

SET 2_EC_Engineering

1. Let A be 2×2 matrix over the field of real numbers such that $\text{determinant}(I + A) = 1 + \text{determinant}(A)$, then
 - A. $\text{determinant}(A) = 0$
 - B. $A = 0$
 - C. $\text{determinant}(A) \neq 0$
 - D. $\text{trace}(A) = 0$

2. Let V be a vector space of dimension n and S is a subset of it having m elements, where $m > n$. Then
 - A. S is linearly independent.
 - B. S is linearly dependent.
 - C. S is the whole space V .
 - D. all elements of S are zero.

3. The system of equations: $x + y + 4z = 2$, $2x + y - z = 3$ and $3x + 2y + mz = 4$ has a unique solution, if
 - A. $m \neq 3$
 - B. $-1 < m < 4$
 - C. $0 < m < 5$
 - D. $-4 < m < 4$

4. The coefficient of $(x - 1)^2$ in the Taylor's expansion of $f(x, y) = x^3 + y^3 + xy^2$ in powers of $(x - 1)$ and $(y - 2)$ is
 - A. 0
 - B. 1
 - C. 2
 - D. 3

5. If $\int_0^{\pi/2} \log|\sin x| dx = k \log 2$, then k is equal to
 - A. $\pi/2$
 - B. π
 - C. $-\pi/2$
 - D. $\pi/4$

6. If $u = \sin^{-1} \left(\frac{x-2y}{3x^5+3y^5} \right)$, then the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is
- A. $4 \sin u$
 B. $-4 \tan u$
 C. $-4 \sin u$
 D. $4 \tan u$
7. The particular integral $y_p(x)$ of $(D^3 - 5D^2 + 7D - 3)y = e^{2x} \sinh x$ is given by__
- A. $y_p(x) = \frac{x e^{3x} + x^2 e^x}{8}$ B. $y_p(x) = \frac{x e^{3x} - e^x}{8}$
 C. $y_p(x) = \frac{e^{3x} + x^2 e^x}{8}$ D. $y_p(x) = \frac{x(e^{3x} - e^x)}{8}$
8. The complete solution of the differential equation: $\frac{d^2 y}{dx^2} + y = e^{-x} + \cos x$, is
- A. $y = c_1 \cos x + c_2 \sin x + (e^x + x \cos x)/2$
 B. $y = c_1 \cos x + c_2 \sin x + (e^{-x} + x \sin x)/2$
 C. $y = c_1 \cos x + c_2 \sin x + (e^{-x} + x \cos x)/2$
 D. $y = c_1 \cos x + c_2 \sin x + (e^{-x} - x \cos x)/2$
9. The solution $y(x, t)$ to the partial differential equation $\frac{\partial y}{\partial x} = 2 \frac{\partial y}{\partial t} + y$ with $y(x, 0) = 3e^{-5x}$ is given by
- A. $y(x, t) = 3e^{-5x+3t}$
 B. $y(x, t) = 3e^{-5x-3t}$
 C. $y(x, t) = 3e^{-5x-4t}$
 D. $y(x, t) = 3e^{-5x+2t}$
10. If $\phi = x^3 + 3xy^2z$ and $\nabla = \hat{i} \frac{\partial}{\partial x} + \hat{j} \frac{\partial}{\partial y} + \hat{k} \frac{\partial}{\partial z}$, then the value of $\nabla \times \nabla \phi$ is
- A. 0
 B. 1
 C. x^3
 D. $-3xy^2z$

11. Using the Green's theorem, the value of the line integral $\oint_C (x^3 dx + (x^2 + y^2) dy)$, where C is the boundary of the square with vertices $(0,0)$, $(3,0)$, $(3,3)$ and $(0,3)$, is
- A. 3
 B. 9
 C. $27/2$
 D. 27
12. Using the divergence theorem, the value of the surface integral $\oiint_S \vec{F} \cdot \hat{n} dS$, where $\vec{F} = 3x\hat{i} + z^2\hat{j} - y\hat{k}$ and S is closed surface bounding the cylinder $x^2 + y^2 = 4, 0 \leq z \leq 3$, is
- A. 0
 B. 3π
 C. 36π
 D. 36
13. Let $f(z) = u + iv$ be an analytic function with $v = e^x(x \sin y + y \cos y)$, then $f(z)$ is
- A. $z + c$
 B. $e^z + c$
 C. $ze^z + c$
 D. $ze^{-z} + c$
14. The value of $\int_C \frac{(z+4)dz}{z^2 + 2z + 5}$, where C is $|z+1-i|=2$, is
- A. 0
 B. $\pi(1+2i)/2$
 C. $\pi(1+i)$
 D. $\pi(3+2i)/2$
15. The residue of $\frac{e^z}{(z^2 + \pi^2)^2}$ at $z = -\pi i$ is
- A. $\frac{\pi+i}{4\pi^3}$
 B. $\frac{\pi-i}{4\pi^3}$
 C. $\frac{2\pi-i}{4\pi^3}$
 D. none of these

