ELECTRONICS & TELECOMMUNICATION ENGINEERING

PAPER-I

1. Consider the following operations in respect of a Wheat- stone bridge:

   (Key "K_b" is used for the supply battery and Key "K_g" is used for the galvanometer)

   1. Open K_b
   2. Close K_g
   3. Close K_b
   4. Open K_g

   The correct sequence of these operations is:

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

2. Loading effect is primarily caused by instruments having

   a. High resistance
   b. High sensitivity
   c. Low sensitivity
   d. High range

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

   List I

   A. Former
   B. Coil
   C. Core
   D. Springs

   List II

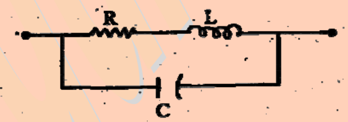
   1. Produces deflecting torque
   2. Provides base for the coil
   3. Makes the magnetic field radial
   4. Provides controlling torque

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

4. Measurement of an unknown voltage with a dc potentiometer loses its advantage of open-circuit measurement when

   a. The primary circuit battery is changed
   b. Standardization has to be done again to compensate for drifts
   c. Voltage is larger than the range of the potentiometer
   d. Range reduction by a factor of 10 is employed

5. The equivalent circuit of a resistor is shown in the given figure. The resistor will be non-inductive if



   a. R = L/C
   b. $R = \sqrt{L/C}$
   c. $L = CR^2$
   d. $C = LR^2$

6. The difference between the measured value and the true called value is

   a. Gross error
   b. Relative error
   c. Probable error
   d. Absolute error

7. Harmonic distortion analyzer

   a. Measures the amplitude of each harmonica component
   b. Measures the rms value of fundament frequency component
   c. Measures the rms value of all the harmonic component except the fundamental frequency component
   d. Displays the rms value of each harmonic component of the screen of a CRO

8. If the secondary winding of a current transformer is opened while the primary winding is carrying current, then

   a. The transformer will bum immediately

b. There will be weak flux density in the core

c. There will be a very high induced voltage in the secondary winding

d. There will be a high current in the secondary winding

9. A dual-trace CRO has

a. One electron gun

b. Two electron guns

c. One electron gun and one two-pole switch

d. Two electron guns and one two-pole switch

10. A 3½ digit voltmeter having a resolution of 100 mV can be used to measure maximum voltage of

a. 100V

b. 200V

c. 1000 V

d. 5000 V

11. A coil is tuned to resonance at 1 MHz with a resonating capacitance of 72 pF. At 500 kHz, the resonance is obtained with a resonating capacitance value of 360 pF. The self-capacitance of the coil is

a. 12 pF

b. 24 pF

c. 36 pF

d. 72 pF

12. Match List I (Bridges) with List II (Parameters) and select the correct answer:

List I

A. Anderson bridge

B. Kelvin Bridge

C. Schering Bridge

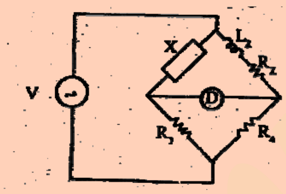
D. Wheal stone Bridge

List II

1. Low Resistance
2. Medium Resistance
3. Inductance
4. Capacitance

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

13. In the balanced bridge shown in the figure, 'X' should be



a. A self-inductance having resistance

b. A capacitance

c. A non-inductive resistance

d. An inductance and a capacitance in parallel

14. A 300 V full-scale deflection voltmeter has an accuracy of ±2%, when it reads 222 V. The actual voltage

a. Lies between 217.56 V and 226.44 V

b. Lies between 217.4 V and 226.6 V

c. Lies between 216 V and 228 V

d. Is exactly 222 V

15. While using Maxwell bridge, the Q factor of a coil is obtained as

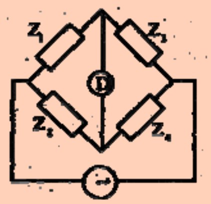
a. $1/\omega CR$

b. ωCR

c. $\omega C/R$

d. $R / \omega C$

16. The ac bridge shown in the figure is balanced if $Z_1 = 100\angle 30°$, $Z_2 = 150\angle 0°$; $Z_3 = 250\angle -40°$ and Z_4 is equal to



a. $325\angle 70°$

b. $375\angle -70°$

c. $150\angle 0°$

d. $150\angle 20°$

17. The device possessing the highest photosensitivity is a

a. Photoconductive cell

b. Photovoltaic cell

c. Photodiode

d. Phototransistor

18. Consider the following statements:

1. Use of digital computers along with transducers makes data manipulation easier.
2. Digital signals are not dependent on signal amplifiers and so are easy to transmit without distortion and external noise.
3. Increased accuracy in pulse count is possible.
4. There are ergonomic advantages in presenting digital data.

