. Norton's theorem is applicable to two-terminal linear active networks

Which of these statements are correct?

a. 1, 2 and 3
b. 1, 2, 3 and 4
c. 1, 2 and 4
d. 3 and 4

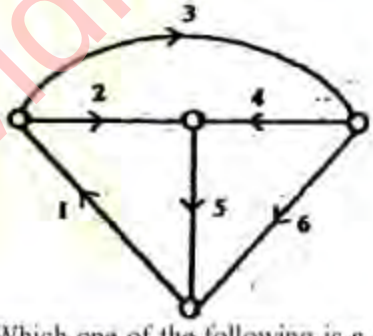
83.



Which one of the following theorems can be conveniently used to calculate the power consumed by the 10 Ω resistor in the network shown in the above figure?

a. Thevenin's theorem
b. Maximum power transfer theorem
c. Millman's theorem
d. Superposition theorem

84.



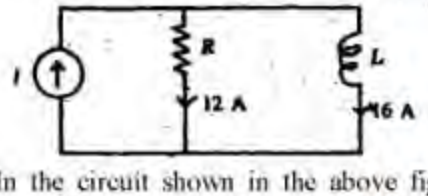
Which one of the following is a cut set of the graph shown in the above figure?

a. 1, 2, 3 and 4
b. 2, 3, 4 and 6
c. 1, 4, 5 and 6
d. 1, 3, 4, and 5

85. A network has 10 nodes and 17 branches. The number of different node pair voltages would be

a. 7
b. 9
c. 10
d. 45

86.

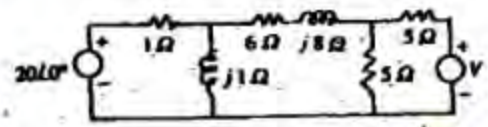


In the circuit shown in the above figure, the current supplied by the sinusoidal current source I is

a. 28 A

b. 4 A
c. 20 A
d. No determinable from the data given

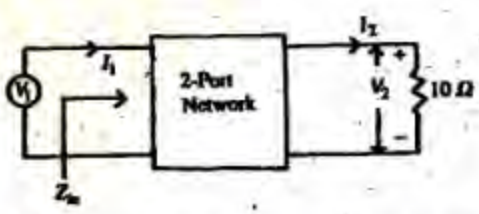
87. Consider the following statements :
A 3-phase balanced supply system is connected to a 3-phase unbalanced load. Power supplied to this load can be measured using
1. two wattmeters
2. one wattmeter
3. three wattmeters
Which of these statements is/are correct ?
a. 1 and 2
b. 1 and 3
c. 2 and 3
d. 3 alone

88.


In the above circuit, if the power dissipated in the 6 Ω resistor zero then V is
a. $20\sqrt{2}\angle 45^\circ$
b. $20\angle 30^\circ$
c. $20\angle 45^\circ$
d. $20\sqrt{2}\angle 30^\circ$

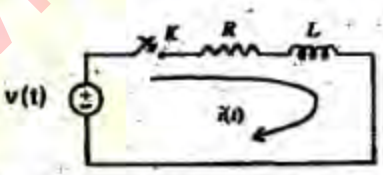
89. A capacitor used for power factor correction in single-phase circuit decreases
a. the power factor
b. the line current
c. both the line current and the power factor
d. the line current and increases power factor

90. For a two-port reciprocal network, the output open-circuit voltage divided by the input current is equal to
a. B
b. z_{12}
c. $1/y_{12}$
d. h_{12}

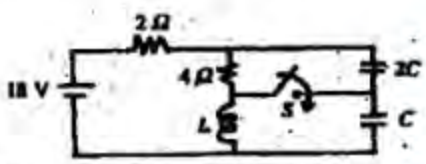
91.


If the transmission parameters of the above network are A = C = 1, B = 2 and D = 3, then the value of Z_{in} is
a. $\frac{12}{13}\Omega$
b. $\frac{13}{12}\Omega$
c. 3Ω
d. 4Ω

92. The impedance matrices of two, two-port networks are given by
$\begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ and $\begin{bmatrix} 15 & 5 \\ 5 & 25 \end{bmatrix}$
If these two networks are connected in series, the impedance matrix of the resulting two-port network will be
a. $\begin{bmatrix} 3 & 5 \\ 2 & 25 \end{bmatrix}$
b. $\begin{bmatrix} 18 & 7 \\ 7 & 28 \end{bmatrix}$
c. $\begin{bmatrix} 15 & 2 \\ 5 & 3 \end{bmatrix}$
d. indeterminate

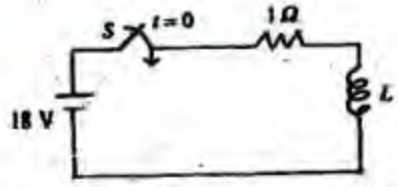
93.


