225/2023

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. A DC voltage source of 100 V with 1 ohm internal resistance is connected to a resistor load of 10 ohms. The current delivered to the load is:

   (A) 9.09 A (B) 10 A
   (C) 9 A (D) 11.1 A

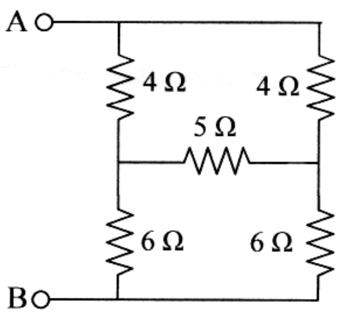
2. Two coils A and B are mutually coupled with mutual inductance of 0.5 henry. Coil A carries a current of (20 sin 100 t) amperes. RMS value of induced voltage in coil B is :

   (A) 14.14 V (B) 10 V
   (C) 707 V (D) Cannot be found out with given data

3. Two identical coupled inductors are connected in series. The measured inductances for the two possible series connections are 300 μH and 200 μH. Their mutual inductance is :

   (A) 10 μH (B) 25 μH
   (C) 50 μH (D) 100 μH

4. What is the effective resistance between A and B in the circuit below?



   (A) 3 Ω (B) 4 Ω
   (C) 5 Ω (D) 10 Ω

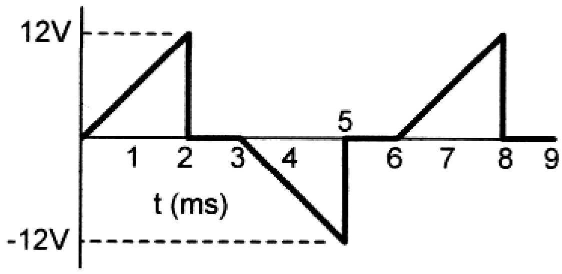
5. An AC circuit has a source voltage of 80 V with internal impedance of (4 + j3) ohms. The load impedance is adjusted such that maximum power is delivered to the load. Then the load current is:

   (A) 8 A (B) 10 A
   (C) 16 A (D) 20 A

6. A 100-microfarad capacitor is initially in the charged condition with a voltage of 10 V. Another 100-microfarad capacitor without any charge in it is connected in parallel with the first capacitor. What will be the voltage of the combination?

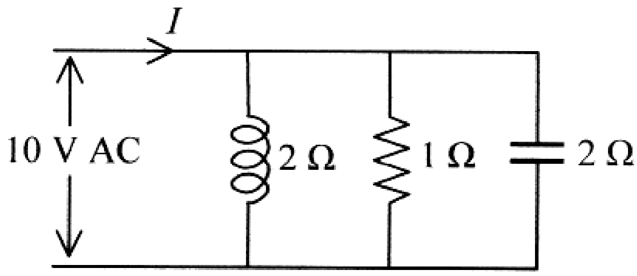
(A) 5 V
(B) 7.07 V
(C) 10 V
(D) 14.14 V

7. The average voltage of the given waveform is:



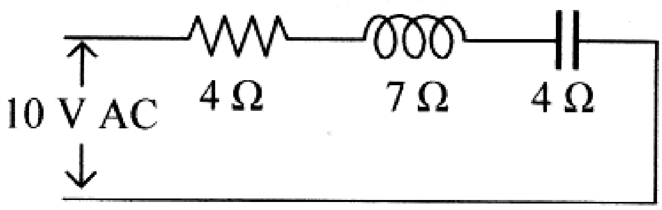
(A) 4 V
(B) 6 V
(C) 7.64 V
(D) 8.48 V

8. The current drawn (I) by the circuit below is:



(A) 2 A
(B) 2.43 A
(C) 10 A
(D) 20 A

9. The power consumed by the circuit below is:



(A) Zero
(B) 1.19 W
(C) 8.16 W
(D) 16 W

10. An amplifier has a maximum output of 10 V. The bandwidth of this amplifier is defined as the frequency range over which the output is above:

(A) 5 V
(B) 5.77 V
(C) 7.07 V
(D) 9 V

11. The relative permeability of a ferromagnetic material is 10000. Its absolute permeability will be :

(A) 10^6 H/m
(B) $4\pi \times 10^{-3}$ H/m
(C) $4\pi \times 10^{-11}$ H/m
(D) $4\pi \times 10^{-15}$ H/m

12. The magnitude of magnetic field strength H is independent of:

(A) Current
(B) Distance
(C) Permeability of the medium
(D) Both current and distance

13. The magnetic potential difference in a magnetic circuit is given by :

(A) H/l
(B) $B \times l$
(C) Hl
(D) $Bl \times H$

14. The conductance of electrical circuit is analogous in magnetic circuit by :

(A) Flux
(B) Reluctance
(C) Permeance
(D) Relative permeability

15. What is the value of the total electric flux coming out of the closed surface?

(A) Zero
(B) Equal to volume charge density
(C) Equal to the total charge enclosed by the surface
(D) Equal to the surface charge density

16. In parallel magnetic circuit, the total ampere turn is equal to the :

(A) Ampere turn of only one smallest part
(B) Ampere turn of only longest part
(C) Difference of Ampere-turn of each path
(D) Sum of Ampere-turn of each path

17. As per Faraday's laws of electromagnetic induction, an e.m.f. is induced in a conductor whenever it:

(A) Lies perpendicular to the magnetic flux

(B) Lies in a magnetic field

(C) Cuts magnetic flux

(D) Moves parallel to the direction of the magnetic field

18. Principle of statically induced e.m.f is used in:

(A) Transformer (B) Motor

(C) Generator (D) Battery

19. The e.m.f induced in a coil of N turns is given by:

(A) $\frac{d\phi}{dt}$ (B) $N\frac{d\phi}{dt}$

(C) $-N\frac{d\phi}{dt}$ (D) $2N\frac{d\phi}{dt}$

20. A conductor of length of 0.8 m lies in and at right angle to a uniform magnetic field of flux density 2 Wb/m^2. The conductor moves with a velocity of 30 m/s. Calculate the EMF induced in the conductor. What will be the EMF induced if the conductor moves at an angle of 30° to the magnetic field?

(A) 47 V, 32 V (B) 48 V, 24 V

(C) 46 V, 35 V (D) 47 V, 34 V

21. Which of the following is not a part of dc machines?

(A) Armature (B) Commutator

(C) Field winding (D) Damping winding

22. The load current and flux of a dc motor are held constant and voltage applied across it armature is increased by 5%, the speed of motor will :

(A) Increase by 5% (B) Reduce by 5%

(C) Remain unaltered (D) Depends on the other factor

23. The core flux of a particular transformer with a resistive load:

(A) Is strictly constant with the load changes

(B) Increases linearly with load

(C) Increases as the square root of load

(D) Decreases with increased load

24. The equivalent circuit of a transformer has leakage reactances X_1, X_2^1 and magnetizing reactance X_M. The magnitude satisfy :

(A) $X_1 >> X_2^1 >> X_M$

(B) $X_1 << X_2^1 << X_M$

(C) $X_1 = X_2^1 >> X_M$

(D) $X_1 = X_2^1 << X_M$

25. The winding used in a 3-phase shell type transformer is ______________ type:

(A) Circular

(B) Cylindrical

(C) Sandwich

(D) Rectangular

26. In a power transformer:

(A) The primary winding is always wound with many turn of thin wire

(B) Secondary winding is always wound with lesser number of turns of thin wire

(C) Low voltage winding is always wound with lesser number of turns of thick wire

(D) High voltage winding is always wound with large number of turns of thicker wire

27. Which one of the following is the primary reason for placing field on rotor in an alternator?

(A) Small power in the field circuit

(B) Insulation of high voltage is made easy on stator than on rotor

(C) Large power in stator

(D) Large current in stator

28. Which of the following method is employed for starting a 3-phase synchronous motor?

(A) Star-delta starter

(B) Damper winding

(C) Resistance starter in the stator circuit

(D) Damper winding in conjunction with the star delta starter or an auto-transformer starter