The main advantages of digital transducers include

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

19. Load cell employ

a. Piezoelectric crystal
b. Capacitor
c. Mutual inductance
d. Strain gauges

20. A 5-channel dc to 60 Hz telemetry system used PAM and PCM systems. For a good quality data transmission, the minimum sampling rate must be

a. 300 samples/s
b. 500 samples/s
c. 1500 samples/s
d. 1250 samples/s

21. A Hall effect transducer can be used to measure

a. Displacement, temperature and magnetic flux
b. Displacement, position and velocity
c. Position, magnetic flux and pressure
d. Displacement, position and magnetic flux

22. Which one of the following pairs of Modulation techniques and Telemetry situations and conditions is correctly matched?

a. Pulse width modulation : Low amplitude signals
b. Pulse code modulation : For short distances when power is enough
c. Pulse amplitude modulation : Power to be spen in telemetry is required to be low
d. Pulse position modulation: Minimization of interference effects

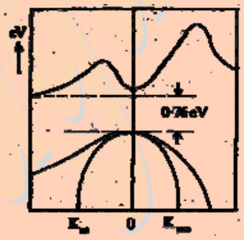
23. Quantum effects have to be taken into account in determining the properties of materials if

a. $E_F = 3/2\ KT$
b. $E_F < 3/2\ KT$
c. $E_F > 3/2\ KT$
d. $E_F >> 3/2\ KT$

24. The Ohm's law for conduction in metals is:

a. J = 6E
b. J = E/6
c. $J \propto 6E$
d. $J \propto E/6$

25. The band structure shown in the given figure is that of



a. Gallium Arsenide (GaAs)
b. Silicon (Si)
c. Copper (Cu)
d. Germanium (Ge)

26. The magnetic moment in units of Bohr magneton of a ferrous ion in any ferrite is

a. Zero
b. 2
c. 4
d. 6

27. For a permanent magnetic material,

a. The residual induction and the coercive field should be large
b. The residual induction and the coercive field should be small
c. The area of hysteretic loop should be small
d. The initial relative permeability should be large

28. Consider the following statements regarding an insulating material connected to an ac signal
   1. The dielectric constant increases with frequency.
   2. The dielectric constant decreases with frequency.
   3. Atomic polarization decreases with frequency.

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

29. The most important set of specifications of transformer oil includes
   a. Dielectric strength and viscosity
   b. Dielectric strength and flash point
   c. Flash point and viscosity
   d. Dielectric strength, flash point and viscosity

30. Which one of the following pairs of semiconductors and current carriers is correctly matched?
   a. Intrinsic : No. of electrons = No. of holes
   b. p-type : No. of electrons> No. of holes
   c. n-type : No. of electrons <No. of holes
   d. Bulk : Neither electrons nor holes

31. The magnetization' M' of a super conductor in a field of H is
   a. Extremely small
   b. – H
   c. –1
   d. Zero

32. The maximum power handling capacity of a resistor depends on
   a. Total surface area
   b. Resistance value
   c. Thermal capacity of the resistor
   d. Resistively of the material used in the resistor

33. A transistor emitter base voltage (V_{EB}) of 20 mV has a collector current (I_C) of 5 mA. For V_{EB} of 30 mV, I_C is 30 mA. If V_{EB} is 40 mV, then the I_c will be
   a. 55 mA
   b. 160 mA
   c. l80 mA
   d. 270 mA

34. An ideal constant voltage source is connected in series with an ideal constant current source. Considered together, the combination will be a
   a. Constant voltage source
   b. Constant current source
   c. Constant voltage and a constant current source or a constant power source
   d. Resistance

35. Match List I (Devices) with list II (Characteristics) and select the correct answer:

   List I
   A. BJT
   B. MOSFET
   C. Tunnel diode
   D. Zener diode

   List II
   1. Voltage controlled negative resistance
   2. High current gain
   3. Voltage regulation
   4. High input impedance

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

36. A series resonant circuit has an inductive reactance of 1000Ω, a capacitive reactance of 1000 Ω and a resistance of 0.1 Ω. If the resonant frequency is 10 MHz, then the bandwidth of the circuit will be
   a. 1 kHz
   b. 10 kHz
   c. 1 MHz
   d. 0.1 kHz

37. In a junction transistor, the collector cutoff current I_{CBO} reduces considerably by doping the
   a. Emitter with high level of impurity
   b. Emitter with low level of impurity
   c. Collector with high level of impurity
   d. Collector with low level of impurity

38. In a junction transistor biased for operation at emitter current 'I_E' and collector current 'I_C' the transco0nductance 'g_m' is

a. $KT/q\ I_E$

b. $q\ I_E/KT$

c. I_C/I_E

d. I_E/I_C

39. A p-n junction diode's dynamic conductance is directly proportional to

a. The applied voltage

b. The temperature

c. Its current

d. The thermal voltage

40. The Trans conductance 'g_m' of a JFET is equal to

a. $-\dfrac{2I_{DSS}}{V_p}$

b. $\dfrac{2}{|V_P|}\sqrt{I_{DSS}I_{DS}}$

c. $-\dfrac{2I_{DS}}{V_P}$

d. $\dfrac{I_{DSS}}{V_P}\left(1-\dfrac{V_{GS}}{V_P}\right)$

41. The unit of a thermal resistance of a semiconductor device is

a. Ohms

b. Ohms/ °C

c. °C/ Ohm

d. °C/ Watt

42. To avoid thermal runway in the design of an analog circuit, the operating point of the BJT should be such that it satisfies the condition

a. $V_{CE} = ½\ V_{CC}$

b. $V_{CE} \le 1/2\ V_{CC}$

c. $V_{CE} > ½\ V_{CC}$

d. $V_{CE} \le 0.78\ V_{CC}$

43. Consider the following devices:

1. BJT in CB mode
2. BJT in CE mode
3. JFET
4. MOSFET

The correct sequence of these devices in increasing order of their input impedance is