In the circuit shown in the above figure, switch K is closed at t = 0. The circuit was initially relaxed. Which one of the following sources of, v(t) will produce maximum current at $t = 0^+$?
a. Unit step
b. Unit impulse
c. Unit ramp
d. Unit step plus unit ramp

94.


In the circuit shown in the above figure, steady -state was reached when the switch S was open. The switch was closed at t = 0. The initial value of the current through the capacitor 2 C is
a. zero
b. 1 A
c. 2A
d. 3A

95.



In the above circuit, S was initially open. At time t = 0, S is closed. When the current through the inductor is 6 A, the rate of change of current through the resistor is 6 A/s. The value of the inductor would be

a. 1H
b. 2H
c. 3H
d. 4H

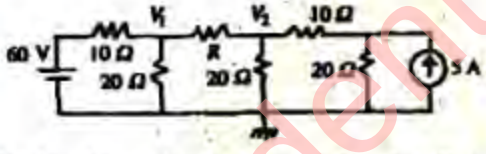
96. Consider the following statements:
If a network has an impedance of (1 – j) at a specific frequency, the circuit would consist of series

1. R and C
2. R and L
3. R, L and C

Which of these statements are correct?

a. 1 and 2
b. 1 and 3
c. 1, 2 and 3
d. 2 and 3

97.



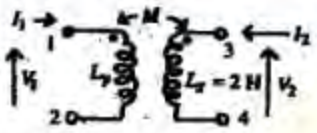
In the above circuit, $V_1 = 40$ V when R is 10 Ω. When R is zero, the value of V_2 will be

a. 40 V
b. 30V
c. 20 V
d. 10 V

98. A network contains only independent current sources and resistors. If the values of all resistors are doubled, the values of the node voltages

a. will become half
b. will remain unchanged
c. will become double
d. cannot be determined unless the circuit configuration and the values of the resistors are known

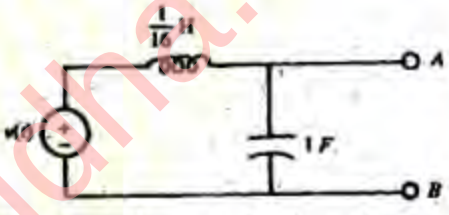
99.



In the transformer shown in the above figure, the inductance measured across the terminal 1 and 2 was 4 H with open terminals 3 and 4. It was 3 H when the terminal 3 and 4 were short circuited. The coefficient of coupling would be

a. 1
b. 0.707
c. 0.5
d. Indeterminate due to insufficient data

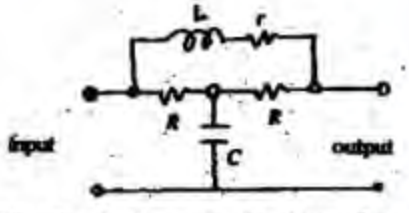
100.



The circuit shown in the above figure, will act as an ideal current source with-respect to terminals A and B, when frequency is

a. zero
b. 1 rad/s
c. 4 rad/s
d. 16 rad/s

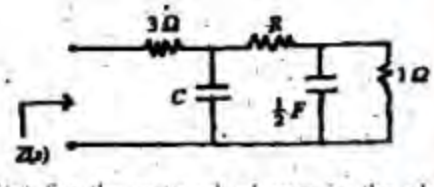
101.



The circuit shown in the above figure is a

a. low pass filter
b. high pass filter
c. band pass filter
d. band stop filter

102.



Z(s) for the network shown in the above figure is

$$\frac{3(s^2+6s+8)}{s^2+4s+3}$$

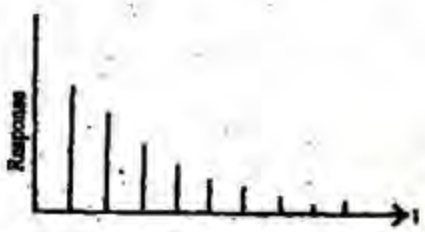
The value of C and R are, respectively

a. 1/6 F and 4 Ω
b. 2/9 F and 9/2 Ω
c. 2/3 F and 1/2 Ω
d. 1/2 F and 1Ω

103. A continuous-time system is governed by the equation
$3y^3(t) + 2y^2(t) + y(t) = x^2(t) + x(t)$.
{y(t)and x(t) respectively are output and input). The system is

a. linear and dynamic
b. linear and non-dynamic
c. non-linear and dynamic
d. non-linear and non-dynamic

104.



