1. Consider the statement regarding rank of matrix

P: The rank of every non-sigular matrix is order of that matrix.

Q: The rank of matrix whose "every element is unity" is one

R: Rank m (AB) ≤ min [Rank (A), Rank (B)]

S: The rank of matrix is also change by any number of additional rows or columns of zero.

Which of the following statements are correct?

(a) P, Q and S (b) P, Q and R
(c) Q, R and S (d) All of the above

2. For the following matrix $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ the roots of characteristics equation are

(a) $4 \pm i$ (b) $2 \pm i$
(c) $1 \pm i$ (d) 2, 4

3. The inverse of 2×2 matrix $\begin{bmatrix} 1 & 2 \\ 5 & 7 \end{bmatrix}$ is

(a) $\begin{bmatrix} -7 & 2 \\ 5 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} -\frac{7}{3} & \frac{2}{3} \\ \frac{5}{3} & -\frac{1}{3} \end{bmatrix}$

(c) $\begin{bmatrix} \frac{7}{3} & \frac{2}{3} \\ \frac{5}{3} & \frac{1}{3} \end{bmatrix}$ (d) $\begin{bmatrix} \frac{7}{3} & -\frac{2}{3} \\ -\frac{5}{3} & \frac{1}{3} \end{bmatrix}$

4. Match the List-I (method) with List-II (Application) the following and select the correct answer using the codes given below the lists.

List-I	**List-II**
P. Trapezoidal Rule	1. Non linear differential equation
Q. Milne's method	2. Numerical integration
R. Newton's forward	3. Interpolation formula
S. Gauss elimination	4. Solution of linear Simultaneous equations

Codes :

	P	Q	R	S
(a)	4	3	2	1
(b)	3	4	1	2
(c)	2	1	3	4
(d)	2	4	3	1

5. If that one root of the equation $x^3 - 10x^2 + 31x - 30 = 0$ is 5 then sum of all three roots are

(a) 31 (b) 10
(c) 30 (d) –10

6. Consider a non-homogeneous system of linear equation represents mathematically as overdamped system. Such a system will be

(a) consistent having a unique solution
(b) consistent having many solution
(c) inconsistent having a unique solution
(d) inconsistent having no solution

7. Which of the following is incorrectly method?

(a) $\lim_{x \to 0} \frac{\sin x}{x} = 1$ (b) $\lim_{x \to \infty} \left(\frac{x+6}{x+1}\right)^{x+4} = e^5$

(c) $\lim_{x \to 0} (\cot x)^{\sin x} = 1$ (d) $\lim_{x \to 0} \left[\frac{1}{e^x - 1} - \frac{1}{x}\right] = \frac{1}{2}$

8. Consider the following statement for Rolle's theorem

1. If f(x) is continuous on [a, b]
2. $f'(x)$ exist for all x in (a, b)
3. f(a) = f(b)
4. f(x) is continuous on (a, b)

Which of the following statement are correct?

(a) 2, 3 and 4 (b) 2 and 3
(c) 1, 2 and 3 (d) All of the above

9. Two dice are thrown simultaneously. The probability that the sum of number on both exceeds 7 is

(a) $\frac{2}{9}$ (b) $\frac{7}{9}$

(c) $\frac{4}{9}$ (d) $\frac{5}{9}$

10. ***Assertion (A) :*** Newton Raphson formula to find the roots of an equation f(x) = 0 is given by

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Reason (R) : N-R method is used to solve the linear algebraic equation only.

(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) R is true but A is false

11. The residue of function

$f(z) = \frac{z^2}{(z-2)(z+1)^2}$ at its singularity, is

(a) $\frac{6}{5}$ (b) $\frac{5}{9}$

(c) $\frac{7}{9}$ (d) $\frac{1}{3}$

12. The function $f(z) = \frac{z^2+1}{z^2+4}$ is singular at

(a) z = ± 2 (b) z = ± 1

(c) z = ± i (d) z = ± 2i

13. The principal value of i^i is

(a) $e^{-\frac{\pi}{2}}$ (b) e^{π}

(c) $e^{\frac{\pi}{2}}$ (d) $e^{\frac{i\pi}{2}}$

14. The value of the integral given below is

$$\int_0^{\pi} x^2 \cos x\, dx$$

(a) –2π (b) π

(c) –π (d) 2π

15. As compared to AC transmission DC transmission is free from

(a) Inductance

(b) Capacitance

(c) Phase displacement

(d) All of the above

16. In a DC transmission

(a) it is necessary for the sending and receiving and to be separated in synchronism.

(b) the effect of inductive and capacitive reactances are greater than is AC transmission line of the same rating

(c) there are no effects due to inductive and capacitive reactances

(d) power transfer capability is limited by stability consideration

17. In the HVDC system, the ac harmonics which gets effectively eliminated which 12-pulse bridge converters are

(a) triplen harmonice

(b) triplen and 5^{th} harmonics

(c) triplen, 5^{th} and 7^{th} harmonics

(d) 5^{th} and 7^{th} harmonics

18. Equality and inquality constraints are respectively

(a) $\sum_{i=1}^{n} P_{uti} - P_D = 0$ and $P_{uti}(\min) < P_{uti} < P_{uti}(\max)$

(b) $\sum_{i=1}^{n} P_{uti} + P_D = 0$ and $P_{uti}(\min) < P_{uti} < P_{uti}(\max)$

(c) $\sum_{i=1}^{n} P_{uti} - P_D = 0$ and $P_{uti}(\min) > P_{uti} > P_{uti}(\max)$

(d) None of the above

19. To get an optimal solution to an optimization problem, we will define an objective function as

(a) $C^* = \sum_{i=1}^{n} C_i \ (P_{Gi})$

(b) $C^* = \sum_{i=1}^{n} C_i \ (P_{Gi} - \lambda)$

(c) $C^* = C - \lambda \left\{\sum_{i=1}^{n} P_{Gi} - P_D\right\}$

(d) $C^* = \lambda - C \left\{\sum_{i=1}^{n} P_{Gi} < P_D\right\}$

20. In the economic operation of a power system, the effect of increased penalty factor between a generating plant and system load centre is to

(a) decrease the load an the generating plant

(b) increase the load on the plant

(c) hold the plant load constant

(d) decrease the first and then increase

21. The damping power is approximately given by (where D is damping coefficient)

(a) $P_D = D\frac{d\delta}{dt}$ (b) $P_D = D\frac{d^2\delta}{dt^2}$

(c) $P_D = \left(\frac{d\delta}{dt} + \frac{d\omega}{dt}\right)$ (d) $P_D = D\frac{d\omega}{dt}$

22. Fast acting circuit breakers

(a) improve transient stability

(b) improve steady state stability

(c) improve both transient and steady state stability

(d) do not affect stability

23. The electrical stiffness of a synchronous generator connected to a very large system can be increased by

(a) increasing the excitation or the power angle of the machine

(b) reducing the excitation of the synchronous reactance of the machine

(c) increasing the synchronous reactance of the machine

(d) operating the generator at a much lower MW value compared to the steady state limit.

24. The angle swings during transients

(a) should not exceed 90°

(b) can exceed 90° but can't exceed 180°

(c) can go beyond 180°

(d) will not be greater than swings under minor disturbance

25. Current chopping is minimum in case of

(a) Vaccum CB (b) Oil CB

(c) SF_6 CB (d) ABCB

26. Match List-I (Power System Components) with List-II (Relaying Schemes) and select the correct answer using the codes given below the lists:

List-I	List-II
A. Feeder	**1.** Off set Mho relay
B. Transformer	**2.** Translay relay
C. Generator	**3.** Ratio relay
D. Transmission line	**4.** Buchholz relay

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

27. The relay most likely to maloperate during power swing is

(a) reactance relay (b) mho relay

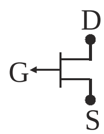
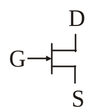
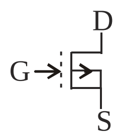
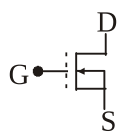
(c) impedance relay (d) both (a) and (c)

28. Match the following

List-I	List-II
A. Clapp	1. RC oscillator for audio frequency
B. Hartley	2. RF oscillator, uses two capacitances and one inductance
C. Colpitt's	3. RF oscillator, uses two inductors and one capacitor
D. Wien Bridge	4. LC oscillator for radio frequencies uses three capacitance and one inductance

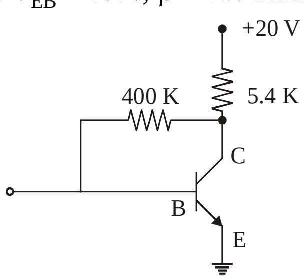
Codes :	**A**	**B**	**C**	**D**
(a)	3	1	4	2
(b)	3	4	1	2
(c)	1	2	3	4
(d)	4	3	2	1

29. Match the following

List-I	**List-II**
A. n-channel JFET	1. 
B. Depletion MOSFET	2. 
C. p-channel JFET	3. 
D. Enhancement MOSFET	4. 