29. Which of the following material of slip ring in an induction machine?

(A) Carbon

(B) Nickel

(C) Phosphor bronze

(D) Manganese

30. A 500 HP, 6 pole, 3-phase, 440 V, 50 Hz induction motor has a speed of 950 rpm on full load. The full load slip and the number of cycles the rotor voltage makes per minute will be respectively :

(A) 10 % and 150

(B) 10 % and 125

(C) 5 % and 150

(D) 5 % and 125

31. Convert binary number 100111.11 to equivalent decimal number:

(A) 39.30 (B) 78.75

(C) 78.30 (D) 39.75

32. A mod – M counter and a Mod-N counter in cascade gives a:

(A) Mod-MN counter (B) Mod -M/N counter

(C) MOD M^N counter (D) None of the above

33. The condition normally avoided in the basic SR flip flop realized using NAND gate, is:

(A) S = 0, R = 0 (B) S = 1, R = 1

(C) S = 0, R = 1 (D) S = 1, R = 0

34. A 4 bit mod-16 ripple counter uses J-K flip flops. If the propagation delay of each flip flop is 20 ns, the maximum clock frequency that can be used is:

(A) 200 MHz (B) 50 MHz

(C) 25 MHz (D) 12.5 MHz

35. Which of the following statement is correct about STA instruction of 8085?

(A) Accumulator is loaded with the content of memory

(B) It is a 2-byte instruction

(C) It uses direct addressing mode

(D) It requires three machine cycles

36. On a negative edge-triggered S-R flip-flop, the outputs reflect the input condition when :

(A) The clock pulse is LOW

(B) The clock pulse is HIGH

(C) The clock pulse transitions from LOW to HIGH

(D) The clock pulse transitions from HIGH to LOW

37. The Boolean expression $A\overline{B} + AC + BC$ simplifies to:

(A) $A\overline{B} + AC$ (B) $A\overline{B} + AC + C$

(C) $AC + BC$ (D) $A\overline{B} + BC$

38. The number of T-states in INX instruction in 8085:

(A) 1 (B) 4

(C) 6 (D) 10

39. The status flags of 8085 microprocessor that is not affected during the execution of DCR instruction.

(A) Carry Flag (B) Parity Flag

(C) Auxiliary Carry Flag (D) Sign Flag

40. The incrementer/decrementer address latch register in 8085 is:

(A) 2 bit (B) 4 bit

(C) 8 bit (D) 16 bit

41. If a transmission of characteristic impedance 200 Ω is terminated with a load impedance of 400 + j200 Ω, then the normalized impedance is:

(A) $-1 + j$ (B) $4 + 2j$

(C) $1 + j$ (D) $2 + j$

42. A 33 kV system has string insulator having 3 discs and the earth to disc capacitance ratio of 0.10. The string efficiency will be:

(A) 75 % (B) 89 %

(C) 55 % (D) 67 %

43. Voltage at which corona glow occurs is known as:

(A) Visual Natural voltage (B) Visual disruptive voltage

(C) Visual critical voltage (D) Visual high voltage

44. A three phase circuit breaker is rated 2000 MVA, 33 kV. What will be the making current?

(A) 39 kA (B) 59 kA

(C) 70 kA (D) 89 kA

45. The dielectric strength of SF6 circuit breaker is ______________ that of air.

(A) Same as (B) 2 to 3 times

(C) 10 times (D) 5 to 6 times

46. Which relay is used in protection of long transmission lines?

(A) Mho relay (B) Reactance relay

(C) Impedance relay (D) Buchholz relay

47. If for an IDMT relay with a plug setting of 50% and a CT ratio of 400/5, the current is 3000A, then the plug setting multiplier would be:

(A) 7.5 (B) 15.0

(C) 18.75 (D) 37.5

48. The per unit impedance of a line is X p.u. if the base voltage is increased 3 times and the base MVA is doubled, the new per unit impedance is:

(A) $2X$ (B) $\frac{1}{9}X$

(C) $\frac{2}{9}X$ (D) $9X$

49. For a fully transposed transmission line:

(A) Positive, negative and zero sequence impedances are equal

(B) Positive and negative sequence impedances are equal

(C) Zero and Positive sequence impedances are equal

(D) Negative and zero sequence impedances are equal

50. In G-S method of power flow problem, the number of iterations:

(A) Depends on tolerance (B) Depends on voltage control buses

(C) Depends on number of buses (D) Remains fixed

51. Consider a system described by characteristic equation $S^2 + 2\zeta\omega_n S + \omega_n^2 = 0$, where ζ, ω_n denotes damping ratio and undamped natural frequency of the system. Choose the correct answer from matching of the pairs:

(a)	$\zeta = 0$	(i)	Underdamped system
(b)	$0 < \zeta < 1$	(ii)	Undamped system
(c)	$\zeta > 1$	(iii)	Critically damped system
(d)	$\zeta < 0$	(iv)	Overdamped system
(e)	$\zeta = 1$	(v)	Negatively damped system

(A) (a)-(ii), (b)-(i), (c)-(iv), (d)-(v), (e)-(iii)

(B) (a)-(iii), (b)-(i), (c)-(iv), (d)-(v), (e)-(ii)

(C) (a)-(ii), (b)-(i), (c)-(v), (d)-(iv), (e)-(iii)

(D) (a)-(i), (b)-(ii), (c)-(iv), (d)-(v), (e)-(iii)

52. Closed-loop transfer function of a unity-feedback system is given by $\frac{Y(s)}{R(s)} = \frac{\omega_n^2}{S^2 + 2\zeta\omega_n S + \omega_n^2}$.

Steady-state error for unit-ramp input is:

(A) ∞ (B) $\frac{2\zeta}{\omega_n}$

(C) 1 (D) $\frac{4}{\zeta\omega_n}$

53. Consider the following statements:

(i) If an open-loop system is unstable, applying feedback will always improve its stability

(ii) If an open-loop system is subject to parameter variations, applying feedback will always improve robustness.

Which of the following is correct answer?

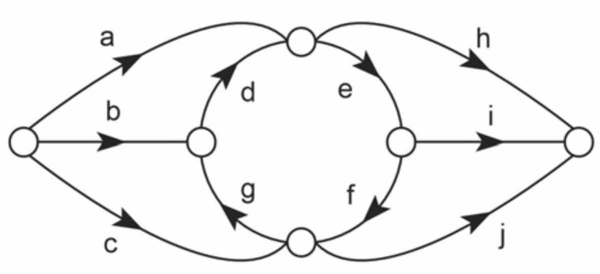
(A) None of the above statements is true

(B) Statement (i) is true but statement (ii) is false

(C) Statement (ii) is true but statement (i) is false

(D) Both Statements are true

54. Identify the number of forward paths for a system between source node and output node whose SFG is shown in figure. Where the source node is a node with outgoing branches and output node is a node with only incoming signals:



(A) 10 (B) 9

(C) 8 (D) 11

55. $(-a \pm jb)$ are the complex conjugate roots of the characteristic equation of a second order system. Its damping coefficient and natural frequency will be respectively:

(A) $\frac{b}{\sqrt{a^2+b^2}}$ and $\sqrt{a^2+b^2}$

(B) $\frac{b}{\sqrt{a^2+b^2}}$ and a^2+b^2

(C) $\frac{a}{\sqrt{a^2+b^2}}$ and $\sqrt{a^2+b^2}$

(D) $\frac{a}{\sqrt{a^2+b^2}}$ and a^2+b^2

56. For $0<\xi<\frac{1}{\sqrt{2}}$, resonant peak "M_r" is equal to :

(A) $\frac{1}{2\xi\sqrt{1-\xi^2}}$

(B) $\frac{1}{2\xi\sqrt{1-2\xi^2}}$

(C) $\frac{\xi}{2\sqrt{1-\xi^2}}$

(D) $\frac{\xi}{2\sqrt{1-2\xi^2}}$

57. The polynomial $\Delta(S) = S^3 + 3S^2 + 2S + 6$ has:

(A) Two roots in left half of S-plane and one root in right half

(B) Two roots in right half of S-plane and one root in left half

(C) Two roots on jω-axis of S-plane and one root in right half

(D) Two roots on jω-axis of S-plane and one root in left half

58. Polar plot of $G(j\omega) = \dfrac{1}{j\omega(1 + j\omega\tau)}$:

(A) Crosses the negative real axis

(B) Crosses the negative imaginary axis

(C) Crosses the positive imaginary axis

(D) None of the answers in the (A), (B) and (C) is correct

59. In control systems

(i) Reduction in bandwidth results in sluggish response

(ii) Reduction in bandwidth results in better signal/noise ratio

Which of the following is correct answer?

(A) None of the above statements is true

(B) Statement (i) is true but statement (ii) is false

(C) Statement (ii) is true but statement (i) is false

(D) Both Statements are true

60. Occasionally in applying the Routh stability criterion, certain difficulties arise causing the breakdown of Routh test. One of the difficulties is given as follows. "When all elements in any one row of the Routh array are zero". This condition is indicating:

(A) Symmetrically located roots in the Complex plane

(B) Unsymmetrically located roots in the complex plane

(C) Roots located in the left half of the S-plane only

(D) Roots located in the right half of the S-plane only

61. The holding current of an SCR is 20 mA. The latching current will be:

(A) 20 mA
(B) 200 mA
(C) 22 mA
(D) 18 mA

62. A line commutated single phase fully controlled rectifier operates as an inverter at firing angles:

(A) $90° \leq \alpha \leq 180°$
(B) $0 \leq \alpha \leq 90$
(C) $0 \leq \alpha \leq 90$
(D) $0 \leq \alpha \leq 90$

63. The prominent ripple frequency at the output of a three-phase fully controlled rectifier operating at 50 Hz is:

(A) 50 Hz
(B) 100 Hz
(C) 150 Hz
(D) 300 Hz

64. To eliminate the 5^{th} harmonic from the output of a single pulse PWM inverter, the width of pulse should be:

(A) 90°
(B) 32°
(C) 72°
(D) 30°

65. For a three-phase bridge inverter operating in 180° mode of conduction, a maximum of:

(A) 2 power switches conduct simultaneously
(B) 3 power switches conduct simultaneously
(C) 4 power switches conduct simultaneously
(D) No restriction

66. The continuous or discontinuous mode of conduction of a chopper is influenced by :

(A) Switching frequency
(B) Duty ratio
(C) Inductance and resistance values
(D) All of these

67. For an ideal op-amp, which one is not applicable:

(A) Infinite input resistance
(B) Infinite output resistance
(C) Infinite bandwidth
(D) Infinite CMRR

68. The maximum frequency of operation of an Op-amp without distortion is decided by its:

(A) Bandwidth
(B) Slew rate
(C) CMRR
(D) Voltage gain

69. The unit of Slew rate is:

(A) A/μS
(B) μS
(C) V/μS
(D) No unit

70. An op - amp operating at a high electromagnetically noisy environment should have:

(A) High CMRR
(B) Low CMRR
(C) Not decided based on CMRR
(D) Zero CMRR

71. Which of the following type of measuring instrument(s) have linear scale?

(i) PMMC

(ii) Moving Iron

(iii) Thermocouple

(iv) Rectifier type

(A) Only (ii)
(B) Both (i) and (ii)
(C) Both (iii) and (iv)
(D) Only (i)

72. Consider the following statement:

(i) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the current coil.

(ii) The compensating coil of a low power factor wattmeter compensates the effect of the impedance of the voltage coil circuit.