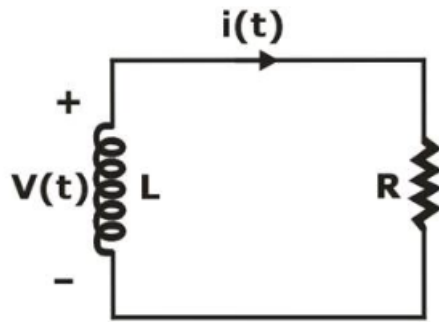
16. The marks obtained by a class of 50 students are given as follows:

Marks Obtained	0-10	10-20	20-30	30-40	40-50
Number of Students	6	15	8	10	11

The median of the marks will be

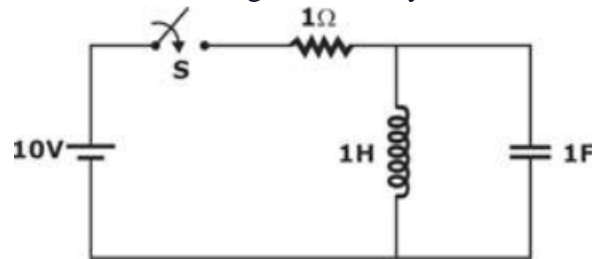
- A. 25
B. 26
C. 26.5
D. 28
17. Three urns contain red, blue and green balls. Urn I has 5 red, 6 blue and 9 green balls; Urn II has 8 red, 7 blue and 5 green balls; Urn III has 7 red, 6 blue and 7 green balls. If a ball is drawn at random and found to be red, the probability that it is from Urn III is
- A. 0.45
B. 0.40
C. 0.35
D. 0.25
18. If X and Y are two normal random variables with means 4, 5 and standard deviations 12, 5 respectively, then the standard deviation of $X - Y$ is
- A. 7
B. 13
C. 14.5
D. 17
19. The mean and variance of a binomial distribution are 16 and 8 respectively, then number of trials are
- A. 24
B. 26
C. 30
D. 32
20. If X is a Poisson variable with $P(X=2)=9P(X=4)+90P(X=6)$, then $E(X^2)$ is :
- A. $1/4$
B. $1/2$
C. 2
D. 3

21. Voltage and current expressions for the circuit shown below are $v(t) = 100e^{-20t}$ and $i(t) = 25e^{-20t}$. At a time, $t \geq 0$. The value of L is _____.



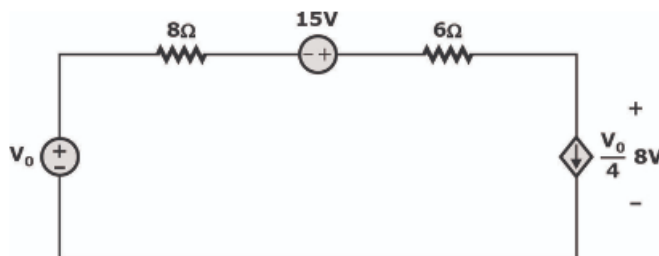
- A. 4 H
 B. 0.4 H
 C. 2 H
 D. 0.2 H

22. Consider the circuit shown below. If the switch 's' in the circuit is opened for a long time and closed at $t = 0$, the current through the battery at $t = 0^+$ and $t = \infty$ are respectively