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

30. In figure $V_{EB} = 0.6V$, $\beta = 99$. Then V_C and I_C are



(a) 4.6 V and 0.02 mA respectively
(b) 4.6 V and 1.98 mA respectively
(c) 9.3 V and 1.98 mA respectively
(d) 9.3 V and 0.02 mA respectively

31. ***Assertion (A) :*** CE amplifier is the most widely used BJT amplifier

Reason (R) : CE amplifier has zero phase difference between input and output

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

32. ***Assertion (A) :*** A push-pull amplifier gives more output per active device for a given amount distortion.

Reason (R) : Even harmonics are absent in the output of push-pull amplifier.

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

33. Consider the following statements Timer 555 can be used as

1. Monostable multivibrator
2. Bistable multivibrator
3. Astable multivibrator

Which of the above statements are correct?

(a) 1 & 2 (b) 1 & 3
(c) 2 & 3 (d) 1, 2 & 3

34. Consider the following statements.

1. ECL has least propagation delay
2. TTL has largest fan out
3. CMOS has highest noise margin
4. TTL has lowest power dissipation

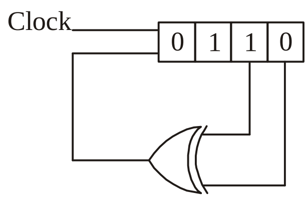
Which of these are correct?

(a) 1 & 3 (b) 2 & 4
(c) 3 & 4 (d) 1 & 2

35. A DRAM cell which holds 5V has to be refreshed every 20 ms so that the stored voltage does not fall by more than 0.5V. If the cell has a constant discharge current of 0.1 pA, the storage capacitance of cell is

(a) 4×10^{-6} F (b) 4×10^{-9} F
(c) 4×10^{-12} F (d) 4×10^{-15} F

36. The initial content of the 4 bit serial in parallel out right shift, shift register shown in figure is 0110. After three clock pulses



(a) 0000 (b) 0101
(c) 1010 (d) 1111

37. For a junction FET is the cut off region, as the drain voltage is increased, the drain current

(a) becomes zero
(b) remains constant
(c) abruptly decreases
(d) abruptly increases

38. The maximum theoretical efficiency of a class B push-pull transistor amplifier is approximately.

(a) 78.6% (b) 50%
(c) 25% (d) 70.7%

39. The coupling capacitor in amplifier circuits

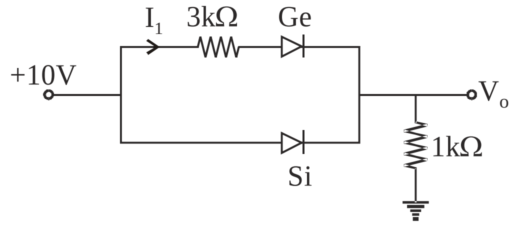
(a) does not affect DC biasing
(b) affects DC biasing to some extent
(c) affects DC biasing
(d) both (b) and (c)

40. The bandwidth of an n-stage tuned amplifier, with each stage having a bandwidth of B is given by

(a) $\frac{B}{\sqrt{n}}$ (b) $\frac{B}{n}$

(c) $\frac{B}{\sqrt{2^{1/n}-1}}$ (d) $B\sqrt{2^{1/n}-1}$

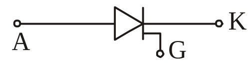
41. Find V_0 and I_1 in the given circuit

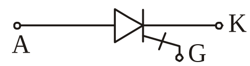


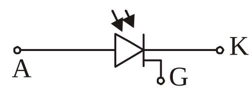
(a) 9.7 V, 0.1667 mA
(b) 9.3 V, 1.667 mA
(c) 9.3 V, 0.1667 mA
(d) 9.7 V, 9.5 mA

42. Match the followings circuit symbols

List-I **List-II**

1. SCR (a) 

2. LASCR (b) 

3. GTO (c) 

(a) 1-(a), 2-(b), 3-(c)
(b) 1-(a), 2-(c), 3-(b)
(c) 1-(c), 2-(b), 3-(a)
(d) 1-(b), 2-(a), 3-(c)

43. Arise in junction temperature effects the width of depletion layer

(a) increase
(b) decrease
(c) remain constant
(d) first increase and then decrease

44. Signal diode current and High power diode current increases

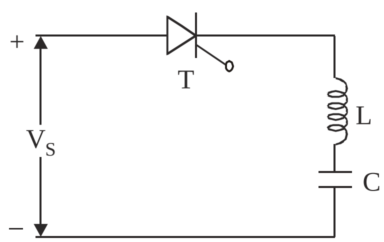
(a) linearly, Exponentially
(b) exponentially, Linearly
(c) linearly, Linearly
(d) exponentially, Exponentially

45. ***Assertion (A) :*** Charging current plays the role of gate current and turns on the SCR when rate of rise of forward voltage $\frac{dv_a}{dt}$ is high.

Reason (R) : Even if v_a is small, SCR may turn on.

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

46. The circuit shown in figure is initially relaxed. The thyristor T is turned on at t = 0. The voltage across capacitor after SCR is turned off, is

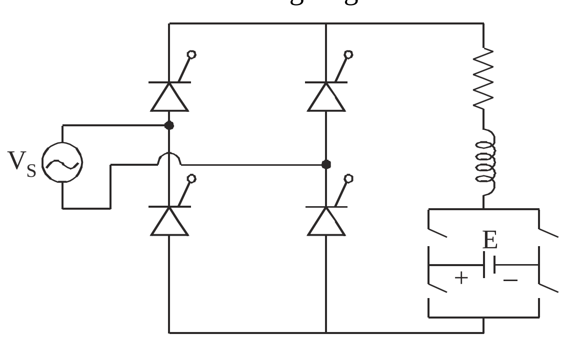


(a) V_S (b) $-V_S$
(c) $2V_S$ (d) $-2V_S$

47. A single phase half-wave rectifier with RL-load has extinction angle of 120°, then find out the circuit turn-off time of thyristor. If supply voltage V = 220 sin100t is applied to circuit

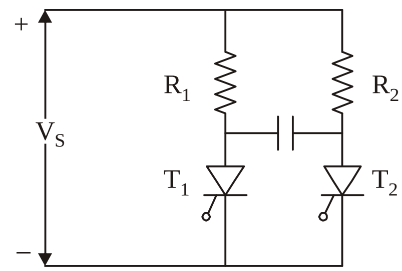
(a) 0 sec (b) 3.14 ms
(c) 41.86 ms (d) 6.28 ms

48. A single phase fully controlled converter shown below is able to feedback the load power to source if the firing angle α is varied from



(a) 0 to 90° and the switches S_3 and S_4 are closed
(b) 0 to 90° and the switches S_1 and S_2 are closed
(c) 90° to 180° and the switches S_3 and S_4 are closed
(d) 90° to 180° and the switches S_1 and S_2 are closed

49. In the circuit shown in figure, $R_1 = 50\Omega$, $R_2 = 100\Omega$ and $V_S = 100V$. The possible peak values of current through T_1 and through T_2 is