(A) (i) is true but (ii) is false
(B) (i) is false but (ii) is true
(C) Both (i) and (ii) are true
(D) Both (i) and (ii) are false

73. V_{RN}, V_{YN} and V_{BN} are the instantaneous line to neutral voltages and i_R, i_Y and i_B are instantaneous line currents in a balanced three-phase circuit, the computation,

$V_{RN}(i_Y - i_B) - (V_{YN} - V_{BN})\, i_R$ will yield a quantity proportional to:

(A) Active Power
(B) Complex Power
(C) Power Factor
(D) Reactive Power

74. A stationary closed Lissajous pattern on an oscilloscope has 5 horizontal tangencies and 1 vertical tangencies for a horizontal input with frequency 3 kHz. The frequency of the vertical input is:

(A) 15 kHz
(B) 0.6 kHz
(C) 3 kHz
(D) 1 kHz

75. Moving Iron instruments can be used for:

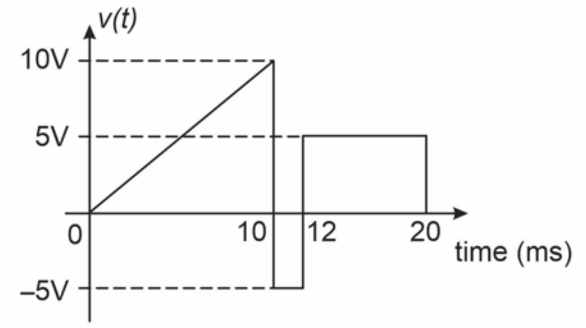
(i) AC

(ii) DC

(iii) Complex AC

(A) Only (iii)
(B) Only (i)
(C) Both (i) and (ii)
(D) Only (ii)

76. A periodic voltage waveform observed on an oscilloscope across a load is shown. A permanent magnet moving coil meter connected across the same load reads:



(A) 5 V (B) 10 V
(C) 4 V (D) 8 V

77. Match the following:

Instrument type		Quantity measured	
P.	Permanent Magnet Moving Coil	1.	AC
Q.	Rectifier Type	2.	DC
R.	Electrodynamometer	3.	Both AC and DC
S.	Moving Coil connected through a current transformer		

(A) P-2, Q-3, R-3, S-1 (B) P-1, Q-1, R-2, S-2
(C) P-2, Q-1, R-2, S-3 (D) P-3, Q-1, R-2, S-3

78. One Single phase energy meter operating on 230 V and 2 A for 5 hours makes 460 revolutions. Meter constant in revolution is 400. The power factor of the load will be:

(A) 1 (B) 0.4
(C) 0.9 (D) 0.5

79. Two wattmeter method is used for measurement of power in a balanced three-phase load supplied from a balanced three-phase system. If one of the Wattmeter reads half of the other (both positive), then the power factor of the load is:

(A) 0 (B) 0.5
(C) 0.866 (D) 1.0

80. A moving coil galvanometer is made into a D.C. ammeter by connecting:

(A) A high resistance in series with the meter
(B) A low resistance across the meter
(C) A capacitor in series with the meter
(D) A pure inductance across the meter

81. A causal system is always:

(A) Anticipative (B) Linear

(C) Non-anticipative (D) Nonlinear

82. Given the signal *x(t)*, which of the following is true for signal $x(3t+6)$?

(A) $x(t)$ shifted to the left by six units

(B) $x(t)$ is compressed by a factor of 3 and then shifted left by two units

(C) $x(t)$ is expanded by a factor of 3 and then shifted right by two units

(D) $x(t)$ is reflected about the vertical axis and then shifted

83. A system with $x(t)$ and $y(t)$ is defined by the input-output relation $y(t)=\int_{-\infty}^{-4t} x(\tau)d\tau$

The system will be:

(A) Causal, time -invariant (B) Causal, time -variant

(C) Non-causal, time -invariant (D) Non-causal, time -variant

84. Which one of the following statements is not true?

(A) The product of two odd signals will be an even signal

(B) The product of two odd signals will be an odd signal

(C) The product of two even signals will be an even signal

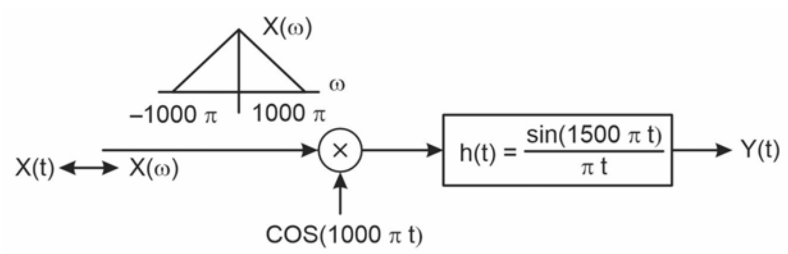
(D) The product of an even and odd signal will be an odd signal