a. 1,2,3,4

b. 2,1,3,4

c. 2, 1, 4, 3

d. 1, 3, 2, 4

44. SCR turns OFF from conducting state to blocking state on

a. Reducing gate current

b. Reversing gate voltage

c. Reducing anode current below holding current value

d. Applying ac to the gate

45. In an integrated circuit, the SO_2 layer provides

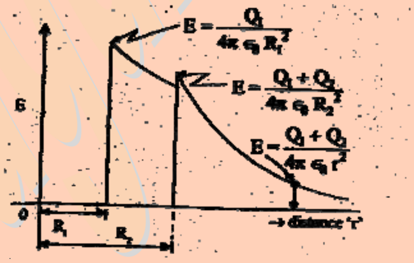
a. Electrical connection to external circuit

b. Physical strength

c. Isolation

d. Conducting path

46. The given figure represents the variation of electric field 'E'



a. Due to a spherical volume charge $Q = Q_1 + Q_2$

b. Due to two concentric shells of charges Q_1 and Q_2 uniformly distributed over spheres of radii R_1 and R_2

c. Due to two points charges Q1 and Q2 located at any two points 'r' (- R_1 and R_2)

d. In a signal spherical shell of charges Q uniformly distributed, $Q = Q_1 + Q_2$

47. Two small diameter 5g dielectric balls can slide freely on a vertical non-conducting thread. Each ball carries a negative charge of 2µc. if the lower ball is restrained from moving, then the separation between the two balls will be

a. 8570 mm

b. 857mm

c. 85.7 mm

d. 8.57 mm

48. Solutions of Laplace's equation, which are continuous through the second derivative, are called

a. Bessel functions

b. Odd functions

c. Harmonic functions

d. Fundamental functions

49. Charge needed within a unit sphere centred at the origin for producing a potential field,

$V = \dfrac{6r^5}{\epsilon_0}$, for r ≤ 1 is

a. 12π C

b. 60π C

c. 120π C

d. 180π C

50. The region between two concentric conducting cylinders with radii of 2 and 5 cm contains a volume charge distribution of $-10^{-8}(1+10r)C/m^3$. If E_r and V both are zero at the inner cylinder and $\epsilon = \epsilon_0$ the potential V at the outer cylinder will be

a. 0.506 V

b. 5.06 V

c. 50.6V

d. 506V

51. A 50 Ω characteristic impedance line is connected to a load which shows a reflection coefficient of 0.268. If V_{in} = 15 V, then the net power delivered to the load will be

a. 0.139 W

b. 1.39 W

c. 0.278W

d. 2.78W

52. For a transmission line with homogeneous dielectric, the capacitance per unit length is 'C' the relative permittivity of the dielectric is $\epsilon_r^{'}$ and velocity of light in free space is 'v'. The characteristic impedance Z_0 is equal to

a. $\dfrac{\epsilon_r}{vC}$

b. $\dfrac{\epsilon_r}{\sqrt{vC}}$

c. $\dfrac{\sqrt{\epsilon_r}}{vC}$

d. $\sqrt{\dfrac{\epsilon_r}{vC}}$

53. A dipole antenna was radiating with some excitation in free space radiating a certain amount of the power. If this antenna is immersed in a lake where water is non-magnetic and non-dissipative but has a dielectric constant of 81, the radiated power with the same excitation will

a. Decrease to finite non-zero value

b. Remain the same

c. Increase

d. Decrease to zero

54. A TEM wave implies obliquely on a dielectric – dielectric boundary with $\epsilon_{r1} = 2$ and $\epsilon_{r2} = 1$

The angle of incidence for total reflection is:

a. 30°

b. 60°

c. 45°

d. 90°

55. It is desired to reduce the reflection at an air porcelain by use of $\lambda/4$ plate. (For porcelain $\mu = \mu_0$ and $\epsilon_r = 7$ The thickness of the polystyrene plate required at 10 GHz will be

a. 5.039 cm

b. 50.39 cm

c. 0.5039 cm

d. 0.05039 cm

56. When the phase velocity of an electromagnetic wave depends on frequency in any medium, the phenomenon is called

a. Scattering

b. Polarization

c. Absorption

d. Dispersion

57. A broadside array operating at 100 cm wavelength consists of 4 half-wave dipoles spaced 50cm apart. Each element carries radio frequency current in the same phase and of magnitude 0.5 A. The radiated power will be

a. 146 W
b. 73 W
c. 36.5 W
d. 18.25W

58. The function $F = e^{-\alpha z} \sin \omega / v - (x - vt)$ satisfies the wave equation $\nabla^2 F = \frac{F}{c^2}$ provided

a. $v = c\left(1 + \frac{\alpha^2 c^2}{c^2}\right)^{-1/2}$
b. $v = c\left(1 + \omega^2 \alpha^2 c^2\right)^{-1/2}$
c. $v = c\omega\left(1 + \alpha^2 c^2\right)^{-1/2}$
d. $v = 1/c\left(1 + \frac{\omega^2 c^2}{c^2}\right)^{-1/2}$