The impulse response of a discrete system with a simple pole shown in the above figure.
The pole of the system must be located on the

a. real axis at z = –1
b. real axis between z = 0 and z = 1
c. imaginary axis at z = j
d. imaginary axis between z = 0 and z = j

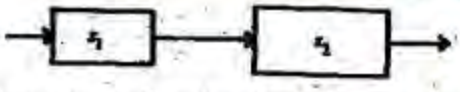
105. Which one of the following systems is a causal system?
[y(t) is output and u(t) is a input step function]

a. y(t) = sin (u(t + 3))
b. y(t) = 5u(t) + 3u(t – 1)
c. y(t) = 5u(t) + 3u(t + 1)
d. y(t) = sin (u(t – 3)) + sin (u(t + 3))

106. Which one of the following transfer functions represents the critically damped system?

a. $H_1(s) = \frac{1}{s^2 + 4s + 4}$
b. $H_2(s) = \frac{1}{s^2 + 3s + 4}$
c. $H_3(s) = \frac{1}{s^2 + 2s + 4}$
d. $H_4(s) = \frac{1}{s^2 + s + 4}$

107.



Two linear time-invariant discrete time systems s_1 and s_2 are cascaded as shown in the above figure. Each system is modelled by a second order difference equation. The difference equation of the overall cascaded system can be of the order of

a. 0, 1, 2, 3 or 4
b. either 2 or 4
c. 2
d. 4

108. Consider the following equations for the state transition matrix of the linear time-invariant continuous time system '$\phi(t)$' :

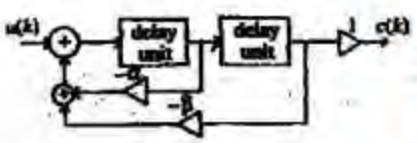
1. $\phi(-t) = [\phi(t)]^{-1}$
2. $[\phi(t)]^k = \phi(t^k)$ for any positive integer 'k'
3. $\phi(t - t_0) = \phi(t)\,\phi(-t_0)$ for any constant t_0.

Which of these equations correctly define the properties of the given system ?

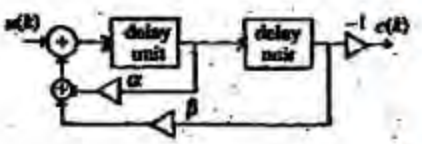
a. 1, 2 and 3
b. 1 and 2
c. 1 and 3
d. 2 and 3

109. Which one of the following is the correct state-space realization of a discrete system given by the difference equation
$c(k + 2) + \alpha\, c(k + 1) + \beta\, c(k) = u(k)$?

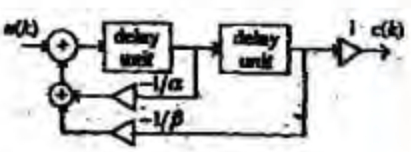
a.



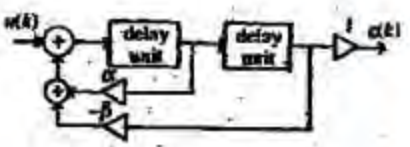
b.



c.



d.



110. The Fourier series representation of a periodic current is
$[2 + 6\sqrt{2}\cos\omega t + \sqrt{48}\sin 2\omega t]A$.
The effective value of the current is
a. $(2 + 6 + \sqrt{24})A$
b. 8 A
c. 6 A
d. 2 A

111. Match List I (Properties) with List II (Characteristics of the trigonometric form) in regard to Fourier series of periodic f(t) and select the correct answer :
List I
A. $f(t) + f(-t) = 0$
B. $f(t) - f(-t) = 0$
C. $f(t) + f(t - T/2) = 0$
D. $f(t) - f(t - T/2) = 0$
List II
1. Even harmonics can exist
2. Odd harmonics can exist
3. The dc and cosine terms can exist
4. sine terms can exist
5. cosine terms of even harmonics can exist

	A	B	C	D
a.	4	5	3	1
b.	3	4	1	2
c.	5	4	2	3
d.	4	3	2	1

112. Consider the following statements regarding the fundamental component $f_1(t)$ of an arbitrary periodic signal f(t):
It is possible for
1. the amplitude of $f_1(t)$ to exceed the peak value of f(t).
2. $f_1(t)$ to be identically zero for a non-zero f(t).
3. the effective value of $f_1(t)$ to exceed the effective value of f(t).
Which of these statements is / are correct?
a. 1 alone
b. 1 and 2
c. 2 and 3
d. 1 and 3