(a) 4A, 6A (b) 4A, 5A
(c) 5A, 8A (d) 4A, 8A

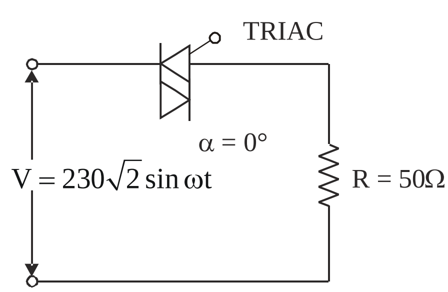
50. A 3-phase inverter is fed from a 600V source. For a star connected resistive load 15Ω/phase. The rms load current for 120° conduction is

(a) 32.66 A (b) 16.33 A
(c) 8.16 A (d) 12.33 A

51. Resonant converters are basically used to

(a) generate large peak voltages
(b) reduce the switching losses
(c) eliminate harmonics
(d) convert a square wave into a sinewave

52. The triac circuit shown in below figure the AC output power to the resistive load. The peak power dissipation in the load, is



(a) 7935 W (b) 5290 W
(c) 2116 W (d) 3968 W

53. A 1-ϕ full wave rectifier has source inductance, overlapping angle corresponding to $\alpha = 0°$ is 10° and device turn-off time is $\frac{1}{314}$ sec., then what will be maximum value of α(firing angle)

(a) 95° (b) 112.67°
(c) 115° (d) 120°

54. A junction with lightly doped layer on its one side requires

(a) low Breakdown Voltage
(b) high Breakdown Voltage
(c) constant Voltage for Long Time
(d) can't Predict

55. ***Assertion (A):*** The image charge must be located in the conducting region.

Reason (R) : Due to image charge in conducting region, it satisfy the Laplace equation.

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

56. Consider the following statement.

(i) Electric field intensity depends on medium.
(ii) Electric flux density depends on medium.

Which is the correct statement among above?

(a) only (i) (b) only (ii)
(c) both (i) and (ii) (d) None

57. Uniform plane wave is given by

$$\vec{E} = 8\cos(\omega t - 4x - 3z)\hat{a}_y \frac{V}{m}$$

is incident on the dielectric slab (Z = const.) with $\mu_r = 1$, $\varepsilon_r = 2.5$, $\sigma = 0$. Wave is

(a) horizontally polarized
(b) vertically polarized
(c) elliptically polarized
(d) circularly polarized

58. Two identical co-axial circular coil carry the same current but in opposite direction. The magnitude of the magnetic field B at a point on the axis midway between the coil is

(a) zero
(b) same as that produced by one coil
(c) twice that produced by one coil
(d) half that produced by one coil.

59. Which one of the following statements does not pertain to the equation $\nabla.\vec{B} = 0$?.

(a) There are no sinks and sources for magnetic fields
(b) Magnetic field is perpendicular to the electric fields
(c) Single magnetic pole cannot exist
(d) $\vec{B}$ is solenoidal

60. Input impedance of short circuited lossless line of length l where $\frac{\lambda}{4} < l < \frac{\lambda}{2}$ will be.

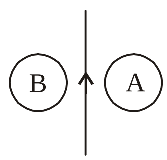
(a) Resistive (b) Inductive
(c) Capacitive (d) None

61. Charge needed within unit sphere centred at origin for producing a potential field V = $-\frac{6r^5}{\epsilon_0}$ for $r \le 1$ is

(a) 30 πC (b) 120 πC

(c) 60 πC (d) 180 πC

62. A straight current-carrying conductor and two conducting loops A and B are shown in the given figure. If the current in the straight wire is decreasing, then the induced currents in the two loops A and B will be



(a) clockwise in both A and B

(b) anticlockwise in both A and B

(c) anticlockwise in A and clockwise in B

(d) clockwise in A and anticlockwise in B

63. Consider the following statements associated wih the basic electrostatic properties of ideal conductors

1. The resultant field inside is zero
2. The net charge density in the interior is zero
3. Any net charge resides on the surface
4. The surface is always an equipotential.
5. The field just outside is zero

Of these statements

(a) 1, 2, 3 and 4 are correct

(b) 2, 4 and 5 are correct

(c) 1, 2 and 3 are correct

(d) 2 and 3 are correct

64. An infinite plane Z = 10 m carries a uniformly distributed charge of density 2 nC/m^2. The electric feld intensity at the origin is

(a) $0.4\vec{a}_z$ nV/m (b) $8\vec{a}_z$ nV/m

(c) $-2\vec{a}_z$ nV/m (d) $-36\pi\vec{a}_z$ V/m

65. Two concentric spherical conducting shells are held at two different potentials. Their centre coincides with the origin of a spherical (r, θ, ϕ) coordinate system. Which one of the following gives the correct nature of the electric field in the annular gap region?

(a) It is purely radial and independent of the coordinates (r, θ, ϕ)

(b) It is purely radial and independent of (θ, ϕ) and varies as r^{-2}

(c) The field lines are like the latitude of the Earth, and depend or (r, θ) but not on ϕ

(d) The field lines are radial and independent of (θ, ϕ) but varies as r^{-1}

66. When an electromagnetic wave travelling in a lossless medion falls on a perfect conductor,

(a) 50% of the energy will be transmitted

(b) the entire energy will be transmitted

(c) the entire energy will be reflected

(d) the transmission of energy will depend upon the angle of incidence

67. In a 100 turn coil, if flux through each turn is ($t^3 - 2t$) mWb. The magnitude of induced emf in the coil at time t = 4 sec. is

(a) 46 mV (b) 56 mV

(c) 4.6 V (d) 5.6 V

68. The voltage reflection coefficient for a wave travelling over a transmissionline terminated in an impedance equal to the surge impedance of the line is

(a) zero (b) 1

(c) –1 (d) ∞

69. The correct relation is

(a) $\vec{P} = \varepsilon_0(\varepsilon_r - 1)\vec{E}$ (b) $\vec{P} = \left(\frac{\varepsilon_0}{\varepsilon_r - 1}\right)\vec{E}$

(c) $\vec{P} = \left(\frac{\varepsilon_0}{\varepsilon_r + 1}\right)\vec{E}$ (d) $\vec{P} = \varepsilon_0(\varepsilon_r + 1)\vec{E}$

70. Some magnetic materials may be classified on the basis of

1. Susceptibility
2. Saturation
3. Spin arrangement
4. Nature of hysteresis
5. Domain structure

Critical temperature above which it behaves as a paramagnetic materials.

Out of these, those which can be used to distinguish between ferrite and ferromagnetic materials would include

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

71. The magnetization M of a superconductor in a field of H is

(a) extremely small (b) –H
(c) –1 (d) Zero

72. Which law is synonymous to the occurrence of diamagnetism?

(a) Ampere's law (b) Maxwell's law
(c) Coulomb's law (d) Lenz's law

73. As per curie-weiss law, the magnetic susceptibility of a material varies as

(a) T^{-2} (b) $\frac{1}{T}$
(c) T (d) T^2

74. German silver contains

(a) 12.5% Silver (b) 5% Silver
(c) 1% Silver (d) No Silver

75. In HRC confridge fuse we use

(a) Gold (b) Silver
(c) Copper (d) Aluminium

76. If the frequency of light falling on a metal plate is doubled, the kinetic energy of emitted electrons will be

(a) Exactly double
(b) Slightly more than double
(c) Slightly less than double
(d) Four times

77. Consider the following steps.

1. Etching
2. Exposure to UV radiation
3. Stripping
4. Developing

After a wafer has been coated with photoresist the correct sequence of these steps in photolithography is

(a) 2, 4, 3, 1 (b) 2, 4, 1, 3
(c) 4, 2, 1, 3 (d) 4, 2, 3, 1

78. Match List-I (Material) with List-II (Classification) and select the correct answer using the codes given below the lists.