59. An antenna has a gain of 44 dB. Assuming that the main beam of the antenna is circular in cross-section, the beam width will be

a. 0.4456°
b. 1.4456°
c. 2.4456°
d. 3.4456°

60. A plane electromagnetic wave is traveling in an unbounded loss-less dielectric having $\mu_y = 1$ and $\in_y = 4$. The time averaged pointing vector of the wave is 5 W/m^3. The phase velocity V_p (assuming velocity of light as 3×10^8 m/s) is

a. 1.5×10^8 m/s
b. 3×10^8 m/s
c. 2.5×10^8 m/s
d. 0.5×10^8 m/s

61. When a plane wave is incident normally from dielectric '1' $(\mu_0, \in_1)$ onto dielectric '2' $(\mu_0, \in_1)$, the electric field of the transmitted wave is –2 times the electric field of the reflected wave. The ratio $\in_2 / \in_1$ is

a. 0.5
b. 1
c. 2
d. 4

62. If for the transmission of a parallel polarized wave from a dielectric medium of permittivity $\in_1$ into a dielectric medium of permittivity $\in_2$, there exists a value of the angle of incidence θ_p for which the reflection coefficient is zero, than

a. $\tan\text{h}\,\theta_p = \sqrt{\in_1 / \in_2}$
b. $\tan\theta_p = \sqrt{\in_1 / \in_2}$
c. $\tan\theta_p = \sqrt{\in_2 / \in_1}$
d. $\tan h\,\theta_p = \sqrt{\in_2 / \in_1}$

63. For an elliptically polarized wave incident on the interface of a dielectric at the Brewster angle, the reflected wave will be

a. Elliptically polarized
b. Linearly polarized
c. Right circularly polarized
d. Left circularly polarized

64. A rectangular waveguide 2.29cm×1.02cm operates at a frequency of 11 GHz in TE_{10} mode. If the maximum potential gradient of the signal is 5kv/cm, then the maximum power handling capacity of the wave guide of the waveguide will be

a. 31.11 mW
b. 31.11W
c. 31.11 kW
d. 31.11 MW

65. A cavity is a

a. Los-pass filter
b. High-pass filter
c. Band-pass filter
d. Band-stop filter

66. The amounts of time-average energies stores in electric and magnetic fields, for p-th mode of a cavity resonator will be

a. Always equal
b. Equal provided the q-factor is very high
c. Equal in the case of spherical cavities
d. Equal in the case of fundamental mode of oscillation

67. For identifying a radar target in a non-loss medium, if the range of the target is to be doubled; the RF power radiated must be increased by

a. 2 times
b. 4 times
c. 8 times
d. 16 times

68. A dipole antenna of $\lambda/8$ length has an equivalent total loss resistance of 1.5Ω. The efficiency of the antenna is:
a. 0.89159 %
b. 8.9159 %
c. 89. 159%
d. 891.59%

69. For electromagnetic wave propagation in free space, the free space is defined as
a. $\sigma = 0, \in = 1, \mu \neq 1, \vec{p} \neq 0, \vec{j} = 0$
b. $\sigma = 0, \in = 1, \mu = 1, \vec{p} = 1, \vec{j} = 0$
c. $\sigma \neq 0, \in > 1, \mu < 1, \vec{p} \neq 0, \vec{j} = 0$
d. $\sigma = 0, \in = 1, \mu = 1, \vec{p} \neq 0, \vec{j} \neq 0$

70. **Assertion (A):** Net charge within a conductor is always zero.
Reason (R): The conductor has a very large number of free electrons.
a. Both A and Rare 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 B is true

71. Assertion (A): In a graded semiconductor, a built-in electric field exists.
Reason (R): The built-in electric field gives improve performance to a graded base transistor as compared to a uniform base transistor.
a. Both A and Rare 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 B is true

72. Assertion (A): A uniaxial stress on the ends of a piezoelectric crystal develops a potential difference between the two ends of the crystal.
Reason (R): The ions in the crystal get displaced placed and produce dipoles.
a. Both A and Rare 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 B is true

73. Assertion (A): The needle of an indicating instrument attains a position where deflecting and control torques acting on the moving system are equal and opposite.
Reason (R): The oscillations of the needle are suppressed by the damping mechanism.
a. Both A and Rare 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 B is true

74. Assertion (A): FETs are more suitable at the input stages of mill voltmeter and CROs than BJTs.
Reason (R): A FET has lower output impedance than a BJT
a. Both A and Rare 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 B is true

75. Assertion (A): The capacitive transducer is best suited for measurement of very small pressure differentials under dynamic conditions.
Reason (R): The capacitance transducer can be excited by both dc and ac voltages.
a. Both A and Rare 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 B is true

76. Assertion (A): An LTI discrete system represented by the difference equation y(n + 2) - 5y(n + 1) + 6y(n) = x(n) is instable.
Reason (R): A system is unstable if the roots of the characteristic equation lie outside the unit circle.
a. Both A and Rare 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 B is true

77. Assertion (A): Tellegen's theorem is used in developing the sensitivity coefficients of a network from the concept of adjoint network.

Reason (R): Tellegen's theorem is applicable to any lumped network.

a. Both A and Rare 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 B is true

78. The circuit shown in Figure - I is replaced by that in Figure - II. If current 'I' remains the sme, then R_0 will be

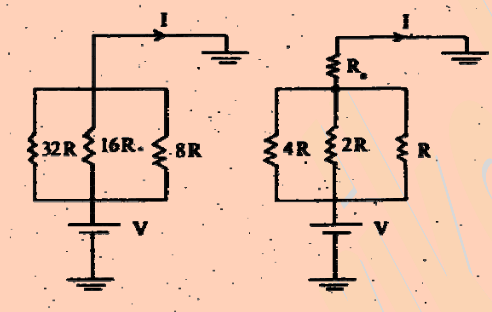


Figure-I Figure-II

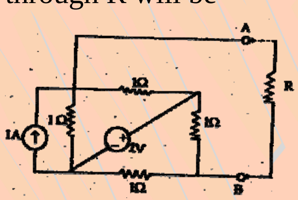
a. zero

b. R

c. 2R

d. 4R

79. If a resistance 'R' of 1Ω is connected across the terminals AB as shown in the given figure, then the current flowing through R will be