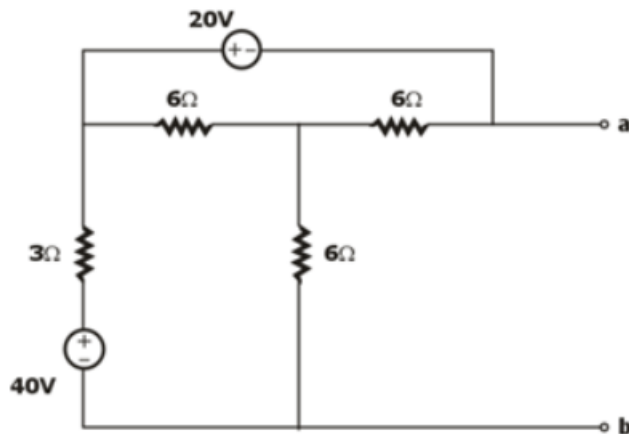
- A. 0A, 0A
 B. 10A, 10A
 C. 0A, 10A
 D. 10A, 0A

23. Determine the current through the 8 Ω resistor in the given network.



- A. 1.1 A
 B. 0.7 A
 C. 2.2 A
 D. 2.4 A

24. Find the Thevenin's equivalent resistance between the terminals a – b?



- A. 8Ω
 B. 12Ω
 C. 2.25Ω
 D. 6.5Ω

25. If the Laplace transform of a signal $y(t)$ is $Y(s) = \frac{1}{s(s-2)}$. Then its final value is ____

- A. 1
 B. -2
 C. 0
 D. unbounded

26. The Fourier transform of signal $g(t) = \frac{1}{1+t^2}$

- A. $\pi e^{|\omega|}$
 B. $\pi e^{-2|\omega|}$
 C. $2\pi e^{-|\omega|}$
 D. $\pi e^{-|\omega|}$

27. The signal given is $z(t) = 5\cos(2000\pi t + 4\pi) + 8\sin(6000\pi t)e^{j1000\pi t} + 12\cos(4000\pi t - 6\pi)$.
 The Nyquist rate is:

- A. 7000KHz
 B. 3500khz
 C. 2000khz
 D. 4000kh

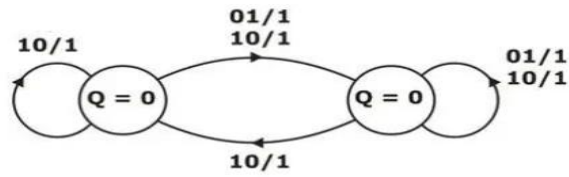
28. Let a causal LTI system is given by the following differential equation $y(t) + \frac{1}{2} \frac{dy}{dt} = 2x(t)$.
Its impulse response is :
- A. $2e^{-2t}u(t)$
 - B. $2e^{-0.25t}u(t)$
 - C. $4e^{-2t}u(t)$
 - D. $8e^{-4t}u(t)$
29. Consider a discrete-time signal defined as $x[n] = \sin\left(\frac{2\pi}{3}n + \frac{\pi}{6}\right) + \cos\left(\frac{3\pi}{4}n - \frac{\pi}{3}\right)$, n being an integer is :
- A. Periodic with π
 - B. Periodic with 24
 - C. Not periodic
 - D. Periodic with 12
30. The signal $x(t) = te^{-\frac{t}{T}}u(t)$ represents:
- A. Energy signal
 - B. Power signal
 - C. Neither energy nor power
 - D. None
31. In the PN junction diode I_D - V_D characteristics graph will be
- A. Linear
 - B. There will be no change in current with voltage.
 - C. Exponential
 - D. curvature
32. At 300K to maintain a diode current of 1mA, a certain Ge diode requires a forward bias of 0.143V, whereas a certain Si diode requires a forward bias of 0.178V. Then the ratio of reverse saturation current in Ge to that of Si is (approximately):
- A. 3.8
 - B. 3.2
 - C. 0.25
 - D. 0.50