List-I	**List-II**
(A) MgO. Fe_2O_3	1. Piezoelectric material
(B) $BaTiO_3$	2. Ferrimagnetic material
(C) Cobalt	3. Ferromagnetic material
(D) Copper	4. Diamagnetic material

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

79. Creation of temperature difference by applying a voltage between two electrode connect to a sample of semiconductor material

(a) Peltier effect (b) Seeback effect
(c) Thomson effect (d) Half effect

80. In a two - wattmeter method of measuring power in a balanced 3-phase circuit, the ratio of the two wattmeter reading is 2 : 1. The circuit power factor is

(a) 0.707 (b) 0.5
(c) 0.866 (d) 1

81. What is meant by a single - chip data acquistion system

(a) A single integrated circuit containing a DAC and a demultiplexer

(b) A single integrated circuit containing on ADC and a multiplexer

(c) A single IC containing all the element of DAS

(d) A single IC Containing an ADC and a DAC

82. A signal contains components with frequencies up to 10 kHz, although no useful information is contained at frequencies 6 kHz. The minimum frequency at which the signal should be sampled, is

(a) 6 kHz (b) 12 kHz

(c) 14.4 kHz (d) 20 kHz

83. Match List-I (instrument type) with List-II (used for) the following and select the correct answer using the codes given below the lists.

	List-I		**List-II**
A.	PMMC	1.	DC only
B.	Moving Iron conected with CT	2.	AC only
C.	Rectifier	3.	AC and DC
D.	Electrodynamometer		

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

84. While measuring of 3-ϕ balanced load by two-wattmeter method, the reading are 100 W and 250 W. The power factor of the load is

(a) 0.802 (b) 0.602

(c) 0.702 (d) 0.902

85. A 100 µA ammeter has an internal resistance of 100Ω. For extending its range to measure 500 µA the shunt required is of resistance

(a) 20.0 Ω (b) 22.22 Ω

(c) 25.0 Ω (d) 50.0 Ω

86. ***Assertion (A) :*** The wein bridge can be used for frequency measurements.

Reason (R) : The wein bridge uses only capacitor and resistors.

(a) Both A and R are correct and R is correct explanation of A

(b) Both A and R are correct and R is not correct explanation of A

(c) A is correct R is wrong

(d) A is wrong R is correct

87. ***Assertion (A) :*** The screen of a CRT is coated with phosphor on the inside

Reason (R) : Phosphor absorbs the KE of the bombarding electrons and re emits energy at a frequency in the visible region.

(a) Both A and R are correct and R is correct explanation of A

(b) Both A and R are correct and R is not correct explanation of A

(c) A is correct R is wrong

(d) A is wrong R is correct

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

	List-I		**List-II**
A.	Megger	1.	Measurement of loss angle in a dielectric
B.	Spectrum analyzer	2.	Measurement of frequency
C.	Schering bridge	3.	Measurement of insulation resistance
D.	Digital counter	4.	Measurement of harmomics

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

89. A 12 bit counter type ADC counter uses a 1 MHz clock. If the full scale output is +10V, its resolution output is

(a) 2.44 mV (b) 2.4 mV

(c) 0.02 V (d) 0.02 mV

90. In case of power measurement by two wattmeter method in a balanced 3-ϕ system with a pure inductive load

(a) Both the wattmeter will indicate the same but of opposite sign

(b) Both the wattmeters will indicate zero

(c) Both the wattmeter will indicate same vlaue and of the same sign

(d) One wattmeter will indicate zero and the other non-zero value

91. Which of the following is not primary transducer?

(a) Burdon tubes

(b) Bellows

(c) LVDT (for displacement measurement)

(d) LVDT (for pressure measurement)

92. Mechanical impedance is the ratio of

(a) rms force to rms velocity

(b) rms force to rms displacement

(c) rms velocity to rms displacement

(d) None of the above

93. Find the inverse laplace transform of

$$f(s) = \frac{2s+12}{s^2+2s+5}$$

(a) $2\,e^{-t}\sin 2t + 5\,e^{-t}\cos 2t$

(b) $2\,e^{-t}\sin 2t - 5\,e^{-t}\cos 2t$

(c) $5\,e^{-t}\sin 2t + 2\,e^{-t}\cos 2t$

(d) $5\,e^{-t}\sin 2t - 2\,e^{-t}\cos 2t$

94. The open loop transfer function of a unity feedback system is

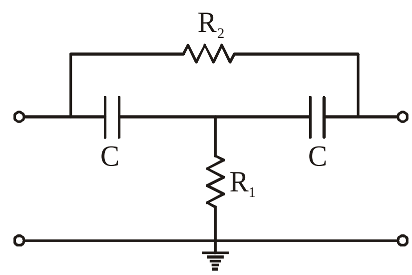
$$G(s) = \frac{50}{s(s+10)(s+5)(s+1)}$$

The gain & phase margins respectively

(a) 10 dB, 28° (b) 28°, 10 dB

(c) 3.2 dB, 14° (d) 14°, 3.2 dB

95. The transfer function $\frac{E_0(s)}{E_i(s)}$ of the bridge. T network shown in figure, is



(a) $\dfrac{R_1CR_2Cs^2+2R_2Cs+1}{R_1CR_2Cs^2+(2R_1C+R_2C)s+1}$

(b) $\dfrac{R_1CR_2Cs^2+(2R_1C+R_2C)s+1}{R_1CR_2Cs^2+2R_1Cs+1}$

(c) $\dfrac{R_1CCs^2+2R_2Cs+1}{R_1CCs^2+(2R_1C+R_2C)s+1}$

(d) None of above

96. ***Assertion (A) :*** The steady state response, of a stable, linear, time invariant system, to sinusoidal input depends on initial conditions.

Reason (R) : Frequency response, in steady state, is obtained by replacing s in the transfer function by jω.

(a) Both A and R are correct and R is correct explanation of A

(b) Both A and R are correct and R is not correct explanation of A

(c) A is correct R is wrong

(d) A is wrong R is correct

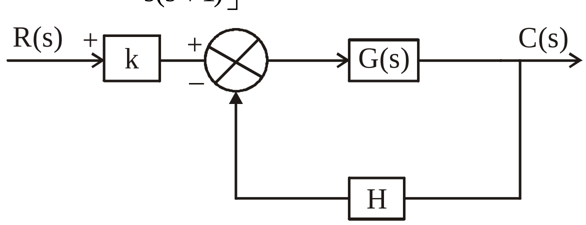
97. ***Assertion (A):*** An LTI discrete system represented by the difference equation
y (n + 2) – 5y (n + 1) + 6y (n) = x(n) is unstable.
Reason (R): A system is unstable if the roots of the characteristic equation lie outside the unit circle.

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

98. A lag lead compensator is essentially a
(a) low pass filter, High pass filter
(b) low pass filter, low pass filter
(c) High pass filter, Band pass filter
(d) High pass filter, low pass filter

99. In bode diagram (lag magnitude plot) the factor $\frac{1}{j\omega}$ in the transfer function having slope
(a) – 20 dB/octave (b) – 2 dB/octave
(c) – 10 dB/octave (d) – 6 dB/octave

100. A control system shown in figure what is the sensitivity of the system's transfer function T with respect to k and H respectively.
[where k = 10V/rad, H = 10 V/rad and $G(s) = \frac{100}{s(s+1)}$]



(a) $1, \frac{s(s+1)}{s^2+s+1000}$

(b) $\frac{1000}{s^2+s+1000}, 1$

(c) $1, -\frac{1000}{s^2+s+1000}$

(d) $\frac{1000}{s^2+s+1000}, -\frac{1000}{s^2+s+1000}$

101. Match list-I (compensation) with list-II (characteristic) the following and select the correct answer using the codes given below the lists.

	List-I		**List-II**
A.	lead	1.	Attenuation
B.	Rate	2.	Increase bandwidth
C.	Lag	3.	Increase damping factor
D.	Lag-lead	4.	Second order

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

102. In feedback control system relative stability can be calculated using
(1) Routh-hurwitz array
(2) Nyquist plot
(3) Root locus techniques
(4) Polar plot
Correct answer is
(a) 2, 3 and 4 (b) 2 and 4
(c) 2 and 3 (d) All of the above.