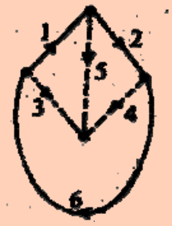
a. 1A

b. 0.5A

c. 0.25 A

d. 0.125 A

80. Consider the graph and tree (dotted) of the given figure:



The fundamental loops include the set of lines

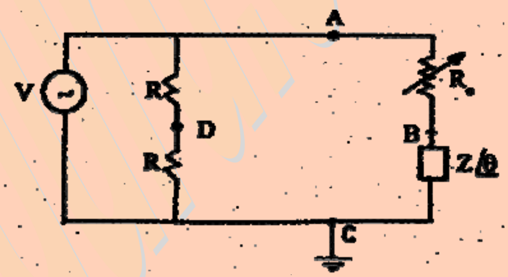
a. (1,5,3), (5, 4, 2) and (3, 4, 6)

b. (1,2,4,3),(1,2,6),(3,4,6)and(1,5,4,6)

c. (1,5,3), (5,4,2), (3,4,6) and (2,4,3,1)

d. (1,2,4,3) and (3, 4, 6)

81. In the circuit shown in the figure, if R_0 is adjusted such that $|V_{AB}| = |V_{BC}|$, then



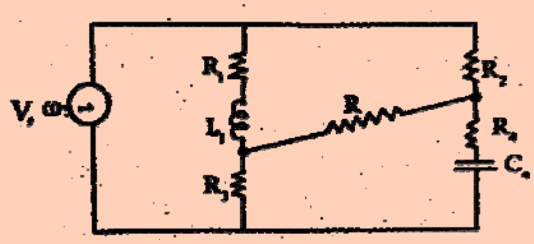
a. $\theta = 2\tan^{-1}\left(\frac{2|V_{BD}|}{|V|}\right)$

b. $|V_{BC}| = |V_{DC}|$

c. $|V_{AB}| = |V_{AD}|$

d. $\theta = \tan^{-1}\left(\frac{|V_{BD}|}{|V|}\right)$

82. In the circuit shown in the figure, if the current in resistance 'R' in Nil, then



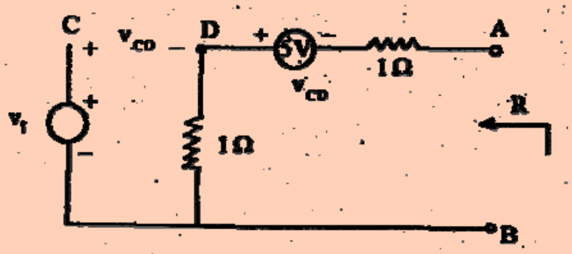
a. $\frac{\omega L_1}{R_1} = \frac{1}{\omega C_4 R_4}$

b. $\frac{\omega L_1}{R_1} = \omega C_4 R_4$

c. $\tan^{-1}\frac{\omega L_1}{R_1} + \tan^{-1}\omega C_4 R_4 = 0$

d. $\tan^{-1}\frac{\omega L_1}{R_1} + \tan^{-1}\frac{1}{\omega C_4 R_4} = 0$

83. The resistance 'R' looking into the terminals AB in the circuit shown in the figure will be



a. 0.5Ω

b. 2Ω

c. 3Ω

d. 7Ω

84. Consider the following statements for a 2-port network:

1. $Z_{11} = Z_{22}$

2. $h_{12} = h_{21}$

3. $Y_{12} = -Y_{21}$

4. $BC - AD = -1$

The network is reciprocal if and only if

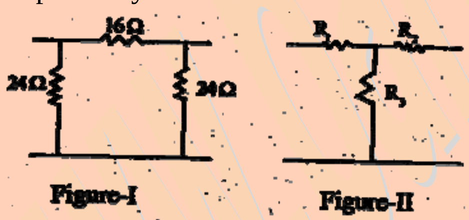
a. 1 and 2 are correct

b. 2 and 3 are correct

c. 3 and 4 are correct

d. 4 alone is correct

85. If the π-network of Figure-I and T-network of Figure – II are equivalent, then the values of R_1, R_2 and R_3 will be respectively



a. 9Ω, 6Ω and 6Ω

b. 6Ω, 6Ω and 9Ω

c. 9Ω, 6Ω and 9Ω

d. 6Ω, 9Ω and 6Ω

86. Voltage transfer function of a simple RC integrator has

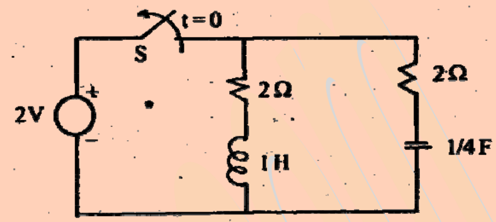
a. A finite zero and a pole at infinity

b. A finite zero and a pole at the origin

c. A zero at the origin and a finite pole

d. A zero at infinity and a finite pole

87. On closing switch 'S' the circuit in the given figure is in steady-state. The current in the inductor after opening the switch 'S' will