33. The intrinsic semiconductor has which of the below capabilities at room temperature?
- Insulation
 - Zero current conduction
 - High current conduction
 - Little current conduction
34. A half wave rectifier has a load resistance of $1.2\text{ K}\Omega$ and peak ac voltage is 320 V. The root mean square value of current I_s will be _____, if $R_f = 100\ \Omega$, where the symbols have their usual meaning.
- 246.15 mA
 - 295.12 mA
 - 256.15 mA
 - 123.07 mA
35. An n-channel JFET, having a pinch-off voltage (V_p) of -5 V , shows a trans conductance (g_m) of 1 mA/V when the applied gate-to-source voltage (V_{GS}) is -3 V . Its maximum trans conductance (in mA/V) is _____
- 1.5
 - 2.5
 - 2
 - 3
36. A p-n junction diode has a reverse saturation current rating of 50 nA at 32°C . Assuming $V_T = \frac{kT}{q}$ at 32°C is 26 mV . The dynamic AC resistance of the diode at 32°C is _____ $\text{m}\Omega$ (forward voltage drop of diode is 0.5 V)
- 2.5
 - 2.3
 - 1
 - 0
37. In a forward biased region of a pn junction diode:
- the diode current increases exponentially with decrease in voltage.
 - the diode current decreases exponentially with increase in voltage.
 - the diode current increases exponentially with increase in voltage.
 - the diode current decreases exponentially with decrease in voltage.

38. A four-stage amplifier has voltage gains of $A_1 = -24$, $A_2 = -60$, $A_3 = -8.5$ and $A_4 = 0.7$. A fifth stage is added and the overall voltage gain becomes 10^5 . The voltage gain of the fifth stage is
- 2.282
 - 4.284
 - 6.485
 - 1.167
39. What are the regions in which a BJT is operated and MOS is operated when they are used as an amplifier respectively?
- Saturation, Linear
 - Saturation, Saturation
 - Active, Saturation
 - Active, Linear
40. In modern electronic multi meter a FET or MOSFET is preferred over BJT because _____.
- Its input resistance is low
 - Its input resistance is high
 - Its input resistance is high and does not vary with the change of range
 - It is cheaper
41. If $2^{y+1} + 2^{y-1} = 640$, then find y.
- 6
 - 7
 - 8
 - 9
42. Let X be the distinct integers possible to store in 8-bit register when storing of data is done using 1's complement representation. Let Y be the largest possible magnitude that can be stored in the 8-bit register. The value of X-Y is_____.
- 0
 - 10
 - 12
 - 5
43. Consider the following Boolean expression represented in extended canonical form: $F(w, x, y, z) = \sum (0, 2, 4, 5, 6, 13, 14, 15)$. The number of prime implicants which are not essential prime implicants are_____.
- 5
 - 4
 - 3
 - 2

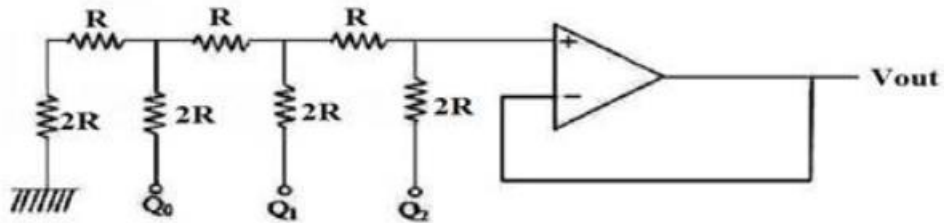
44. Let the frequency of the clock signal applied to the flip-flop be 10 kHz. If the flip-flop is T- flip flop with a negative edge-triggered clock signal and $T=1$ and the previous state was made clear, the frequency of the output signal will be?
- A. Equal to the frequency of the clock signal.
 - B. It is independent of the frequency of the clock signal.
 - C. Half to the frequency of the clock signal, i.e.,5 KHz.
 - D. None of these
45. Consider the function $F(x, y, z) = xy + x'z + yz$. All the variables are available in complemented and non-complemented form. The minimum number of gates required to implement the above function is _____. (All gates are available only with 2-inputs)
- A. 3
 - B. 4
 - C. 2
 - D. 5
46. A Johnson ring counter consisting of four flip-flops will have _____.
- A. 8 used states
 - B. mod value 4
 - C. 4 used states
 - D. mod value 10
47. The maximum number of bit ripple counters that can be designed for a clock period 10ns with each flip flop delay is 1ns and the strobe time is 2.5ns is?
- A. 10
 - B. 9
 - C. 8
 - D. 7
48. Find the base k of the number system if $(654)_6 = (475)_k$
- A. 6
 - B. 7
 - C. 8
 - D. 9