85. Which one of the following systems is a memory less system?

(A) $y(t)=tx(t)+5x^3(t)$ (B) $y(t)=x(t^3)$

(C) $y(t)=tx(t)+7x(t^2)$ (D) $y(t)=x(t)+5x(t-2)$

86. The output $y(t)$ of the following system is to be sampled, so as to reconstruct it from its samples uniquely. The required minimum sampling rate is:



(A) 1000 samples/s (B) 1500 samples/s

(C) 2000 samples/s (D) 3000 samples/s

87. The minimum Nyquist sampling rate $\frac{\sin t}{\pi t}$ is:

(A) $\frac{2}{\pi}$ (B) $\frac{1}{\pi}$

(C) π (D) 2π

88. The discrete time system, $y(n) = x(n-1) - 6x(n-8)$ is a:

(A) Dynamic system (B) Static system

(C) Time varying system (D) None of the above

89. Aliasing occurs when sampling frequency ω_s is (ω_{sm} -band limited signal frequency):

(A) $\omega_s = 2\omega_m$ (B) $\omega_s < 2\omega_m$

(C) $\omega_s > 2\omega_m$ (D) 0

90. Consider the two continuous-time signals defined below:

$$x_1(t) = \begin{cases} |t|, & -1 \le t \le 1 \\ 0, & \text{otherwise} \end{cases}$$

$$x_2(t) = \begin{cases} 1-|t|, & -1 \le t \le 1 \\ 0, & \text{otherwise} \end{cases}$$

These signals are sampled with a sampling period of T = 0.25 seconds to obtain discrete time signals $x_1[n]$ and $x_2[n]$, respectively. Which one of the following statements is true?

(A) The energy of $x_1[n]$ is greater than the energy of $x_2[n]$

(B) The energy of $x_2[n]$ is greater than the energy of $x_1[n]$

(C) $x_1[n]$ and $x_2[n]$ have equal energies

(D) Neither $x_1[n]$ nor $x_2[n]$ is a finite-energy signal

91. LVDT is an electrical transformer with ———— type of core.

(A) Non-contacting (B) Contacting

(C) Fixed core (D) Laminated core

92. In domestic wiring the total lighting load in a sub-circuit should not be more than :

(A) 2000 W (B) 1000 W

(C) 800 W (D) 500 W

93. Which among the following wiring system has large life span?

(A) Wodden wiring (B) C.T.S wiring/T.R.S wiring

(C) Cleat wiring (D) Conduct pipe wiring

94. The type of varnish used for the casing in capping wiring system :

(A) Asphalt varnish (B) Turpentine varnish

(C) Spar varnish (D) Pure shellac varnish

95. According to Law of Illumination, the illumination of the surface is ———— to the spare of the distance of the surface from the source of light.

(A) Proportional (B) Directly proportional

(C) Inversely proportional (D) Equal

96. A hydrometer is used for checking the ———— of the Electrolyte.

(A) Moisture content (B) Specific gravity

(C) Number of electrons (D) Density

97. The region for adding charcoal in earthing :

(A) Absorbs moisture (B) Increase resistance

(C) Decrease Resistance (D) Increase conductivity

98. The current range that can cause lack of muscular control in human beings :

(A) 50 mA to 30 mA (B) 20 mA to 60 mA

(C) 10 mA to 30 mA (D) 10 mA to 60 mA

99. In control of light, absorption of rays of particular wave-length causes :

(A) decrease the intensity of light (B) switch off the light

(C) increase the intensity of light (D) change of the color of light

100. The cell which is chemically irreversable in Battery :

(A) Primary cell (B) Secondary cell

(C) Fuel cell (D) Storage cell

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK