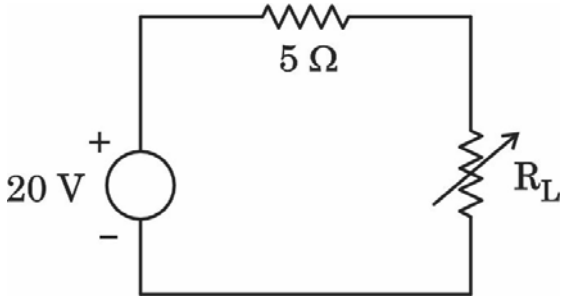
023/2025

Maximum : 100 marks

Time : 1 hour and 30 minutes

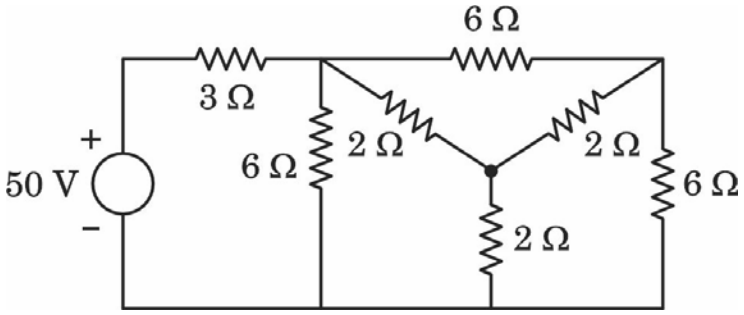
1. In the circuit below, what is the maximum power transferred to the load :



(A) 10 w (B) 15 w

(C) 20 w (D) 25 w

2. Determine the current drawn by the circuit shown below :



(A) 5 A (B) 10 A

(C) 15 A (D) 20 A

3. A voltage of v = 20 sin (314 t + 30°) is applied across an RLC series circuit, where $R=5\Omega$, $X_L=25\Omega$ and $X_c=20\Omega$. The current through the circuit will be :

(A) 1 A (B) 1.4 A

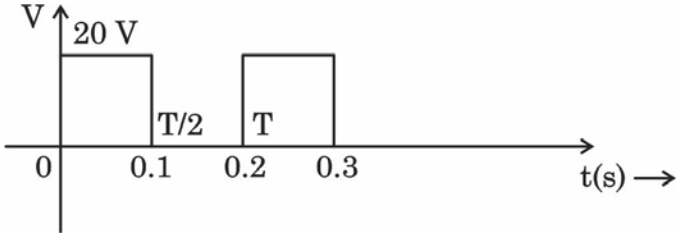
(C) 2 A (D) 2.8 A

4. Which of the following condition is true for both series and parallel resonance?

(A) Impedance is minimum (B) Current is minimum

(C) Power factor is zero (D) Power factor is unity

5. Calculate the form factor of the half rectified square voltage shown below :



(A) 1.4 (B) 1

(C) 2.8 (D) 2

6. How much energy is stored by a 100 mH inductance with a current of 1A?

(A) 0.01 J (B) 1 J

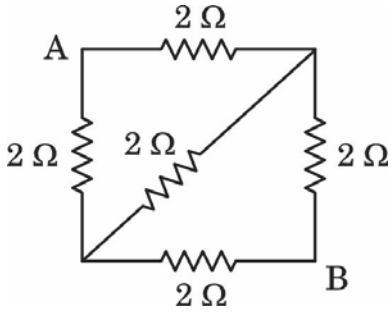
(C) 0.05 J (D) 5 J

7. A coil has an inductance of 0.35 H and is joined in series with a resistance of 110 Ω. When an alternating voltage of 220 V, 50 Hz is applied to it, the wattless component of current is :

(A) 0.5 A (B) 0.7 A

(C) 0.9 A (D) 1 A

8. The resistance between the terminals A and B of the circuit shown is :



(A) 1 Ω (B) 2 Ω

(C) 5 Ω (D) 7 Ω

9. If form factor of a sinusoidal wave is 1.11, then the form factor of triangular wave will :

(A) also be 1.11 (B) be less than 1.11

(C) be more than 1.11 (D) be equal to 1

10. Dot convention in coupled circuits is used to :

(A) Determine the polarity of the mutually induced voltage in coils

(B) Determine the polarity of the self induced voltage in coils

(C) Measure the self inductance

(D) Measure the voltage drop in coils due to self induction

11. Assertion [A] : Magnetic field lines can never cross each other

Reason [R]: Magnetic field lines can never form closed loop around empty space

(A) Both [A] and [R] are individually true but [R] is not the correct explanation of [A]