49. For the given state diagram, Q is the output. The logic gate is



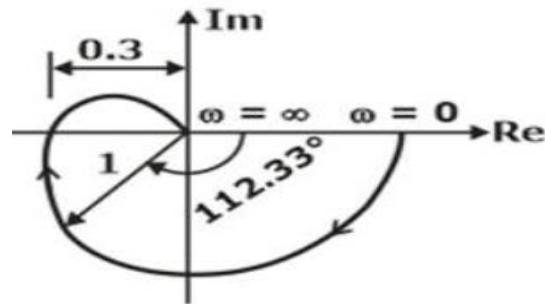
- A. XOR
- B. AND
- C. OR
- D. NONE

50. For the given circuit, binary '1' is equal to +5V and binary '0' is equal to 0V. Then the equivalent analog voltage (in Volts) when inputs Q_0 Q_1 Q_2 are 011 is

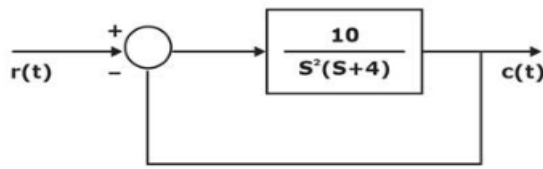


- A. 2.7
- B. 3
- C. 5
- D. 1.9

51. A unity feedback system has an open-loop transfer function $G(s)$. The polar plot of $G(j\omega)$ is shown below. The gain margin (GM) and the phase margin (PM) of the feedback system are



- A. Gain Margin = -0.3 ; Phase Margin = 112.33
 B. Gain Margin = 0.3 ; Phase Margin = 112.33
 C. Gain Margin = 3.33 ; Phase Margin = 67.67°
 D. Gain Margin = 3.83 ; Phase Margin = 67.67°
52. The steady-state error resulting from or input $r(t) = 2 + 3t + 4t^2$ for the given state is



- A. 2.4
 B. 4
 C. Zero
 D. 3.2
53. A system with characteristic polynomial $s^4 + 2s^3 + 3s^2 + 4s + 5$ is
- A. Stable
 B. Unstable
 C. Marginally stable
 D. In equilibrium
54. If $s^3 + 3s^2 + 4s + A$ then all the roots of the equation are in the left half of the s-plane, provided that
- A. $A > 12$
 B. $-3 < A < 4$
 C. $0 < A < 12$
 D. $5 < A < 12$

55. The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{k}{s(s+2)(s+5)}$. What is the value of 'K' at which the root locus diagram of the system intersects the imaginary axis?
- A. 70
B. 80
C. 20
D. 50
56. A unity feedback system has the open loop transfer function $G(s) = \frac{1}{(s+1)(s-2)(s-3)}$. The Nyquist plot of a encircle the origin
- A. Never
B. Once
C. Twice
D. Thrice
57. A unity feedback system has an open loop transfer function $G(s) = \frac{1000}{s(s+10)^2}$. The phase margin in degrees will be _____.
- A. $37 \cdot 8^0$
B. $-37 \cdot 8^0$
C. $-36 \cdot 87^0$
D. $-35 \cdot 8^0$
58. A linear second-order single-input continuous-time system is described by the following set of differential equations:
- $$\dot{X}_1(t) = -2 X_1(t) + 4 X_2(t)$$
- $$\dot{X}_2(t) = 2 X_1(t) - X_2(t) + u(t)$$
- Where $X_1(t)$ and $X_2(t)$ are the state variables and $u(t)$ are the control variable.
The system is
- A. Controllable and stable
B. Controllable but unstable
C. Uncontrollable and unstable
D. Uncontrollable but stable