103. Which of the following is not electro mechanical energy conversion converter
(i) DC Motor
(ii) Synchronous Motor
(iii) Induction Motor
(iii) Transformer
(a) (i), (ii) & (iii) (b) (ii) & (iii)
(c) (iv) Only (d) None

104. An ideal transformer possesses following properties

(i) Winding resistances are negligible

(ii) All the flux setup by the primary links the secondary winding

(iii) The core losses are negligible

(iv) The core has constant permeability

(a) Only (i) & (ii)

(b) Only (i), (ii) & (iv)

(c) Only (i), (ii) & (iii)

(d) All of the above

105. From circuit point of view, which is the equation suitable for transformer (primary winding point of view)

(i) $e_1 = N_1 \frac{d\phi}{dt}$

(ii) $e_1 = -N_1 \frac{d\phi}{dt}$

(a) Only (i) (b) Only (ii)

(c) Both (i) & (ii) (d) None of the above

106. Following data are given - for a transformer

No. of primary turns (N_1) = 100

No. of secondary turns (N_2) = 50

Secondary impedance of transformer = 5Ω

Equivalent impedance referred to primary side is

(a) 10Ω (b) 2.5Ω

(c) 20Ω (d) 1.25Ω

107. 3-ϕ, star connection is used for

(a) low voltage, low capacity application

(b) low voltage, high capacity application

(c) high voltage, low capacity application

(d) high voltage, high capacity application

108. A 150 kW, 250 volt compound generator is connected as long shunt. If the shunt field resistance is 20Ω, then series field current at full load is

(a) 588.5A (b) 600A

(c) 612.5A (d) None of the above

109. Equalizer connection is used in lap winding to

(a) bypass the circulating current

(b) reduce armature reaction effect

(c) increase armature reaction effect

(d) None of the above

110. Semiclosed slots (or) totally closed slots are used in induction motor, essentially to

(a) improve starting torque

(b) increase pull-out torque

(c) increase efficiency

(d) reduce magnetizing current and improve power factor

111. In an induction motor the supply frequency is 50 Hz, the rotor frequency is 4.5 Hz when the slip is 7.5% then the rotor frequency for a slip of 2.5% is.

(a) 13.5 Hz (b) 1.5 Hz

(c) 0 Hz (d) 1 Hz

112. Double field revolving theory, explains the concept of

(a) 1-ϕ Generator

(b) 1-ϕ Synchronous Motor

(c) 1-ϕ DC Motor

(d) 1-ϕ Induction Motor

113. At constant load, the magnitude of armature current of a synchronous motor has large values for

(a) low values of field excitation only

(b) high values of field excitation only

(c) both low values and high values of excitation

(d) None of the above

114. When a synchronous motor delivering rated load is adjusted so that counter emf equals terminal voltage at torque angle 30°, then the impedance voltage drop in armature winding as a percentage of terminal voltage is

(a) 0% (b) 51.8%

(c) 48.2% (d) 100%

115. A cylindrical rotor synchronous generator will deliver maximum power output when

(a) load angle = synchronous impedance angle
(b) load angle = internal power factor angle
(c) load angle = 90°
(d) input power factor is unity

116. ***Assertion (A) :*** An op-amp has high voltage gain, high input impedance and low output impedance.

Reason (R) : Negative feedback increases output impedance

(a) Both A and R are correct and R is correct explanation of A
(b) Both A and R are correct and R is not correct explanation of A
(c) A is correct R is wrong
(d) A is wrong R is correct

117. Which one of the following address technique is not used on 8085 microprocessor?

(a) Register (b) Immediate
(c) Register Indirect (d) Relative

118. Minimum T-States are required to Opcode fetch?

(a) 3T (b) 4T
(c) 5T (d) 6T

119. Machine cycle represent in which operations?

(a) Opcode fetch (d) Memory Read/write
(c) I/O read/write (d) All of these

120. Which of the following flag condition are not available in 8085 microprocessor?

(a) Zero (b) Parity
(c) Overflow (d) Carry

121. Vectored address of RST 6.5 interrupt is

(a) 0034 H (b) 0052 H
(c) 0064 H (d) All these

122. Return of a subroutine is affected by instruction

(a) RST (b) JUMP
(c) RET (d) HLT

123. After completing the execution, the microprocessor returns to

(a) Halt State (b) Fetch state
(c) Execute state (d) Interrupt state

124. Number of output pins in 8085 microprocessor are

(a) 21 (b) 27
(c) 23 (d) 25

125. 80186 microprocessor have Data lines are?

(a) 16 bit (b) 32 bit
(c) 8 bit (d) None of these

126. Which one is logical operation?

(a) ADD B (b) ADI 25 H
(c) CMA B (d) INR B

127. A certain Network N feeds a load resistance R as shown in figure-I. It consumes a power of 'P'Watt. If an identical network is added as shown in figure-II the power consumed by R will be

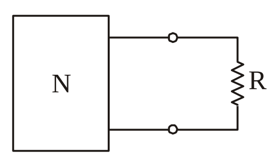


Figure I

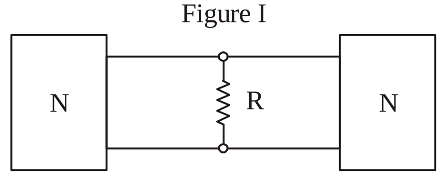
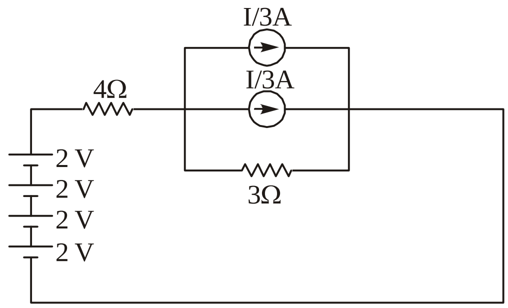


Figure II

(a) less than P
(b) equal to P
(c) between P and 4P
(d) more than 4P

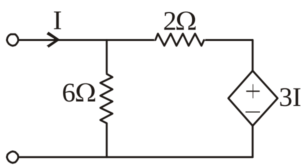
128. In the circuit, the voltage across 3Ω resistance is



(a) 8V (b) $\frac{8}{3}$V

(c) $\frac{8}{5}$V (d) $\frac{8}{4}$V

129. The circuit shown in the figure is equivalent to a load of



(a) $\frac{6}{12}\,\Omega$ (b) 6 Ω

(c) $\frac{15}{4}\,\Omega$ (d) 2 Ω

130. Consider the following statements regarding driving-point admittance function having two complex conjugate poles.

1. Closer the poles to jω-axis, Higher the Q of the circuit.

2. Value of Q varies inversely as the damping ratio

3. A circuit with low R has low quality of these statements

Which of the following statements are true?

(a) 1 and 3 are correct

(b) 1 and 2 are correct

(c) 2 and 3 are correct

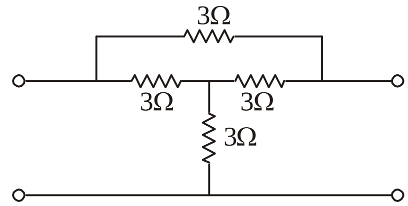
(d) 1, 2 and 3 are correct

131. An series RLC resonant circuit has resonance frequency of 1.5 MHz and a bandwidth of 10 kHz. It C = 150 pF, then the effective resistance of the circuit will be

(a) 9.4 Ω (b) 4.7 Ω

(c) 10.75 Ω (d) 29.5 Ω

132. The y_{21} parameter of the network shown in the given figure will be



(a) $-\frac{1}{3}$ mho (b) $-\frac{4}{6}$ mho

(c) $-\frac{4}{9}$ mho (d) –6 mho

133. Which one of the following is positive real function?

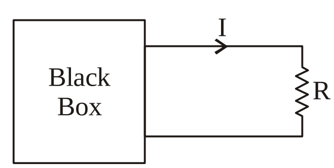
(a) $\frac{s^2+3s^2+2s+1}{4s}$

(b) $\frac{s(s^4+3s^2+1)}{(s+1)(s+2)(s+3)(s+4)}$

(c) $\frac{s(s^2+4)}{(s^2+1)(s^2+6)}$

(d) $\frac{s(s^2-4)}{(s^2+1)(s^2+6)}$

134. The black box as shown in the circuit below contains resistance and independent source. For R = 0 Ω and 3Ω the value of current I is 4 A and 2 A respectively. The value of I for R = 2Ω will be



(a) 2 A (b) 4 A

(c) 2.4 A (d) 4.2 A

135. ***Assertion (A):*** Millman's theorem helps in replacing a number of current sources in parallel by a single current source

Reason (R): Maximum power transistor theorem is applicable only for DC circuits.