(B) Both [A] and [R] are true and [R] is the correct explanation of [A]

(C) [A] is true, [R] is false

(D) [A] is false, [R] is true

12. The magnetic potential due to a short dipole of the magnetic moment $2\sqrt{2}\,Am^2$ at a point 2 m away from it along the axis of the dipole is :

(A) $10^{-7}/\sqrt{2}$ Tm (B) $10^{-5}/\sqrt{2}$ Tm

(C) $10^{-4}/\sqrt{2}$ Tm (D) $10^{-9}/\sqrt{2}$ Tm

13. A circular loop is moving out of a uniform magnetic field region to a field free region with a constant velocity v. The field is normal to the loop then :

(A) The induced electromotive force (emf) in the loop is constant

(B) The induced electromotive force (emf) in the loop is varying

(C) The induced electromotive force (emf) is zero

(D) The induced electromotive force (emf) cannot be determined

14. A current carrying infinitely long wire is kept along the diameter of a circular wire loop without touching it. Then correct statements are :

(I) The emf induced in the loop is zero if the current is constant

(II) The emf induced in the loop is finite if the current is constant

(III) The emf induced in the loop is zero if the current decreases at a steady state

(IV) The emf induced in the loop is finite if the current is decreasing at a steady state

(A) (I), (II) (B) (I), (IV)

(C) (I), (III) (D) (II), (IV)

15. The current in a 0.5mH coil increases by 200 mA in 0.1 second. The induced emf will be :

(A) +1 V (B) –1 V

(C) +1 mV (D) –1 mV

16. Assertion [A] : A moving conductor in a magnetic field can be replaced by a battery of emf e=Blv and negative terminal is that end towards which electron are moving due to magnetic force

Reason [R] : The dynamically induced emf will exist only when, all three magnetic field of B Wb/m^2, terminal velocity of vm/s and conductor of length 1 meters are mutually perpendicular.

(A) Both [A] and [R] are true and [R] is the correct explanation of [A]

(B) Both [A] and [R] are individually true but [R] is not the correct explanation of [A]

(C) [A] is true, [R] is false

(D) [A] is false, [R] is true

17. A constant current is maintained in a solenoid. Which of the following quantities will increase if an iron rod is inserted in the solenoid along its axis?

(i) Magnetic field at the centre

(ii) Magnetic field linked with the Solenoid

(iii) Heating effect of Current

(iv) Rate of joule heating

(A) (i), (ii) (B) (i), (iii)

(C) (i), (iv) (D) (ii), (iv)

18. The radius of a circular coil having 50 turns is 2cm. Its plane is normal to the magnetic field. The magnetic field changes from 2 T to 4T in 3.14 sec. The induced emf in the coil will be:

(A) 4 mV (B) 0.4 V

(C) 0.12 V (D) 0.04 V

19. In a composite series magnetic circuit, magnetic lines of force tend to bulge out when crossing an air gap. This effect is known as :

(A) Magnetic leakage (B) Fringing

(C) M.M.F drop (D) Leakage drop

20. Match the similarity between magnetic and electric circuits :

	Column A		Column B
(a)	m.m.f. (ampere-turns)	(i)	Electric intensity, E = V/d
(b)	Magnetic intensity, H = NI/1	(ii)	Conductance
(c)	Permeance	(iii)	Conductivity
(d)	Permeability	(iv)	e.m.f. (volts)

(A) (a) – (i), (b) – (ii), (c) – (iv), (d) – (iii)
(B) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)
(C) (a) – (ii), (b) – (i), (c) – (iii), (d) – (iv)
(D) (a) – (iv), (b) – (ii), (c) – (iii), (d) – (i)

21. The magnetic field produced by the armature of a DC generator has the following effect on the main field flux :

(A) Demagnetisation
(B) Cross magnetisation
(C) Field enhancement
(D) Both demagnetisation and cross magnetisation

22. In a DC shunt motor, what happens to the speed when the load is increased from no-load to full load?

(A) Remains constant
(B) Reduces slightly
(C) Reduces drastically
(D) Increases slightly

23. A 220V dc series motor produces 40 Nm torque at an armature current of 10 A. When the armature current is 20A, the developed torque will be :

(A) 56.6 Nm
(B) 80 Nm
(C) 120 Nm
(D) 160 Nm

24. When the load on a single-phase transformer is increased from no-load to full load, the core loss in the transformer will :

(A) Slightly reduce
(B) Slightly increase
(C) Considerably increase
(D) Remain constant

25. In a 11 kV/110 kV star/delta transformer, the phase transformation ratio is :

(A) 10
(B) $10/\sqrt{3}$
(C) $10\sqrt{3}$
(D) None of the above

26. A 4000V/400V delta-star transformer has 10A third harmonic current in all the three secondary phases. What is the magnitude of the third harmonic line current on the primary side?

(A) Zero (B) 1 A

(C) 0.577 A (D) 1.73 A

27. An alternator generates 400V, 50 Hz when excited with 4A field current. Assuming the magnetic circuit is unsaturated, the generated voltage when operating at 40 Hz and 6A field current is :

(A) 320 V (B) 480 V

(C) 600 V (D) 720 V

28. Two alternators are connected in parallel and equally share the load of an inductive load connected across the pair. The excitation of one of the alternators is increased, then :

(A) Its power factor will increase

(B) Its load share will increase

(C) Its load share will decrease

(D) Both alternators will stop generating

29. What happens when a set of equal low resistances is inserted in each phase of the rotor circuit of a slip ring induction motor?

(A) The speed increases (B) The power factor decreases

(C) The starting torque decreases (D) The starting torque increases

30. The input power of a three-phase, 50 Hz, 1440 rpm induction motor is 22 kW. The stator copper loss and core loss are 1 kW each. Then the rotor copper loss will be :

(A) 800 Watts

(B) 840 W

(C) 880 W

(D) Cannot be found with given data

31. How many bits are required to represent a decimal number in the range from 0 to 999 using binary code? Using BCD code

(A) 10, 16 (B) 12, 10

(C) 10, 12 (D) 16, 10

32. The logic expression $Y = A'B'.\ D_0 + A'B.D_1 + AB'.D_2 + AB.D_3$ is that of a :

(A) Decoder (B) Encoder

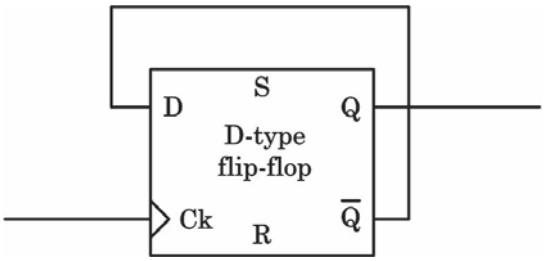
(C) Multiplexer (D) De-multiplexer

33. Find the minterms of the following Boolean expression $F(x, y, z) = x\,y + yz + xy'\,z$:

(A) $\Sigma(3, 5, 6, 7)$ (B) $\Sigma(3, 4, 6, 7)$

(C) $\Sigma(3, 6, 7, 8)$ (D) $\Sigma(3, 4, 5, 6)$

34. A square wave of 1kHz is applied as the clock signal to the following circuit, Q will be a square wave of _____ frequency.



(A) 1 kHz (B) 500 Hz

(C) 250 Hz (D) 2 kHz

35. The minimum number of flip flops needed for counting upto 300 is :

(A) 7 (B) 8

(C) 9 (D) 10

36. How long will it take to shift an 8-bit number into an 8-bit serial input-parallel output shift register if the clock is set at 10 MHz?

(A) 100 ns (B) 800 ns

(C) 400 ns (D) 200 ns

37. An 8085 microprocessor accesses two memory locations (2501 H) and (2502 H), that contain 8-bits numbers 27 H and B1 H, respectively. The following program is executed :

LXI H, 2501 H

MVI A, 21 H

INX H

ADD M

INX H

MOV M, A

HLT

At the end of this program, the memory location 2503 H contains the number in decimal (base 10) form

(A) 210 (B) 216

(C) 72 (D) 78

38. The instruction RET executes with the following series of machine cycle :

(A) Fetch, read, write
(B) Fetch, write, write
(C) Fetch, read, read
(D) Fetch, read

39. Which stack is used in 8085 microprocessors?

(A) FIFO
(B) LIFO
(C) FILO
(D) LILO

40. The clock frequency of an 8085 microprocessor is 5 MHz. If the time required to execute an instruction is $1.4\ \mu s$ then the number of T-states needed for executing this instruction is :

(A) 7
(B) 6
(C) 4
(D) 1

41. A synchronous generator has the following parameters :

Synchronous reactance $X_S = 0.5\Omega$, rated voltage V = 220 V. Field excitation is adjusted so that the generator operates at 180° power angle. The generator is delivering power to a load with a power factor of 1.0. Calculate the power output of the generator at a power angle of $\delta = 30^\circ$?

(A) 48.4 KW
(B) 52.6 KW
(C) 46.2 KW
(D) 54.8 KW

42. Alternator is rated as 150 MVA, 11 kV, X = 1.2 Pu. What will be the PU reactance at 250 MVA and 13.2kV :

(A) 1.08 Pu
(B) 0.08 Pu
(C) 3.08 Pu
(D) 2.08 Pu

43. A synchronous generator is connected to an infinite bus through a transmission line. The pre-fault power transfer is P = 0.5 Pu, and the maximum power transfer capability is $P_{\max} = 1.5\,pu$. A fault reduces $P_{\max}$ to 0.3 pu. Determine if the system remains stable if the fault is cleared in time to restore $P_{\max}$ to 1.5 Pu. Use the equal area criterion.

(A) The system is likely unstable, depending on fault clearing time
(B) The system is likely stable, depending on fault clearing time
(C) Both (A) and (B)
(D) None

44. A 3-ϕ, 11kV oil circuit breaker is rated 600A, 1000 MVA, 3sec. The symmetrical breaking current is :

(A) 10 kA (B) 35 kA

(C) 101.7 kA (D) 52.48 kA

45. A single line-to-ground (LG) fault occurs at a bus with the following sequence impedances:

Z_1 = 0.3 pu, Z_2 = 0.4 pu, Z_0 = 0.2 Pu.

The pre-fault voltage is 1 pu. Calculate the fault current and voltage of the faulted phase.

(A) $I_f = 3.33\, pu, V_f = 0\, v$ (B) $I_f = 1.13\, pu,\ V_f = 5\, v$

(C) $I_f = 2.53\, pu,\ V_f = -5v$ (D) $I_f = 4.23\, pu,\ V_f = 2.5\, v$

46. A 100 MVA, 20 kV generator is subjected to a three-phase fault at its terminals. The generator has a sub-transient reactance X"=0.25 Pu. Calculate the fault current (I_f) during a three-phase fault.

(A) 13.89 kA (B) 14.59 kA

(C) 11.54 kA (D) 9.25 kA

47. In a five-unit insulator string, voltage across the lowest unit is 17.5 kV and string efficiency is 85.24%. The total voltage across the string will be equal to :

(A) 44.25 kV (B) 52.34 kV

(C) 33.85 kV (D) 74.58 kV

48. A 50 Hz, 4-pole synchronous generator has a moment of inertia (H) of 5 MJ/MVA. The generator operates at 100 MVA and 0.8 power factor lagging. If a disturbance causes a sudden load rejection of 25 MW, determine the initial acceleration of the rotor in electrical degrees per second squared. Assume no damping :

(A) 133.24°/sec^2 (B) 143.24°/sec^2

(C) 113.24°/sec^2 (D) 123.24°/sec^2

49. A synchronous generator has the following parameters :

Rated voltage V = 500 V, Synchronous reactance X_s 0.8 Ω, Power angle δ= 60°. The generator delivers a load with a power factor of 0.8 (lagging). Calculate the power delivered by the generator at a power angle of $\delta = 60^\circ$.

(A) 270.6 KW (B) 254.3 KW

(C) 305.2 KW (D) 291.5 KW

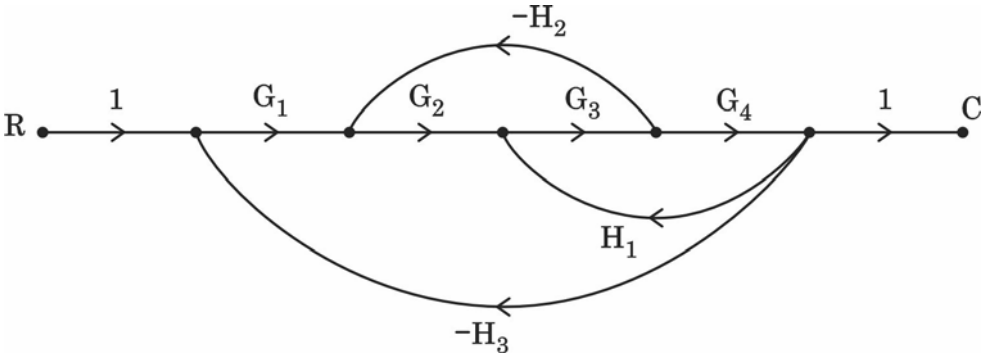
50. A synchronous generator has the following parameters:

Rated voltage V = 400 V, Synchronous reactance X_s = 1.2 Ω. The generator operates at a power angle δ = 45°. The field excitation is adjusted so that the generator delivers a maximum power. Calculate the maximum power the generator can deliver.

(A) 111.11 KW (B) 122.22 KW

(C) 133.33 KW (D) 144.44 KW

51.



The ratio $\frac{C}{R}$ from the given signal flow graph is :

(A) $\frac{G_1\ G_2\ G_3\ G_4}{1-G_1 G_2^{\ 2}\ G_3^{\ 2} G_4^{\ 2} H_1\ H_2}$

(B) $\frac{G_1\ G_2\ G_3\ G_4}{1-G_3 G_4 H_1+G_2 G_3 H_2}$

(C) $\frac{G_1\ G_2\ G_3\ G_4}{1-G_3\ G_4\ H_1+G_2\ G_3\ H_2+G_1 G_2 G_3\ G_4 H_3}$

(D) $\frac{G_1 G_2\ G_3 G_4}{1+G_3 G_4 H_1-G_2\ G_3 H_2-G_1\ G_2\ G_3\ G_4\ H_3}$

52. $\frac{\Omega(s)}{E_i(s)}=\frac{100}{s^2+14s+100}$ where $\Omega(t)$ represents angular velocity and $e_i(t)$ represents a constant voltage of amplitude A volts. The steady state response of angular velocity will be :

(A) $A/2$ (B) $A/5$

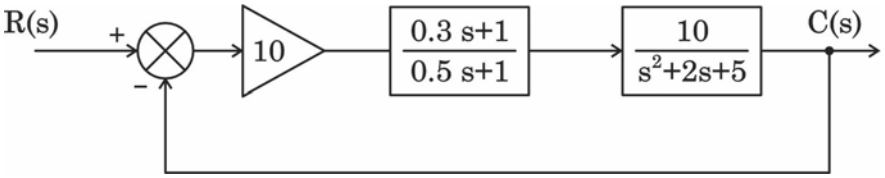
(C) A (D) $2A$

53. The damping ratio of a second order system whose closed loop transfer function is given by $\frac{10000}{s^2+140s+10000}$ is :

(A) 0.4 (B) 0.5

(C) 0.6 (D) 0.7

54. The steady state error in the unit step response for the system represented in figure below is :



(A) $\frac{1}{7}$ (B) $\frac{1}{9}$

(C) $\frac{1}{11}$ (D) $\frac{1}{21}$

55. By what factor should gain K be multiplied for the damping ratio to be increased from 0.2 to 0.8 in the closed loop transfer function given by $\frac{K/T}{S^2+\frac{S}{T}+\frac{K}{T}}$?

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

56. For a critically damped system the nature of roots is :

(A) Complex conjugate with real parts negative

(B) Complex conjugate lying on imaginary axis

(C) Real and distinct

(D) Real and repeated

57. The open loop transfer function with $s = jw$ is obtained as $G(jw)\,H(jw) = \frac{k}{-0.25w^2 + jw(1-0.01w^2)}$. The value of k corresponding to gain margin of 20 dB is :

(A) 1 (B) 2.5

(C) 5 (D) 10

58. If gain k is increased from 100 to 1000 in the system closed loop transfer function $\frac{k}{s^2+10s+k}$:

(A) Damping ratio and natural frequency increase

(B) Damping ratio increases but natural frequency reduces

(C) Damping ratio reduces but natural frequency increases

(D) Damping ratio and natural frequency reduce

59. The steady state output corresponding to unit step input for a system whose forward path transfer function is $\frac{20}{s^2}$ and feedback path transfer function is $(s+5)$ is :

(A) 20 (B) 5

(C) 0.2 (D) 0

60. The value of gain K satisfying $K_v > 10\,\text{sec}^{-1}$ and stable closed loop operation for a unity feedback system with $G(s)=\frac{K}{s(s+2)(s+10)}$ is :

(A) $K > 6$ (B) $6 < K < 10$

(C) $K > 10$ (D) None of the above

61. Anode current of a thyristor is given by,

[Assume two transistor model of thyristor]

Note :

α – Current gain

I_G – Gate current

I_{co} – Leakage current

(A) $\frac{\alpha_2 I_G + I_{co1} + I_{co2}}{1-(\alpha_1+\alpha_2)}$ (B) $\frac{\alpha_2 I_{co1} + I_{co2} - I_{co1}}{1-\alpha_1+\alpha_2}$

(C) $\frac{\alpha_2 + I_G + I_{co1} + I_{co2}}{1-\alpha_1+\alpha_2}$ (D) $\frac{\alpha_2 + I_{co1} - I_{co2}}{1-\alpha_1-\alpha_2}$

62. Displacement angle of third harmonic in a single phase full converter for an firing angle of 15° will be :

(A) 0° (B) 30°

(C) 45° (D) 90°

63. Ripple frequency of three phase full converter operating at 60 Hz will be :

(A) Zero (B) 12 Hz

(C) 20 Hz (D) 360 Hz

64. Effective input resistance of chopper (step down) operating with resistive load $(R\,\Omega)$ will be :

(A) $R\,\Omega$ (B) $\left(1/R\right)\Omega$

(C) (Duty cycle × R) Ω (D) $\left(\frac{R}{\text{Duty cycle}}\right)\Omega$

65. Which PWM will have better DC bus utilisation?

(A) Fixed (B) Sine PWM

(C) SVPWM (D) Multiple

66. Drives used for pressing operation can be classified as :

(A) Intermittent periodic duty (B) Short time duty

(C) Continuous duty (D) Continuous duty with starting

67. A DC shunt motor drives a constant load whose torque is constant. When the applied voltage is reduced to half of the rated voltage, new armature current will be :

(A) Half of the rated current (B) 10% of the rated current

(C) Twice the rated current (D) Current will remain constant

68. In the figure shown below, find the relation between the resistances R_1, R_2 and R_3 :

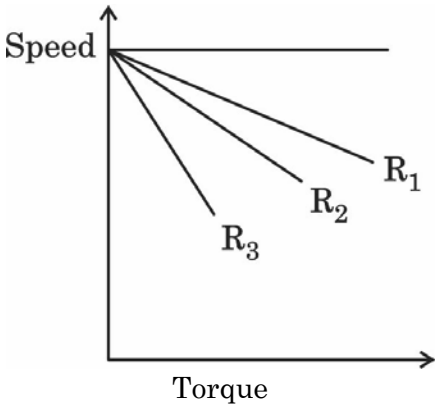


Fig : Speed-Torque relationship for different external resistances connected.

(A) $R_1 = R_2 = R_3$ (B) $R_1 > R_2 < R_3$

(C) $R_1 < R_2 < R_3$ (D) $R_1 = R_2 < R_3$

69. Effective input impedance of an ideal Op-Amp will be (measured directly at the inverting terminal) :

(A) Zero
(B) Unity
(C) Infinity
(D) – 1

70. Mechanism which sets an upper limit to the rate at which the output voltage of an op-amp can change is :

(A) CMRR
(B) Gain
(C) Slew rate
(D) Gain margin

71. A practical voltmeter has a finite resistance. What is the impact of this on the measurement?

(A) It results in the voltmeter displaying a voltage that is higher than the actual voltage
(B) It results in the voltmeter displaying a voltage that is less than the actual voltage
(C) It exerts no influence on the measured voltage
(D) The variation is dependent upon the internal resistance of the voltage source

72. A moving iron ammeter is used to measure the current $i(t) = 1 + 4\sin \omega t$. The reading of the ammeter is :

(A) 2 A
(B) 2.82 A
(C) 3 A
(D) 4 A

73. The current flowing through a moving iron ammeter is reversed without changing its magnitude. Then :

(A) The ammeter will read zero Ampere
(B) The ammeter pointer deflects in the opposite direction
(C) The ammeter pointer deflects in the same direction and reads the same current
(D) The pointer will oscillate

74. What current would flow through a PMMC ammeter which has a coil of 100 turns, flux density of $0.1 web/m^2$, area of cross section of $50 mm^2$ if the pointer deflecting torque is $2\times10^{-3} Nm$?

(A) 5 mA (B) 2 A

(C) 3 A (D) 4 A

75. Which of the following types of instrument(s) is (are) used exclusively for DC measurements?

(i) PMMC type

(ii) Electrolytic type

(iii) Dynamo type

(iv) Moving iron type

(A) Options (i) and (ii) (B) Options (i) and (iii)

(C) Option (i) only (D) Options (iii) and (iv)

76. In an unbalanced three-wire system, the minimum number of wattmeters that are necessary to measure power is :

(A) One (B) Two

(C) Three (D) Four

77. The ratio of the readings from the two Wattmeters employed to measure power in a balanced three-phase load is $\sqrt{3}+1:\sqrt{3}-1$. What is the power factor of the load?

(A) Unity (B) 0.5

(C) 0.707 (D) Zero

78. An induction type energy meter with a meter constant of 500 revolutions per kilowatt-hour, working at 250 volts and 10 amperes for 4 hours, completes 2000 revolutions. The load power factor is :

(A) Unity (B) 0.866

(C) 0.5 (D) 0.4

79. To calculate power factor using a digital energy meter, the meter constantly samples the instantaneous voltage and currents and then requires :

(i) Calculation of average value of product of instantaneous voltage and currents over a period of time T where T is the time period of the a.c. waveform

(ii) Calculation of time at which maximum and minimum voltages occur

(iii) Calculation of maximum voltage and maximum current

(A) Option (i) only

(B) Options (i) and (ii)

(C) Options (i) and (iii)

(D) All the three options

80. A CRO is used to monitor the output of a circuit. The display exhibits a sustained sine wave characterized by a peak-to-peak amplitude of 6 divisions. What is the peak voltage of the signal if the vertical sensitivity is adjusted to 5V/div and the horizontal time base is set to 10 ms/div?

(A) 30 mV

(B) 15 V

(C) 30 V

(D) 0.6 V

81. The transfer function of a zero-order hold circuit for a sampling frequency of n samples/sec is given by :

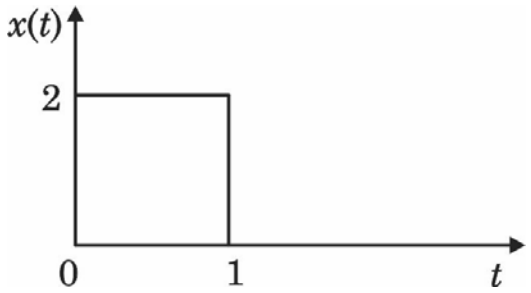
(A) $\frac{1-e^{sn}}{s}$

(B) $\frac{1-e^{-\left(\frac{s}{n}\right)}}{sn}$

(C) $\frac{1-e^{sn}}{sn}$

(D) $\frac{1-e^{-\left(\frac{s}{n}\right)}}{s}$

82. The following figure represents a continuous-time signal, $x(t)$ vs time (t) in seconds, then $x(t)$ can also be represented using unit steps signal, $u(t)$ as :



(A) $u(t)+2u(t-1)$

(B) $2u(t)-2u(t+1)$

(C) $2u(t)-2u(t-1)$

(D) $2u(t)+2u(t+1)$

83. Figure (a) represents a continuous-time signal, $x(t)$ vs time (t) in seconds, and Figure (b) represents a continuous-time signal, $y(t)$ vs time (t) in seconds. The signal $y(t)$ is obtained by performing some operations on $x(t)$, then $y(t)$ can be represented in terms of $x(t)$ as :

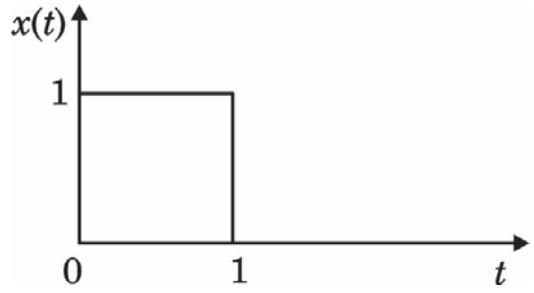


Figure (a)

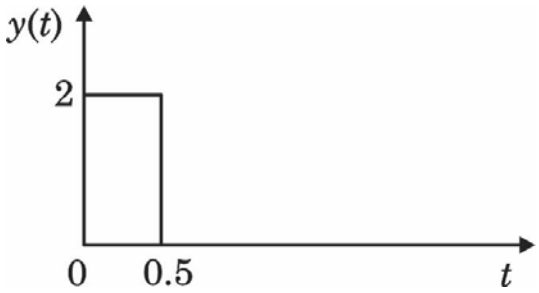


Figure (b)

(A) $2x(2t)$ (B) $0.5x(2t)$

(C) $2x(0.5t)$ (D) $2x(t-0.5)$

84. Let $x(t)$ and $y(t)$ represents the input and output of a system respectively. Also, the input-output relationship of the system is given by

$$y(t)=x(t)+x(t+5)+x(t-10)$$

then the system is :

(A) Linear (B) Causal

(C) Both (A) and (B) (D) Non-linear

85. Let $x(t)$ and $y(t)$ represents the input and output of a system respectively. Also, the input-output relationship of the system is given by

$$y(t)=t\sin(x\ (t))$$

then the system is :

(A) Non-linear (B) Time-varying

(C) Both (A) and (B) (D) Linear and time-variant

86. The discrete-time signal, $x(n)=\sin\left(\frac{7\pi}{4}n\right)$ is:

(A) a periodic signal with fundamental period $\frac{8}{7}$

(B) a periodic signal with fundamental period 8

(C) a periodic signal with fundamental period 7

(D) not a periodic signal

87. For a signal,

$x(t)=\cos(2t)+\sin(4t)\ \cos(4t)$

if $x_e(t)$ and $x_0(t)$ represents its odd and even components, then $x_e(t)$ and $x_0(t)$ will be

(A) $x_0(t)=\sin(4t)\cos(4t)x_e(t)=\cos(2t)$

(B) $x_e(t)=\sin(4t)\cos(4t)x_0(t)=\cos(2t)$

(C) $x_e(t)=\cos(2t)+\sin(4t)\cos(4t)x_0(t)=0$

(D) $x_0(t)=\cos(2t)+\sin(4t)\cos(4t)$

88. A signal $x(t)=10\sin(400\ \pi t)$ is to be sampled and converted into discrete form, if so among the following options which sampling frequency will ensure that $x(t)$ can be uniquely recovered from its samples?

(A) 200 Hz

(B) 500 Hz

(C) 350 Hz

(D) None of the above

89. Which of the following statement about a signal, $x(t)$ is correct?

(A) The signal will be a power signal if the total energy of the signal is zero and time-averaged power is infinite

(B) The signal will be a power signal if the total energy of the signal is zero and time-averaged power is finite

(C) The signal will be an energy signal if the total energy of the signal is finite and time-averaged power is infinite

(D) The signal will be an energy signal if the total energy of the signal is finite and time-averaged power is zero

90. What will be the output, $y(n)$ when $y(n)=u(n)\delta(n)$ where $u(n)$ is the discrete unit step and $u(n)$ is the discrete unit impulse?

(A) $2u(n)$ (B) $u(n)$

(C) $\delta(n)$ (D) $2\delta(n)$

91. An LVDT transducer is used to measure displacement in a robotic arm. If the primary winding voltage decreases by 10%, how does it affect the sensitivity of the output voltage in the presence of external electromagnetic interference?

(A) Sensitivity increases, and the output is stable

(B) Sensitivity decreases, but the output remains linear

(C) Sensitivity decreases, and output becomes nonlinear

(D) Sensitivity is unaffected, but the output noise increases

92. A Hall-effect sensor is calibrated for a magnetic field of 0.5 T, producing an output voltage of 25 mV with a supply current of 2 A. If the magnetic field increases to 0.8 T and the current decreases to 1.5 A, what is the new output voltage?

(A) 30 mV (B) 35 mV

(C) 40 mV (D) 50 mV

93. A battery pack consists of 4 cells, each rated at 3.7 V, 2500 mAh, connected in a 2S2P configuration. What is the total voltage and capacity of the pack?

(A) 3.7 V, 5000 mAh (B) 7.4 V, 2500 mAh

(C) 7.4 V, 5000 mAh (D) 14.8 V, 2500 mAh

94. What happens to the capacity and voltage of a battery system when connected in parallel?

(A) Voltage increases, capacity remains constant

(B) Voltage remains constant, capacity increases

(C) Voltage and capacity both increases

(D) Voltage decreases, capacity increases

95. In a high-rise building, the earthing system is connected to multiple points on the building's metal framework. Why is this practice followed?

(A) To reduce earthing resistance to zero

(B) To ensure equipotential bonding throughout the structure

(C) To eliminate the need for an external earth pit

(D) To prevent overloading a single earth conductor

96. A domestic wiring system uses a radial circuit to supply kitchen appliances with a maximum load of 2.5 kW at 230 V. If the circuit is protected by a 16 A circuit breaker, which of the following rules ensures the breaker does not trip?

(A) The cable must have a minimum current rating of 20 A

(B) The total impedance of the wiring must not exceed 1 Ω

(C) The maximum load must not exceed 85% of the breaker rating

(D) The appliances must have a combined power factor of 0.8 or higher

97. A room has three light fixtures rated at 40 W each, connected to a 230 V supply via a 2 mm^2 copper wire (resistance = 0.008 Ω/m) with a total wire length of 20 m (round trip). Calculate the voltage drop in the wire.

(A) 0.128 V

(B) 0.0835 V

(C) 0.256 V

(D) 0.512 V

98. A rotary angular displacement transducer has a total angular range of 360° and a linear output characteristic. It is supplied with a voltage of 12 V. If the output voltage is measured as 8 V, what is the corresponding angular displacement of the shaft?

(A) 120°

(B) 180°

(C) 240°

(D) 300°

99. An incandescent lamp operates at 60 W and has a luminous efficacy of 15 lm/W, while an LED lamp operates at 15 W and has a luminous efficacy of 60 lm/W. What is the ratio of the total luminous flux emitted by the LED to that of the incandescent lamp?

(A) 1:1

(B) 2:1

(C) 3:2

(D) 4:1

100. In a workspace with high ceilings, which lighting source is most efficient for uniform illumination?

(A) Halogen lamps

(B) Incandescent lamps

(C) Mercury vapor lamps

(D) LED lamps

SPACE FOR ROUGH WORK

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