113. Match list I with List II and select the correct answer:
List I
A. $f(t) = -f(-t)$
B. $\sum_{n=-\infty}^{\infty} C_n e^{jn\omega_0 t}$
C. $\int_{-\infty}^{\infty} f(t)e^{-j\omega t}dt$
D. $\int_{0}^{\infty} f_1(\tau)f_2(t-\tau)d\tau$
List II
1. Exponential form of Fourier series
2. Fourier transform
3. Convolution integral
4. z – transform
5. Odd function wave symmetry

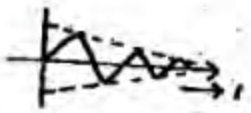
	A	B	C	D
a.	5	1	2	3
b.	2	1	5	3
c.	5	4	2	1
d.	4	5	1	2

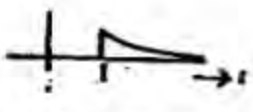
114. A voltage signal v(t) has the following Fourier transform:
$$V(j\omega) = \begin{cases} e^{-j\omega t} & \text{for } |\omega| < 1 \\ 0 & \text{for } |\omega| > 1 \end{cases}$$
The energy that would be dissipated in a 1Ω resistor fed from v(t) is
a. $2/\pi$ Joules
b. $2e^{-2}/\pi$ Joules
c. $1/\pi$ Joules
d. $1/2\pi$ Joules

115. The output of a linear system to a unit step input u(t) is t^2e^{-2t}. The system function H(s) is
a. $\frac{2}{s^2(s+2)}$
b. $\frac{2}{(s+2)s^2}$
c. $\frac{2}{(s+2)^3}$
d. $\frac{2s}{(s+2)^3}$

116. Match List I (System function) with List II (Impulse response) and select the correct answer :
List I
A. $\frac{e^{-s}}{s+1}$
B. $\frac{1}{s^2+s+1}$
C. $\frac{1}{(s+1)^2}$
D. $\frac{1}{s^2+s}$
List II
1.

2. 

3. 

4. 

5. 

	A	B	C	D
a.	3	4	1	2
b.	5	2	3	4
c.	3	2	1	4
d.	5	4	3	2

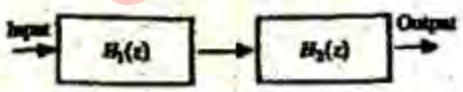
117. If the step response of a causal, linear time-invariant system is a(t), then the response of the system to a general input x(t) would be

a. $\int_{0^-}^{t} \frac{da(\tau)}{d\tau} x(t-\tau)d\tau$

b. $a(0)x(t)+\int_{0}^{t} \frac{da(\tau)}{d\tau} x(t-\tau)d\tau$

c. $x(0)a(t)+\int_{0}^{t} x(\tau)a(t-\tau)d\tau$

d. $x(0)a(t)+\int_{0}^{t} \frac{da(\tau)}{d\tau} x(t-\tau)d\tau$

118. 

Consider the compound system shown in the above figure; Its output is equal to input with a delay of two units. If the transfer function of the first system as given by $H_1(z) = \frac{z-0.5}{z-0.8}$, then the transfer function of the second system would be

a. $H_2(z) = \frac{z^{-2}-0.2z^{-3}}{1-0.4z^{-1}}$

b. $H_2(z) = \frac{z^{-2}-0.8z^{-3}}{1-0.5z^{-1}}$

c. $H_2(z) = \frac{z^{-1}-0.2z^{-3}}{1-0.4z^{-1}}$

d. $H_2(z) = \frac{z^{-2}+0.8z^{-3}}{1+0.5z^{-1}}$

119. Match List I with List II and select the correct answer:

List I {x(n)}

A. $\alpha^n u(n)$

B. $-\alpha^n u(-n-1)$

C. $-n\alpha^n u(-n-1)$

D. $n\alpha^n u(n)$

List II {X(z)}

1. $\frac{\alpha z^{-1}}{(1-\alpha z^{-1})^2}$
ROC : $|z| > |\alpha|$

2. $\frac{1}{(1-\alpha z^{-1})}$
ROC : $|z| > |\alpha|$

3. $\frac{1}{(1-\alpha z^{-1})}$
ROC : $|z| < |\alpha|$

4. $\frac{\alpha z^{-1}}{(1-\alpha z^{-1})^2}$
ROC : $|z| < |\alpha|$

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

120. A linear system has the transfer function $H(j\omega) = \frac{1}{(j\omega+1)}$. When it is subjected to an input white noise process with a constant spectral density 'A', the spectral density of the output will be

a. $\frac{1}{(j\omega+1)}$

b. $\frac{A}{(j\omega+1)^2}$

c. $\frac{A}{(\omega^2+1)}$

d. $\frac{A}{\sqrt{(\omega^2+1)}}$