59. A unity feedback control system requires 0.52 seconds to reach its peak value while subjected to the step input. If the settling time of the response for 2% tolerance band is 1.05 seconds. The resonant frequency of the system will be _____ rad/sec.
- A. 3.676
 B. 46.76
 C. 4.676
 D. 2.676
60. For any control system, a settling time is 7 seconds and a peak time is 3 seconds. So, the location of the second-order pair of poles is
- A. $0.30 \pm 0.507j$
 B. $0.60 \pm 1.20j$
 C. $0.57 \pm 1.047j$
 D. $0.39 \pm 0.82j$
61. A communication channel with Additive White Gaussian Noise has a bandwidth of 4 kHz and SNR of 31dB. Its channel capacity is _____.
- A. 2 kbps
 B. 20 kbps
 C. 40 kbps
 D. 38kbps
62. In amplitude modulation, the modulation envelope has a peak value which is double the unmodulation carrier value. What is the value of the modulation index?
- A. 25%
 B. 50%
 C. 75%
 D. 100%
63. A delta modulator is designed to operate on speech signals limited to 3.4 kHz. The sampling rate is 8 times the Nyquist rate of the speech signal. The step size is 100 mV. The modulator is tested with a 1 kHz sinusoidal test signal. Which of the following is/are correct?
- A. The maximum amplitude of the test signal required to avoid slope over load is 2.34 V
 B. Sampling rate is 68 kHz
 C. Sampling rate is 54.4 kHz
 D. The maximum amplitude of the test signal required to avoid slope overload is 0.966 V.

64. Which of the following is false regarding the white noise?
- A. White noise and an impulse function both have a similar magnitude spectrum.
 - B. It is a Gaussian noise signal.
 - C. Its frequency spectrum contains all frequency components but in unequal proportion.
 - D. Theoretically it has infinite power.
65. A data stream of 500 Mbps is to be transmitted through a wireless channel using 32-PSK technique. Find the minimum bandwidth requirement of the wireless channel.
- A. 15.625 MHz
 - B. 50 MHz
 - C. 60 MHz
 - D. 100 MHz
66. A carrier is AM modulated by a combination of two sinusoidal modulating signals of different frequencies with individual modulation indices 0.3 and 0.4. The power in the sidebands as a percentage of the total power of the modulating signal is
- A. 11.1%
 - B. 13%
 - C. 17%
 - D. 20%
67. Consider an 8-PSK system with an information bit rate 24 kbps. The bandwidth efficiency of the system (in bits per cycle) is _____.
- A. 3
 - B. 6
 - C. 2
 - D. 1.5
68. An analog voltage signal with highest frequency of 1 kHz is digitally encoded with a resolution of 0.02% covering the voltage range -50 V to 50 V to avoid the loss of information, the RMS value of quantization noise is
- A. 1.98 V
 - B. 3.5 mV
 - C. 4 mV
 - D. 18.25 mV

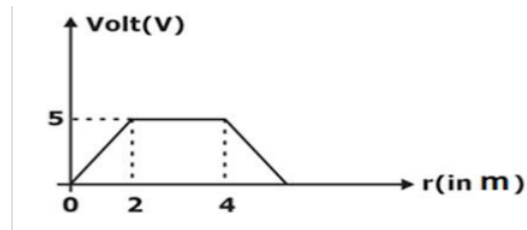
69. A satellite receiver with noise figure of 5.6 dB has a bandwidth of 16 kHz and consist of a preamplifier with noise temperature 147 K and a gain of 30 db. If the reference temperature is 297 K the equivalent noise temperature of the receiver is
- 150 K
 - 219.64 K
 - 146.3 K
 - 150.9 K
70. A signal is band limited to 7.2 KHz and three other signals are band-limited to 2.4 KHz each. The signals are to be transmitted by means of TDM. If each signal is sampled at, its Nyquist rate, find the speed of commutator in rpm.
- 144000 rpm
 - 288000 rpm
 - 14400 rpm
 - 28800 rpm
71. A message signal with bandwidth 10 kHz is Lower-Side Band SSB modulated with carrier frequency is $f_{c1} = 10^6 \text{ Hz}$. The resulting signal is then passed through a Narrow-Band Frequency Modulator with carrier frequency $f_{c2} = 10^9 \text{ Hz}$. The bandwidth of the output would be:
- $4 \times 10^4 \text{ Hz}$
 - $5 \times 10^5 \text{ Hz}$
 - $6 \times 10^5 \text{ Hz}$
 - $20 \times 10^3 \text{ Hz}$
72. If the total power of an amplitude-modulated signal is 800 W, and the carrier power is 500 W, what is the modulation index?
- 1.925
 - 1.095
 - 1.238
 - 1.90
73. In an AM signal, received signal power is 10^{-10} W with a maximum modulating signal of 5kHz. The noise spectral density at the receiver input is 10^{-18} W/Hz . If noise power is restricted to the message signal bandwidth only then the signal-to-noise ratio at the input to the receiver is _____ (dB).
- 66
 - 43
 - 53
 - 68