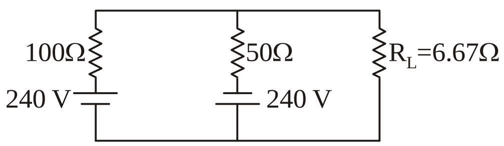
(a) Both A and R are correct and R is correct explanation of A

(b) Both A and R are correct and R is not correct explanation of A

(c) A is correct R is wrong

(d) A is wrong R is correct

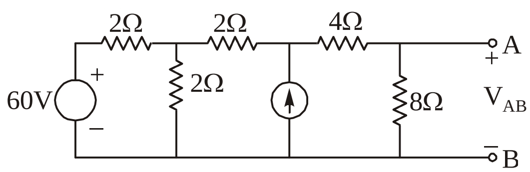
136. In the circuit shown in the given figure, the current I through R_L is



(a) 2 A (b) –2 A

(c) 10 A (d) –5 A

137. Find V_{AB} for the circuit shown below



(a) 105 V (b) 60 V

(c) 56 V (d) 43 V

138. The voltage gain of an amplifier without and with feedback are 100 and 20. The negative feed back is

(a) 80% (b) 20%

(c) 5% (d) 4%

139. Match List-I (Network Theorems) with List-II (Property) and select the correct answer using the codes given in the below list

	List I		**List II**
A.	Reciprocity	1.	Impedance matching
B.	Tellegen's	2.	Bilateral
C.	Superposition	3.	$\sum_{k=1}^{n} V_k(t) i_k(t) = 0$
D.	Maximum. Power transfer	4.	Linear
		5.	Non linear

Code:

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

140. Which one of the following digital filters does have a linear phase response?

(a) $y(n) + y(n-1) = x(n) - x(n-1)$

(b) $y(n) = \frac{1}{6}\left[3x(n) + 2x(n-1) + x(n-2)\right]$

(c) $y(n) = \frac{1}{6}\left[x(n) + 2x(n-1) + 3x(n-2)\right]$

(d) $y(n) = \frac{1}{4}\left[x(n) + 2x(n-1) + x(n-2)\right]$

141. If $F(s) = \frac{2s+5}{s^2+5s+6}$, then f(t) is given by

(a) $e^{-2.5t}\left[\cosh 0.5t + \sinh 0.5t\right]$

(b) $e^{2.5t}\left[\cosh 0.5t + \sinh 0.5t\right]$

(c) $\sqrt{2}\, e^{-2.5t} \sin(0.5t + 45°)$

(d) None of these

142. If the cumulative distribution function is $F_x(x)$, then the probability density function $f_x(x)$ is given as

(a) $\int F_x(x)\, dx$ (b) $\frac{d}{dx} F_x(x)$

(c) $\int F_x(-x)\, dx$ (d) $\frac{d}{dx} F_x(-x)$

143. Consider the following statements:

1. Fourier transform is special case of Laplace transform.

2. Region of convergence need not be specified for Fourier transform.

3. Laplace transform is not unique unless the region of convergence is specified

4. Laplace transform is special case of Fourier transform.

Which of these statements are correct?

(a) 2 and 4 (b) 4 and 1
(c) 4, 3 and 2 (d) 1, 2 and 3

144. Match List-I (Fourier series and Fourier transforms) with List-II (Their properties) and select the correct answer using the codes given below the lists:

	List-I		**List-II**
A.	Fourier series	1.	Discrete, periodic
B	Fourier transform	2.	Continuous, periodic
C	Discrete time Fourier series	3.	Discrete aperiodic
D	Discrete Fourier transform	4.	Continuous, aperiodic

Codes :

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

145. The units of the spectrum obtained by Fourier transforming the covariance function of a stationary stochastic process is

(a) power per Hertz
(b) energy per Hertz
(c) power per second
(d) energy per second

146. The load instruction is mostly used to designate a transfer from memory to a processor register known as

(a) accumulator
(b) instruction register
(c) program counters
(d) memory address register

147. A group of bits that tell the computer to perform a specific operation is known as

(a) instruction code (b) micro-operation
(c) accumulator (d) register

148. The time interval between adjacent bits is called the

(a) word-time (b) bit-time
(c) turn around time (d) slice time

149. Which of the following is not a weighted code?

(a) Decimal number system
(b) Excess 3 code
(c) Binary number system
(d) None of these

150. The circuit used to store one bit of data is known as

(a) register (b) encoder
(c) decoder (d) flip Flop

❍❍❍

ANSWER & EXPLANATION

1. ***Ans. (b)***

2. ***Ans. (b)***

3. ***Ans. (d)***

4. ***Ans. (c)***

5. ***Ans. (b)***

6. ***Ans. (d)***

7. ***Ans. (d)***

8. ***Ans. (c)***

9. ***Ans. (c)***

10. ***Ans. (d)***

11. ***Ans. (b)***

12. ***Ans. (d)***

13. ***Ans. (a)***

14. ***Ans. (a)***

15. ***Ans. (d)***

16. ***Ans. (c)***

17. ***Ans. (d)***

18. ***Ans. (a)***

19. ***Ans. (c)***

20. ***Ans. (c)***

21. ***Ans. (a)***

22. ***Ans. (a)***

23. ***Ans. (d)***

24. ***Ans. (b)***

25. ***Ans. (c)***

26. ***Ans. (d)***

27. ***Ans. (d)***

28. ***Ans (d)***

29. ***Ans (c)***

30. ***Ans (c)***

$$I_C = \frac{20 - 0.6}{5.4 + \frac{400}{9}} = 1.98 \text{ mA}$$

$$V_C = 20 - 1.98 \times 10^{-3} + 5.4 \times 10^{3}$$
$$= 9.3 \text{ V}$$

31. ***Ans (c)***

32. ***Ans (b)***

33. ***Ans. (b)***

34. ***Ans. (a)***

35. ***Ans. (d)***

36. ***Ans. (c)***

37. ***Ans (b)***

38. ***Ans (a)***

39. ***Ans (a)***

40. ***Ans (d)***

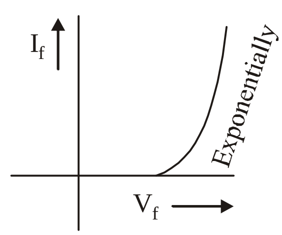
41. ***Ans (c)***

42. ***Ans.(b)***

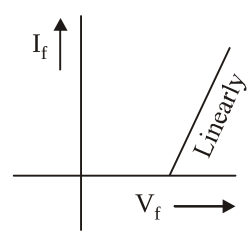
43. ***Ans.(b)***

As the barrier potential depends on width of the depletion layer, the barrier potential decrease with rise in junction temperature.

44. ***Ans.(b)***



Signal Diode

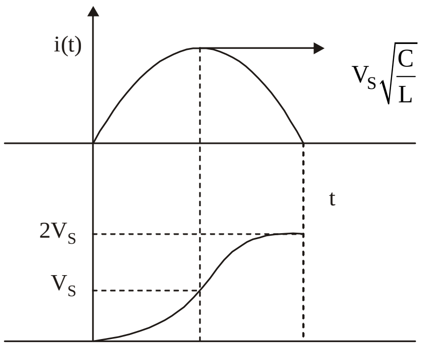


Power Diode

45. ***Ans.(b)***

Magnitude of V_a is not important, rate of rise of anode current plays the important during turning on the SCR.

46. ***Ans.(c)***



For LC-circuit, the current which is flowing in the circuit will be sinusoidal in nature.