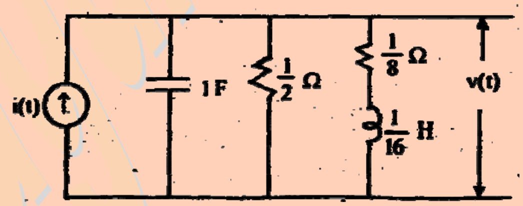
a. decay exponentially with a time constant of ?

b. decay exponentially with a time constant of 0.5s

c. consist of two decaying exponentials each with a time constant of O.5s

d. be oscillatory

88. In the circuit shown in the figure, i(t) is a unit step current. The steady-state value of v(t) is



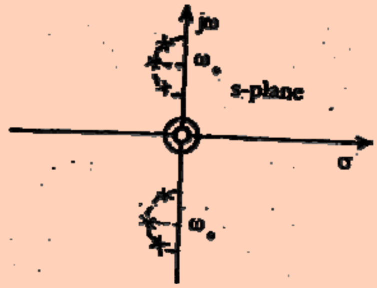
a. 2.5V

b. 1 V

c. 0.1 V

d. zero

89. The given figure shows the pole-zero pattern of a filter in the s-plane. The filter question is a



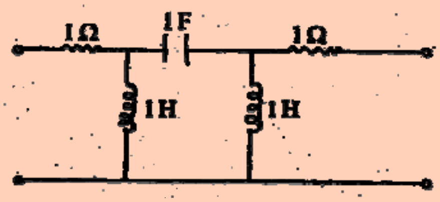
a. band elimination filter

b. band-pass filter

c. loss-pass filter

d. high-pass filter

90. Driving-point impedance of the network shown in the figure is



a. $\dfrac{s^2+2s^2+s+1}{2s^2+1}$

b. $\dfrac{s^3+s^2+s+1}{s^2+1}$

c. $\dfrac{2s^2+1}{s^2+2s^2+s+1}$

d. $\dfrac{s^3+2s^2+s+1}{s^2+1}$

91. Match the List I (Network) with List II (Poles of driving- point impedance) and select the correct answer:

List I

A. LC

B. RC

C. RLC

D. RL

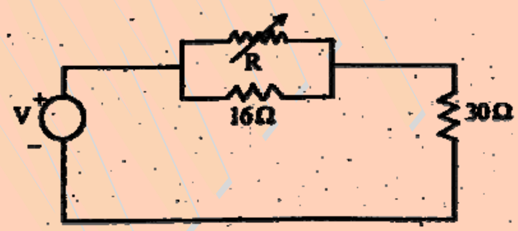
List II

1. Negative real
2. Imaginary
3. Either real or complex

Codes;

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

92. In the circuit shown in the figure, the power dissipated in 30Ω resistor will be maximum if the value of R is



a. 30Ω

b. 16Ω

c. 9 Ω

d. zero

93. In the circuit shown in the figure, for R = 20 Ω the current 'I' is 2A. When R is 10Ω the current 'I' would be

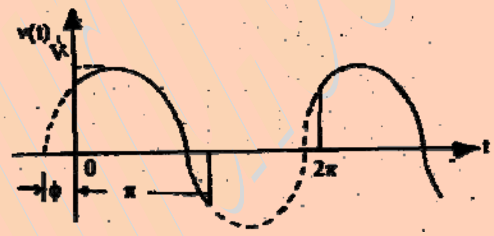
a. 1A

b. 2A

c. 2.5A

d. 3A

94. The average value of the periodic function v(t) of the given figure is



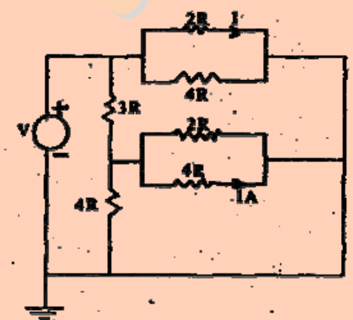
a. V/π cos ϕ

b. V/π sin ϕ

c. 2V/π cos ϕ

d. V/π

95. For the circuit shown in the figure, the current 'I' is



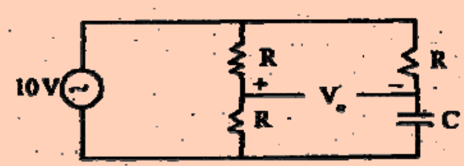
a. indeterminable due to inadequate data

b. zero

c. 4 A

d. 8 A

96. In the circuit shown in the figure, output $|V_o(j\omega)|$ is



a. indeterminable as values of Rand C are not given

b. 2.5 V

c. $5\sqrt{2}$ V

d. 5 V

97. If two identical first order loss-pass filters are cascaded non-interactively, then the unit step response of the composite filter will be

a. critically damped

b. under damped

c. over damped

d. oscillatory

98. Consider the following statements regarding the driving- point admittance function.

$$Y(s) = \frac{s^2 + 2.5s + 1}{s^2 + 4s + 1}$$

1. It is an admittance of RL network.
2. Poles and zeros alternate on the negative real axis of the s-plane.
3. The lowest cricitcal frequency is a pole.
4. $Y(0) = 1/3.$

Which of these statements are correct?

a. 1, 2 and 3

b. 2 and 4

c. 1 and 3

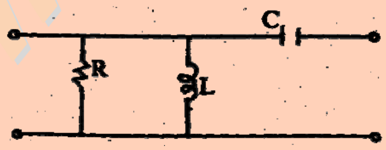
d. 1, 2, 3 and 4

99. An R-L-C circuit for the driving-point admittance function $\left(\frac{\frac{1}{RLs}}{\frac{1}{R} + \frac{1}{Ls}} + Cs \right)$ is

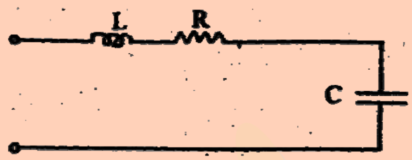
a.

b.

c.



d.