74. What is the advantage of Offset QPSK (OQPSK) compared to conventional QPSK?
- A. Bandwidth efficiency
 - B. Constant envelope
 - C. Simple demodulator
 - D. All of these
75. What is the relationship between the percentage efficiency saving when the carrier wave and one of the sidebands are suppressed in an AM wave modulated to a depth of 100% modulation index?
- A. $h_{DSB} = 2.5h_{AM}$
 - B. $h_{DSB} = 4h_{AM}$
 - C. $h_{DSB} = 5h_{AM}$
 - D. $h_{DSB} = 2h_{AM}$
76. A receiver is operated at a temperature of 300K. The transistor used in the receiver has an output resistance of $2K\Omega$. What is the value of thermal noise voltage (in μV) in receiver with a bandwidth of 300kHz?
- A. $V_n = 3.15\mu v$
 - B. $V_n = 3.55\mu v$
 - C. $V_n = 4.44\mu v$
 - D. $V_n = 8.25\mu v$
77. An audio signal is digitized using a 12-bit PCM. What is the signal-to-quantization noise ratio (SQNR) for this system?
- A. 74 dB
 - B. 62 dB
 - C. 63 dB
 - D. 70 dB
78. In a receiver, noise is usually developed at _____.
- A. Audio stage
 - B. Receiving antenna
 - C. RF stage
 - D. IF stage

79. An FM transmitter operates with a peak frequency deviation of 50 kHz. If the highest frequency in the modulating signal is 15 kHz, what is the total bandwidth of the FM signal using Carson's rule?
- A. 120 kHz
 - B. 130 kHz
 - C. 150 kHz
 - D. 200 kHz
80. Which of the following type of noise gains importance at low frequency?
- A. Shot noise
 - B. Flicker noise
 - C. Thermal noise
 - D. Transit time noise
81. The electric field component of a time-harmonic plane EM wave traveling in a non-magnetic lossless dielectric medium has an amplitude of 2 V/m. If the relative permittivity of the medium is 4, the magnitude of the time-average power density vector (in W/m^2) is?
- A. $\frac{1}{30\pi}$
 - B. $\frac{1}{120\pi}$
 - C. $\frac{1}{220\pi}$
 - D. $\frac{1}{60\pi}$
82. In a microwave measurement with slotted rectangular waveguides, the distance between successive minima is found to be 2.5 cm. If the measurement has been carried out at a frequency of 10 GHz and the guide operates in TE_{10} mode, the cutoff frequency f_{c10} for the guide is?
- A. 6GHz
 - B. 8GHz
 - C. 10GHz
 - D. 5GHz

83. The tangential component of Magnetic field intensity in two mediums are same if
- A. Current density equal to zero
 - B. Current density not equal to zero
 - C. Tangential component doesn't depend on current density
 - D. None of the above
84. An antenna with a radiation efficiency of 90% has a directivity of 6dB. The maximum power gain of the same antenna is _____ db.
- A. 6.54dB
 - B. 5.54dB
 - C. 7.54dB
 - D. 8.54dB
85. If the directive gain of a half-wave dipole is 2.64 W/W, and ohmic losses is 8Ω , then determined its power gain (in dB) is
- A. 3.74dB
 - B. 7.74dB
 - C. 6.74dB
 - D. 8.74dB
86. A uniform surface charge density of 20 nC/m^2 is present on the spherical sphere $r = 0.6 \text{ cm}$ in free space. Find the absolute potential at P ($r = 1 \text{ cm}$, $\theta = 25^\circ$, $\phi = 50^\circ$) in (volts)
- A. 6.14
 - B. 7.14
 - C. 8.14
 - D. 9.14
87. The surfaces $\rho = 3$ and 5 , $\phi = 100^\circ$ and 130° and $z = 3$ and 4.5 . Find the volume enclosed, by the surface.
- A. $V=6.28$
 - B. $V=20.7$
 - C. $V=11.2$
 - D. $V=22.4$

88. The variation of potential with distance r from a fixed point is as shown below. The electric field at $r = 5$ m is _____ V/m.



- A. 2.5 V/m
 B. 3.7 V/m
 C. 4.8 V/m
 D. 3.5 V/m

89. If the electric field $E = e^{5t} \hat{a}_x$ V/m and $\epsilon = \epsilon_0$ then the displacement current passing through an area of 1 m^2 at $t = 0$ sec is _____

- A. $200 \epsilon_0$
 B. $180 \epsilon_0$
 C. $164 \epsilon_0$
 D. $246 \epsilon_0$

90. Three identical point charges of 4 pC each are located at the corners of an equilateral triangle 0.5 mm on a side in free space. How much work must be done to move one charge to a point equidistant from the other two and on the line joining them?

- A. 376 PJ
 B. 676 PJ
 C. 476 PJ
 D. 576 PJ

91. In transmission on line ($\epsilon_r = 1$) the electric field intensity is $E = \frac{200}{p} \sin(10^8 t - 4z) \hat{a}_p$ V/m displacement current density magnitude will be _____ If $p = 1$

- A. 0.18 A/m^2
 B. 0.9 A/m^2
 C. 0.20 A/m^2
 D. 0.15 A/m^2

92. The material has relative permittivity ϵ_r is 14 and the conductivity is $\sigma = 10^{-3} S/m$. It is operating at a microwave frequency of 50 GHz, and then this material will behave as
- Conductor
 - Dielectric
 - Perfect dielectric
 - Superconductor
93. A square loop of 2 m side is placed in xy – plane with its centre at the origin and sides along the coordinate axes. If the magnetic flux density in the region is given by, $\vec{B} = (2\hat{a}_x + 3\hat{a}_y + 5\hat{a}_z)e^{-0.5t} \text{ Wb/m}^2$. The emf induced in the loop at $t = 10$ sec will be _____ mV.
- 67.379
 - 68.387
 - 69.987
 - 70.654
94. In a material the magnetic field intensity is $H = 1400 \text{ A/m}$ when magnetic flux density $B = 2 \text{ Wb/m}^2$. When the H is reduced to 700 A/m at $B = 1.4 \text{ Wb/m}^2$, the change in permeability is _____.
- 464.53
 - 454.73
 - 598.83
 - 875.98
95. The energy stored in (mJ) in a magnetic field of toroidal iron ring ($\mu_2 = 800$) 20 cm, mean radius and a radius for the winding of 2 cm, wound with 1000 turns of wire carrying a current of 2.5 A is
- 3141.5 mJ
 - 3261.6 mJ
 - 3598.9 mJ
 - 3878.86 mJ
96. Determine the electric field intensity at a distance of 10 km from an antenna having a directive gain of 5 dB and radiating a total power of 20 kW
- 0.8947m/v
 - 0.1948m/v
 - 0.1845m/v
 - 0.1768m/v

97. A circular cross section conductor of radius 1.5 mm carries a current $I_c = 5.5 \sin(4 * \sin 10^{10} t) \mu\text{A}$. What is the amplitude of the displacement current density if $\sigma = 35 \text{ MS/m}$ and $\epsilon_r = 1$
- A. 7.86 nA/m²
 - B. 3.9 A/m²
 - C. 7 A/m²
 - D. None of the option
98. Given electric field $\vec{E} = (3x^2 + y)\hat{a}_x + x\hat{a}_y \text{ KV/m}$. Find the work done (in mJ) moving a $-2 \mu\text{C}$ charge from (0, 5, 0) to (2, -1, 0) by taking the path (0, 5, 0) \rightarrow (2, 5, 0) \rightarrow (2, -1, 0) is_____.
- A. 13mJ
 - B. 20mJ
 - C. 16mJ
 - D. 12mJ
99. An insulating dielectric slab with 500 m X 500 mm cross section is 0.4 m long. A uniform electric field of 10 kV/mm is applied on the slab. The energy stored in the dielectric is..... J. (Relative permittivity of the material is 1.2)
- | | |
|-----------|-----------|
| A. 53.1 J | B. 50 J |
| C. 54.2 J | D. 55.6 J |
100. At the surface of a perfect conductor _____
- A. The tangential component of the magnetic field is zero.
 - B. The tangential component of the electric field is zero.
 - C. Normal component of electric flux density is zero, with surface charge density on the conductor.
 - D. None of these