47. **(c)**

Circuit turn-off time for 1-ϕ halfwave rectifier is

$$t_C = \frac{2\pi - \beta}{w}$$

$$\beta = 120 \Rightarrow \frac{2\pi}{3}$$

$$t_C = \frac{2\pi - \frac{2\pi}{3}}{100}$$

$$t_C = 41.86 \text{ msec}$$

48. ***Ans.(c)***

Load power to source, when firing angle will be $\alpha > 90°$ and source voltage should have capability to receive power from battery E.

49. ***Ans.(b)***

Maximum (peak current) through thyristor T_1

$$I_{T_1} = \frac{V_S}{R_1} + \frac{2V_S}{R_2}$$

$$= \frac{100}{50} + \frac{200}{100} = 4A$$

$$\left(I_{T_2}\right)_{max} = \frac{V_S}{R_2} + \frac{2V_S}{R_1}$$

$$= \frac{100}{100} + \frac{2\times 100}{50}$$

$$= 1 + 4 = 5A$$

$$\left(I_{T_1}, I_{T_2}\right) = (4A, 5A)$$

50. ***Ans.(b)***

$$I_{ph} = \frac{V_S}{\sqrt{6}(R)}$$

$$(I_{ph})_{load} = \frac{600}{\sqrt{6}\times 15}$$

$$= 16.32 \text{ Amp.}$$

51. ***Ans.(b)***

In resonant converter, if commutation tgakes place at current zero (or) voltage zero, this reduce the switching power loss.

52. ***Ans.(c)***

$$V_{peak} = 230\sqrt{2}$$

$$\text{Peak Power Dissipation} = \frac{(230\sqrt{2})^2}{50}$$

$$= 2116\Omega$$

53. ***Ans.(b)***

max firing angle is given by

$$\alpha_{max} = [180° \ (\omega t_q \text{ in degree}) - \mu_0 \text{ (in degree)}]$$

$$\omega t_q = 2\pi \times 50 \times \frac{1}{314}$$

$$= 1 \text{ rad}$$

$$\text{(in degree)} = \frac{180}{\pi} \times 1 = 57.32°$$

$$\alpha_{max} = (180° - 57.32 - 10)$$

$$\alpha_{max} = 112.67°$$

54. ***Ans.(b)***

A junction with lightly doped layer, has large potential barrier, to destroy this barrier needs large breakdown voltage.

55. ***Ans. (a)***

56. ***Ans. (a)***

57. ***Ans. (b)***

Propagation vector

$$K_i = 4\hat{a}_x + 3\hat{a}_z$$

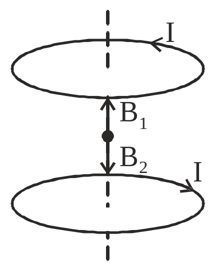
Unit normal vector to the inter face = $\hat{a}_z$

Plane containing K_i and $\hat{a}_z$ is y = constant

Since E_i is normal to the plane

So vertically polarized.

58. ***Ans. (a)***



Since current in the both coil is equal

So $|B_1| = |B_2|$

and in opposite direction

$$\vec{B} = \vec{B}_1 + \vec{B}_2 = 0$$

59. ***Ans. (b)***

60. ***Ans. (c)***

$$Z_{in} = Z_0\left(\frac{Z_L + jZ_0 \tan\beta l}{Z_0 + jZ_L \tan\beta l}\right)$$

For short circuit load $Z_L = 0$

$$Z_{sc} = jZ_0 \tan \beta l$$

for $\frac{\lambda}{4} < l < \frac{\lambda}{2} \Rightarrow \frac{2\pi}{\lambda}.\frac{\lambda}{4} < \beta l < \frac{2\pi}{\lambda}.\frac{\lambda}{2}$

$$\frac{\pi}{2} < \beta l < \pi$$

between $\left(\frac{\pi}{2}, \pi\right)$ tan βl must be –ve

So input impedance will be capacitive.

61. ***Ans. (b)***

$$E = -\frac{dV}{dr} = -\frac{d}{dr}\left(-\frac{6r^5}{\epsilon_0}\right)$$

$$= \frac{30r^4}{\epsilon_0}$$

Electric field at r = 1

$$\frac{30}{\epsilon_0} = \frac{Q}{4\pi\epsilon_0}$$

$$Q = 120\pi \text{ C}$$

62. ***Ans. (b)***

63. ***Ans. (a)***

64. ***Ans. (d)***

65. ***Ans. (c)***

66. ***Ans. (c)***

67. ***Ans. (c)***

$$V = -N\frac{d\phi}{dt}$$

$$= -100\frac{d}{dt}(t^3 - 2t)\text{mV}$$

at t = 4 sec.

V = – 100 [46] mV

= – 4600 mV = – 4.6V

|V| = 4.6V

68. ***Ans. (a)***

69. ***Ans. (a)***

70. ***Ans. (a)***

71. ***Ans. (b)***

72. ***Ans. (d)***

73. ***Ans. (b)***

74. ***Ans. (d)***

75. ***Ans. (b)***

76. ***Ans. (b)***

77. ***Ans. (b)***

78. ***Ans. (c)***

79. ***Ans.(a)***

80. ***Ans.(c)***

81. ***Ans.(b)***

82. ***Ans.(d)***

83. ***Ans.(c)***

84. ***Ans.(a)***

85. ***Ans.(c)***

86. ***Ans.(a)***

87. ***Ans.(a)***

88. ***Ans.(b)***

89. ***Ans.(a)***

90. ***Ans.(a)***

91. ***Ans.(d)***

92. ***Ans. (a)***

93. ***Ans. (c)***

94. ***Ans. (a)***

95. ***Ans. (a)***

96. ***Ans. (d)***

Steady state response does not depend on initial conditions.

97. ***Ans. (a)***

98. ***Ans. (a)***

99. ***Ans. (d)***

$\frac{1}{j\omega}$ for term the slope is –20 dB/decade or –6 dB/octave because –20 log 2 = – 6 dB

100. ***Ans. (c)***

With respect to k

$$S_k^T = 1$$

with respect to H

$$S_k^T = \frac{-GH}{1+GH}$$

$$= -\frac{\frac{100\times10}{s(s+1)}}{1+\frac{100\times10}{s(s+1)}}$$

$$= -\frac{1000}{s(s+1)+1000}$$

$$= -\frac{1000}{s^2+s+1000}$$

101. ***Ans. (b)***

102. ***Ans. (c)***

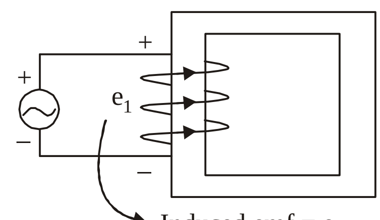
103. ***Ans.(c)***

Transformer is only voltage level converter device, it cannot convert electrical to mechanical energy (or) vice versa.

104. ***Ans.(d)***

All are properties posseses by transformer

105. ***Ans.(a)***



Both polarity of V_1 & e_1 should be same than only KVL can be satisfied

$$\boxed{v_1 - e_1 = 0} \Rightarrow v_1 = e_1 = N_1\frac{df}{dt}$$

106. ***Ans.(c)***

Equivalent impedance referred to primary side

$$z_g^1 = \left(\frac{N_1}{N_2}\right)^2 \cdot z_2$$

$$= \left(\frac{100}{50}\right)^2 \cdot 5 = 4\times5 = 20\Omega$$

107. ***Ans.(c)***

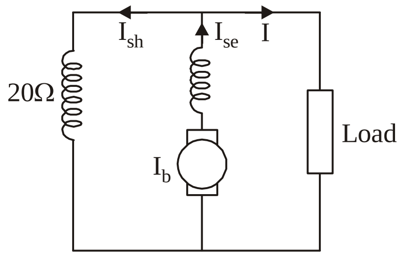
$$I = \frac{S}{\sqrt{3}V}$$

For star connection V↓

For maintaining same amount of current kVA rating should increase.

108. ***Ans.(c)***

Long-shunt compound generator



$$I_{se} = I_{sn} + I$$

Output rating of generator = 150 kw, 250V

$$I = \frac{150\times10^3}{250} = 600A$$

$$I_{sh} = \frac{250}{20\Omega} = 12.5A$$

$$I_{se} = 12.5 + 600$$

$$= 612.5 \text{ Amp}$$

109. ***Ans.(a)***

110. ***Ans.(b)***

Magnetising current will reduce, so that power factor will improve.

111. ***Ans.(a)***

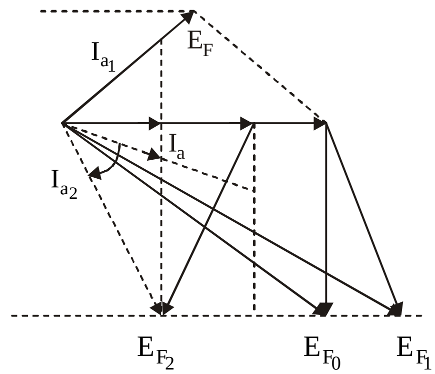
$$s_1f_1 = s_2f_2$$

$$\frac{7.5}{100}\times4.5 = \frac{2.5}{100}\times f_2$$

$$f_2 = 13.5 \text{ Hz}$$

112. ***Ans.(d)***

113. ***Ans.(c)***



114. ***Ans.(b)***

115. ***Ans.(a)***

116. ***Ans (c)***

117. ***Ans (d)***

118. ***Ans (b)***

119. ***Ans (d)***

120. ***Ans (c)***

121. ***Ans (a)***

122. ***Ans (c)***

123. ***Ans (a)***

124. ***Ans (b)***

125. ***Ans (a)***

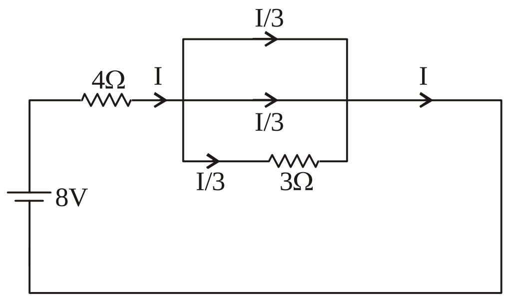
126. ***Ans (c)***

127. ***Ans. (c)***

128. *Ans. (c)*

Three branch are parallel and net current is I. Current through

$$3\Omega = \frac{I}{3}$$



Applying KVL in the loop, we get

$$-8 + 4I + 3\times\frac{I}{3} = 0$$

$$I = \frac{8}{5}$$

voltage across 3Ω resistance $= 3\times\frac{I}{3}$

$$= 3\times\frac{\frac{8}{5}}{3} = \frac{8}{3}\text{V.}$$

129. *Ans. (c)*

Applying KCL

$$\frac{V}{6}+\frac{V-3I}{2} = I$$

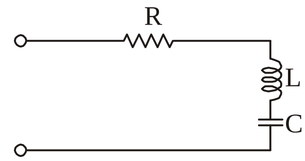
$$\frac{V+3V-9I}{6} = I$$

$$4V = 6I + 9I$$

$$V/I = \frac{15}{4}\Omega$$

130. *Ans. (b)*

Consider the series RLC circuit



$$y = \frac{1}{z} = \frac{1}{R+Ls+\frac{1}{Cs}}$$

$$= \frac{Cs}{LCs^2+RCs+1}$$

$$= \frac{\frac{1}{L}s}{s^2+\frac{R}{L}s+\frac{1}{LC}}$$

poles of the function

$$S_{12} = \frac{R}{L} \pm \sqrt{\frac{RL}{L^2}-\frac{4}{LC}}$$

closer the poles jω-axis means smaller is the value of (R/L). Thus,

$$Q = \frac{\omega_o L}{R}$$

If R is small, then higher the value of Q.

Thus,

$$2\delta\omega_0 = \frac{R}{L}$$

$$\delta = \frac{R}{2\omega_0 L} = \frac{1}{2Q}$$

The value of Q varies inversely as the damping ratio is $Q = \frac{1}{2\delta}$ A circuit with low R has high Q_1, since $Q = \frac{\omega_o L}{R}$

Hence, Statements (1) and (2) are correct

131. *Ans. (b)*

In series resonance circuit

$$Q = \frac{f_0}{BW} = \frac{1}{\omega_0 CR}$$

$$R = \frac{BW}{2\pi f_0 C f_0}$$

$$= \frac{10\times10^5}{2\pi\times1.5\times10^6\times150\times10^{-6}\times1.5\times10^{-6}}$$

$= 4.7\ \Omega$

132. *Ans. (c)*

Convert star to delta network as shown in the following figure

$$y_{21} = \left.\frac{I_2}{V_1}\right|_{V_2=0}$$

$$= -\left(\frac{1}{3}+\frac{1}{9}\right)$$

$$= -\frac{3+1}{9} = -\frac{4}{9}\text{mho}$$

133. *Ans. (c)*

$$f(s) = \frac{s^3+2s^2+2s+1}{4s}$$

is not positive real function as the difference in power of highest degree terms in N(s) and D(s) is more than 1. For this f(s) difference is 2.

$$f(s) = \frac{s(s^4+3s^2+1)}{(s+1)(s+2)(s+3)(s+4)}$$

is not a positive real function as N(s) have missing term of s^4.

$$f(s) = \frac{s(s^2+4)}{(s^2+1)(s^2+6)}$$

represent an LC immittance function with pole zero an $j\omega$ and alternator.

Hence, it is positive real function

$f(s) = \dfrac{s(s^2+4)}{(s^2+1)(s^2+6)}$ is not positive real function as if has a zero in the RHS of the s-plane at s = 2.

134. *Ans. (c)*

$$I = \frac{V_{th}}{R_{th}} = 4\text{, for } R = 0 \quad ...(1)$$

$$I = \frac{V_{th}}{R_{th}+3} = 2,\ \text{for } R = 3 \quad ...(2)$$

from equation (1) & (2) we get.

V_{th} = 12V, R_m = 3Ω

$$I \text{ for } (R = 2) = \frac{12}{3+2}$$

$$= \frac{12}{5}A$$

= 2.4 A

135. *Ans. (c)*

136. *Ans. (b)*

$$\text{Thevenin's voltage} = \frac{240}{150}\times50 - \frac{240}{150}\times100$$

= 80 – 160 = –80V

Thevenin's resistance = 100||50

$$= \frac{100}{3}$$

$$\text{Therefore current} = \frac{-80}{\frac{100}{3}+6.67} = -2A$$

137. *Ans. (c)*

138. *Ans. (d)*

$$20 = \frac{100}{1+100(\beta)}$$

B = 0.04 or 4%

139. *Ans. (b)*

140. *Ans.(a)*

141. ***Ans. (d)***

$$F(s) = \frac{2s+5}{s^2+5s+6}$$

$$= \frac{1}{s+2} + \frac{1}{s+3}$$

$$f(t) = e^{-2t} + e^{-3t}$$

$$= e^{-2.5t}[e^{0.5t} + e^{-0.5}]$$

$$= 2e^{-2.5t}\cos h\ 0.5t$$

$$[\because \cos h\ t = \frac{e^t + e^{-t}}{2}]$$

142. ***Ans.(b)***

143. ***Ans.(d)***

Fourier transform is special case of Laplace

$$FT\{x(t)\} = X(s)|_{s = j\omega}$$

Laplace transform is not a special case of Fourier transform.

144. ***Ans.(a)***

Summary of Fourier series and Fourier transforms :

Continuous frequency periodic in frequency

	Continuous Time		Discrete Time	
	Time domain	Frequency domain	Time domain	Frequency domain
Fourier Series	Continuous time periodic in time	Discrete frequency aperiodic in frequency	Discrete time periodic in time	Discrete frequency periodic in frequency
Fourier Transform	Continuous time aperiodic in time	Continuous frequency aperiodic in frequency	Discrete time aperiodic in time	Continuous frequency periodic in frequency

duality

duality

duality

145. ***Ans.(a)***

146. ***Ans. (a)***

147. ***Ans. (a)***

148. ***Ans. (b)***

149. ***Ans. (b)***

150. ***Ans. (d)***

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