100. Match List I with list II for the driving-point impedance synthesis and select the correct answer:

List (form)

A. Cauer I

B. Cauer II

C. Foster I

D. Foster II

List II (Networks)

1. L in series aims and C in shunt arms of a ladder
2. C in series arms and L in shunt arms of a ladder
3. Series combination of L and C in parallel
4. Parallel combination of L and C in series

Codes;

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

101. Poles and zeros of a driving-point function of a network are simple and interlace on the jω axis. The network consists of elements

a. R and C

b. L and C

c. R and L

d. R, L and C

102. Match List I (Characteristic of f(t)) with List II (Functions and select the correct answers:

List I

A. $f(t)(1 - u(t)) = 0$

B. $f(t) = K\frac{df(t)}{dt} = 0; K$ is a positive constant

C. $f(t) + K\frac{d^2 f(t)}{dt^2} = 0$; K is a positive constant

D. $f(t)+(g(t)-g(o))=0;$ for any arbitrary g(t)

List II

1. Decaying exponential
2. Growing exponential
3. Impulse
4. Causal
5. Sinusoid

Codes;

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

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

(Input x(t) arid output y(t)).

a. Unstable system:

$$\frac{dy(t)}{dt}-0.1\,y(t)=x(t)$$

b. Nonlinear system:

$$\frac{dy(t)}{dt}+2t^2\,y(t)=x(t)$$

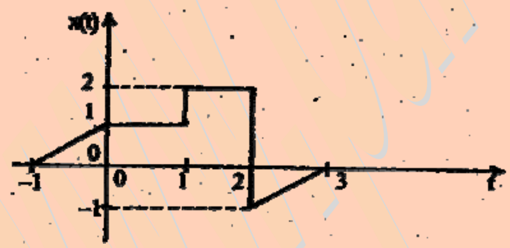
c. Noncausal system:

$$y(t)=x(t+2)$$

d. Nondynarnic system:

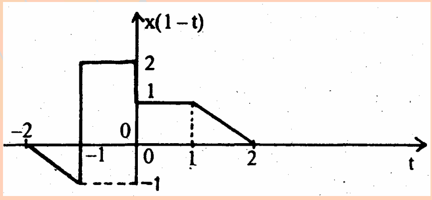
$$y(t)=3x^2(t)$$

104. If a plot of signal x(t) is as shown in the Figure-I,

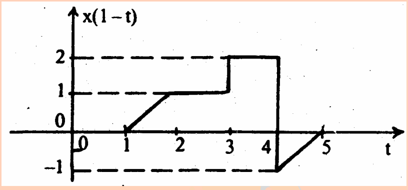


then the plot of the signal x(1 - t) will be

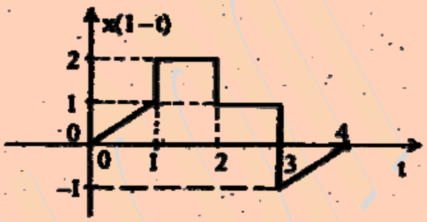
a.



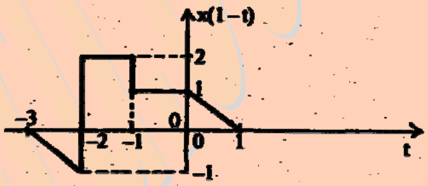
b.



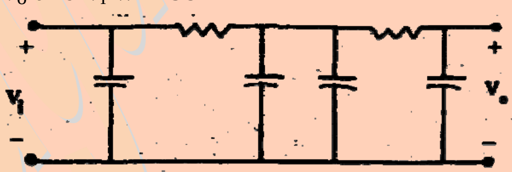
c.



d.



105. For the circuit shown in the figure the order of the differential equation relating v_o and v_i will be



a. 4

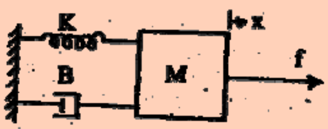
b. 3

c. 2

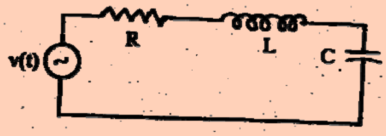
d. 1

106. Consider the following systems:

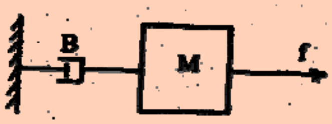
1.



2.



3.



4.

Which of these systems can be modelled by the differential equation $a_2 \frac{d^2 y}{dt^2} + a_1 \frac{dy(t)}{dt} a_0 y(t) = x(t)$?

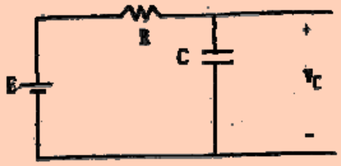
a. 1 and 2

b. 1 and 3

c. 1 and 4

d. 1, 2 and 4

107. Consider the following sets of values of E, R and C of the circuit shown in the figure:



1. 2V, 1Ω and 1.25F
2. 1.6V, 0.8Ω and 1F
3. 1.6V, 1Ω and 0.8F
4. 2V, 1.25Ω and 1.25F

Which of these sets of E, R and C values will ensure that the state equation, $dv_C / dt = 0.25v_C + 2$ is valid?

a. 1 and 4

b. 1 and 2

c. 3 and 4

d. 2 and 3

108. The state model

$$\underline{X}(k+1) = \begin{bmatrix} 0 & 1 \\ -\beta & -\alpha \end{bmatrix} \underline{X}(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$

$$y(k) = [0 \quad 1] \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$

Is represented in the difference equation as

a. $c(k+2) + \alpha c(k+1) + \beta c(k) = u(k)$

b. $c(k+1) + \alpha c(k) + \beta c(k-1) = u(k-1)$

c. $c(k-21) + \alpha c(k-1) + \beta c(k) = u(k)$

d. $c(k-1) + \alpha c(k) + \beta c(k+1) = u(k+1)$

109. The ratio of available power from the dc component of a full-wave rectified sinusoid to the available power of the rectified sinusoid is

a. $8/\pi$

b. $4\sqrt{2}/\pi^2$

c. $4\sqrt{2}/\pi$

d. $8/\pi^2$

110. The signal (1 + M cos 4πt) cos (2π × 10^3t) contains the frequency component (in Hz)

a. 998, 1000 and 1002

b. 1000 and 2000

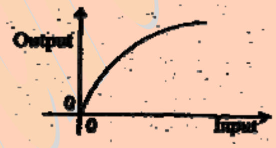
c. dc 2 and 1000

d. …., 996, 998, 1000, 1002, 1004, …..

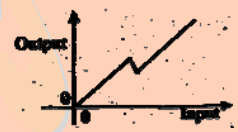
111. Which one of the following input-output relationships is that of a linear system?

a.

b.



c.



d.

112. The discreate-time equation y(n + 1) + 0.5n y(n) = 0.5x (n + 1) is NOT attributable to a

a. Memoryless system

b. Time-varying system

c. Linear system

d. Causal system

113. The period of the function cos $\pi/4(t-1)$ is

a. 1/8 s

b. 8s

c. 4s

d. 1/4s

114. Match List I (Fourier transform) with List II (Functions of time) and select the correct answer:

List I

A. $\dfrac{\sin k\omega}{\omega}$

B. $e^{-j\omega d}$

C. $\dfrac{1}{(j\omega+2)^2}$

D. $k\delta(\omega)$

List II

1. A constant
2. Exponential function
3. t-multiplied exponential function
4. Rectangular pulse
5. Impulse function

Codes;

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

115. Laplace transform of $\sin(\omega t+\alpha)$ is

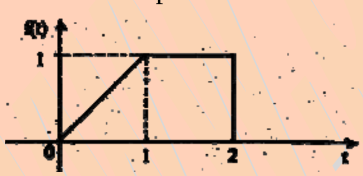
a. $\dfrac{\alpha}{s^2+\alpha^2}\exp(s/\alpha\omega)$

b. $\dfrac{\omega}{s^2+\omega^2}\exp(s/\alpha\omega)$

c. $\dfrac{s}{s^2+\alpha^2}\exp(s/\alpha\omega)$

d. $\dfrac{\omega}{s^2+\alpha^2}\exp(s/\alpha\omega)$

116. The function f(t) shown in the given figure will have Laplace transform as



a. $\dfrac{1}{s^2}-\dfrac{1}{s}e^{-s}-\dfrac{1}{s^2}e^{-2s}$

b. $\dfrac{1}{s^2}\left(1-e^{-s}-e^{-2s}\right)$

c. $\dfrac{1}{s}\left(1-e^{-s}-e^{-2s}\right)$

d. $\dfrac{1}{s^2}\left(1-e^{-s}-se^{-2s}\right)$

117. inverse Laplace transform of the function $\dfrac{2s+5}{s^2+5s+6}$ is

a. 2 exp (-2.5t) cos h 0.5t

b. exp (-2t) – exp (- 3t)

c. 2 exp (-2.5t) sin h 0.5t

d. 2 exp (-2.5t) cos 0.5t

118. Figure – I and Figure – II show respectively the input x(t) to a linear time-invariant system and the impulse response h(t) of the system.

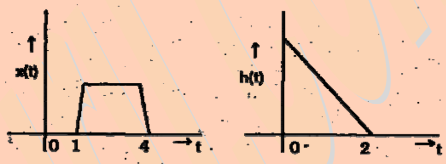


Figure-I Figure-I

The output of the system is zero everywhere except for the time interval

a. $0 < t < 4$

b. $0 < t < 5$

c. $1 < t < 5$

d. $1 < t < 6$

119. Consider the following statements regarding a linear discrete-time system

$$H(z)=\frac{z^2+1}{(z+0.5)(z-0.5)}$$

1. The system is stable
2. the initial value h(0) of the impulse response is -4
3. The steady–state output is zero for a sinusoidal discrete-time input of frequency equal to one-fourth the sampling frequency

Which of these statements are correct?

a. 1, 2 and 3

b. 1 and 2

c. 1 and 3

d. 2 and 3

120. Consider a random sinusoidal signal x(t) = sin (ω_ot + ϕ) where a random variable 'ϕ' is uniformly distributed in the range $\pm\pi/2$. The mean value of x(t) is

a. zero

b. $2/\pi\sin(\omega_o t)$

c. $2/\pi\cos(\omega_o t)$

d. $2/\pi$