ME1315 ELECTRONICS AND COMMUNICATION ENGINEERING

Paper - 2

504

Series A

Sl.No. : 517789

Duration : 150 Minutes *Max. Marks : 300*

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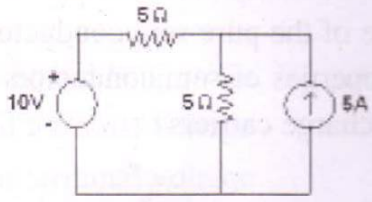
1) A capacitor C is connected across a coil with resistance R and inductance L. The effective of the circuit at resonance is

(1) $\frac{1}{RLC}$ (2) $\frac{RC}{L}$ (3) $\frac{L}{RC}$ (4) $\frac{L}{\sqrt{RC}}$

2) The voltage across 5 A source in the given circuit is

(1) 17.5 volt (2) 25 volt (3) 15 volt (4) 20 volt



3) The current i(t) through a 10Ω resistor in series with an inductance is given by $i(t) = 3 + 4\sin(100t + 45^0) + 4\sin(300t + 60^0)$ Amperes. The rms value of the current and the power dissipated in the circuit are

(1) 40 A, 410W (2) 10A, 350W (3) 5A, 250W (4) 11A, 250W

4) An ideal voltage source and current sources are connected in parallel. This circuit has

(1) neither Thevenin nor Norton's equivalent
(2) both Thevinin and Norton's equivalent
(3) a Thevenin equivalent but not Norton's equivalent
(4) a Norton's equivalent but not Thevenin equivalent

5) A transient current in a network is $i(t) = 2e^{-t} - e^{-5t}$, $t \geq 0$. The pole-zero configuration of I(s) is

(1) poles : 1,5 zeros : 9
(2) poles : –1, –5 zeros : –9
(3) poles : 2, –1 zeros : –1, –5
(4) poles : 2, –1 zeros: 1, 5

6) $F(s) = \frac{(s+1)(s+3)}{s(s+2)}$ represents an

(1) RC impedance and an RL admittance
(2) RL admittance
(3) RC impedance
(4) RC admittance

7) The transfer function of a system $Z(s) = V(s)/I(s) = s/(s+3)$. The system is at rest for $t < 0$. What will be the value of $v(t)$ for $t \geq 0$, if $i(t) = 3\,u(t)$, where $u(t)$ is a step function

(1) e^{-t} (2) $4\,e^{-t}$ (3) $2\,e^{-3t}$ (4) $3e^{-3t}$

8) Doping materials are called impurities because they

(1) change the temperature of the material
(2) alter the crystal structure of the pure semiconductor
(3) change the chemical properties of semiconductors
(4) decrease the number of charge carriers

9) In IC technology, dry oxidation as compared to wet oxidation produces

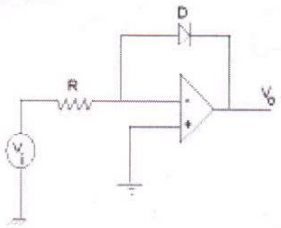
(1) superior quality oxide with a lower growth rate
(2) superior quality oxide with a higher growth rate
(3) inferior quality oxide with a lower growth rate
(4) inferior quality oxide with a higher growth rate

10) In a transistor $h_{fe}=50$, $h_{ie}=830\Omega$, $h_{oe}=10^{-4}$ mho. Its output resistance when used in CB configuration is about

(1) 2 MΩ (2) 2.5 MΩ (3) 500Ω (4) 500 KΩ

11) The circuit shown in the figure can be used as a

(1) full wave rectifier (2) voltage to frequency converter
(3) logarithmic amplifier (4) frequency to voltage converter



12) KCL is a consequences of law of conservation of

(1) flux (2) energy (3) potential (4) charge

13) When a source is delivering maximum power to a load, the efficiency of the circuit
(1) is always 50%
(2) is always 75%
(3) depends on the circuit parameters
(4) is always 100%

14) In the Thevenin equivalent circuit, V_{th} equals
(1) short-circuit terminal voltage
(2) open-circuit terminal voltage
(3) net voltage available in the circuit
(4) voltage of the source

15) For a series RLC circuit, the power factor at the lowest half power frequency is
(1) 0.707 lagging
(2) 0.5 leading
(3) 1.0
(4) 0.707 leading

16) A series RLC circuit has a resonance frequency of 1 kHz and a quality factor Q = 100. If each of R, L and C is doubled from its original value, the new Q of the circuit
(1) 200 (2) 100 (3) 25 (4) 50

17) An inductance and a capacitance are connected in series. If a unit step voltage is applied across the combination, then the initial and final currents in the circuit will be
(1) 0, ∞ respectively
(2) 0, 0 respectively
(3) ∞, ∞ respectively
(4) ∞, 0 respectively

18) The Laplace transform of the function i(t) is $I(s)=\frac{10s+4}{s(s+1)(s^2+4s+5)}$ Its final value will be
(1) $\frac{5}{4}$ (2) $\frac{4}{5}$ (3) 5 (4) 4

19) The network function $F(s)=\frac{(s+2)}{(s+1)(s+3)}$ Represents an
(1) RC admittance and an RL impedance
(2) RC impedance
(3) RL impedance
(4) RC impedance and an RL admittance

20) If a two-port network is reciprocal as well as symmetrical, which one of the following conditions true
(1) $Z_{12} = Z_{21}$ and $Z_{11} = Z_{22}$
(2) $Z_{11} = Z_{21}$ and $Z_{12} = Z_{22}$
(3) $Y_{11} = Y_{21}$ and $Y_{12} = Y_{22}$
(4) AD + BC = 1 and A = C

21) An intrinsic semiconductor at absolute zero temperature
(1) has large number of holes
(2) has a large number of electrons
(3) behaves like an insulator
(4) behaves like a metallic conductor

22) A diode clamper also referred to as a
(1) series rectifier
(2) series clamper
(3) shunt rectifier
(4) shunt clamper

23) The Ebers-Moll model is applicable to
(1) Junction FET (2) UJT (3) NMOS (4) BJT

24) When the frequency of the input signal to a CMOS gate is increased, the average power dissipation
(1) does not change
(2) increases
(3) decreases
(4) decreases exponentially

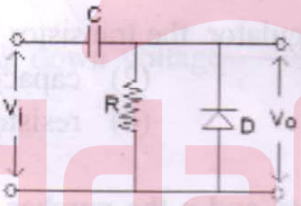
25) Photo masking
(1) controls the depth of diffusion
(2) is used to prevent ambient light shining on the silicon slice
(3) is used in the process to remove selected regions of silicon oxide
(4) reduce the size of the circuit elements

26) The self bias is used in amplifiers to
(1) reduce the cost of the circuit
(2) reduce the dc base current
(3) make the operating point almost independent of β
(4) limit the input ac signal going to the base terminal

27) The h- parameter equivalent circuit of a BJT is valid for
(1) low frequency, large signal operation
(2) low frequency, small signal operation
(3) high frequency, small signal operation
(4) high frequency, large signal operation

28) In a centre-tap full wave rectifier, V_m is the peak voltage between the centre-tap and one of the secondary. The maximum voltage across the reverse biased diode is
(1) V_m (2) $2\,V_m$ (3) $V_m/2$ (4) $3\,V_m$

29) The circuit shown in figure is a
(1) positive peak clipper (2) positive clamper
(3) differentiator (4) negative clamper



30) The gain of a transistor amplifier falls at high frequency due to the
(1) coupling capacitor at the output
(2) skin effect
(3) internal capacitances of device
(4) coupling capacitor at the input

31) Darlington pair consists of the following two stages
(1) both CE (2) CE and CB (3) CE and CC (4) both CC

32) The voltage gain of an amplifier is 100. On applying negative feedback with $\beta = 0.03$, its gain will reduce to
(1) 50 (2) 2.5 (3) 3.0 (4) 25

33) The main function of the transformer used in the output of a power amplifier is
(1) to step up the voltage
(2) to step down the voltage
(3) to match the load impedance with dynamic output resistance of the transistor
(4) to increase voltage gain

34) The bandwidth of a double tuned transformer coupled amplifier can be adjusted by varying the
(1) coupling coefficient
(2) value of the inductance
(3) value of the emitter biasing resistance
(4) value of resistance

35) Crossover distortion results in
(1) class B output stage
(2) common emitter output stage
(3) class AB output stage
(4) class A output stage

36) In transistor series voltage regulator the transistor behaves like a variable
(1) resistor (2) capacitor
(3) inductor (4) resistor and capacitor

37) If b is the number of branches and n the number of nodes in a connected graph, the number of links corresponding to any tree of the graph
(1) $b - n - 1$ (2) $b - n + 1$ (3) $n - b - 1$ (4) $n + 1 - b$

38) The number of edges in a complete graph of n vertices is
(1) $n/(n-1)$ (2) $n-1$ (3) n (4) $n/2$

39) Superposition theorem is not applicable to networks containing
(1) nonlinear elements
(2) dependent voltage sources
(3) dependent current sources
(4) transformers

40) In an RLC parallel circuit the impedance at resonance is
(1) ∞ (2) minimum
(3) maximum (4) zero

41) Any two-port network having a 6dB loss will give
(1) an output power which is 0.707 of the input power
(2) an output power which is one quarter of the input power
(3) an output power which is one half of the input power
(4) an output voltage which is 0.707 of the input voltage

42) For a reciprocal network, the two port h- parameters are related as follows
(1) $h_{12} = h_{21}$ (2) $h_{11}h_{22} - h_{21}h_{12} = 1$
(3) $h_{11}h_{22} - h_{21}h_{12} = -1$ (4) $h_{12} = -h_{21}$

43) Which of the following is not associated with a PN junction?
(1) depletion capacitance
(2) junction capacitance
(3) charge storage capacitance
(4) channel length modulation

44) Zener diode break down voltage————————with temperature
(1) decreases (2) constant
(3) increases (4) may increase or decrease

45) The output V-I characteristics of an enhancement type MOSFET has
(1) an ohmic region at low voltage value followed by a saturation region at higher voltages
(2) an ohmic region at large voltage values preceded by a saturation region at lower voltages
(3) only an ohmic region
(4) only a saturation region

46) Typical value of h_{ie} is
(1) 1KΩ (2) 1 Ω (3) 100 KΩ (4) 50 Ω

47) The ripple factor of a bridge rectifier is
(1) 1.11 (2) 0.121 (3) 1.21 (4) 0.812

48) The ideal Op-Amp has following characteristics
(1) $R_i = \infty$, $A = \infty$, $R_0 = 0$ (2) $R_i = 0$, $A = \infty$, $R_0 = 0$
(3) $R_i = \infty$, $A = \infty$, $R_0 = \infty$ (4) $R_i = 0$, $A = \infty$, $R_0 = \infty$

49) In a half-wave rectifier, if an a.c supply is 60Hz, then the a.c ripple at output will be
(1) 6Hz (2) 30Hz (3) 60Hz (4) 120Hz

50) Maximum theoretical conversion efficiency of class B amplifier is
(1) 7.85% (2) 25% (3) 50% (4) 78.5%

51) In a logic equation $A(A+\bar{B}\bar{C}+C)+\bar{B}(\bar{C}+\bar{A}+BC)+(A+\bar{B}C+A\bar{C})=1$, if $C=\bar{A}$ then
(1) A+B=1 (2) $\bar{A}+B=1$ (3) $A+\bar{B}=1$ (4) A = 1

52) The maximum positive and negative numbers which can be represented in 2's compliment form using n-bit are
(1) $+(2^{n-1}-1), -(2^{n-1}-1)$ (2) $+(2^{n-1}-1), -2^{n-1}$
(3) $+2^{n-1}, -2^{n-1}$ (4) none

53) What is the resolution of a nine bit D/A converter which uses ladder network in percentage?
(1) 1 (2) 2 (3) 4 (4) 10

54) In a positive edge triggered JK flip-flop, the present state Q_n is set to high (1). If the inputs J=A and K=B then next state Q_{n+1} will be
(1) $\bar{B}$ (2) $\bar{A}$ (3) A + B (4) A

55) In PLA both AND and OR arrays are
(1) Non-programmable (2) Programmable
(3) 1 and 2 (4) None

56) Pick the wrong statement of CMOS
(1) Low power dissipation
(2) Poor Noise immunity
(3) High packing density
(4) Wide range of supply voltages

57) The signal $e^{-t}u(t)$ is applied as input to an L-section RC lowpass filter with time-constant equal to 1. The energy spectral density at the output of the filter at the 3-db cutoff frequency of the filter is

(1) 1 (2) 0.5 (3) 0.25 (4) 1.5

58) Two LTI systems with impulse responses $h_1(t)$ and $h_2(t)$ are connected in series(cascade), the impulse response of the overall system is

(1) $h_1(t) + h_2(t)$ (2) $\frac{h_1(t)\,h_2(t)}{h_1(t) + h_2(t)}$

(3) $h_1(t) * h_2(t)$ (4) $h_1(t).h_2(t)$

59) Which of the following system is causal?

(1) $h(n)=n(1/2)^n\,u(n+1)$ (2) $y(n)=x^2(n)-x(n+1)$

(3) $y(n)=x(-n)+x(2n-1)$ (4) $h(n)=n(1/2)^n\,u(n)$

60) Two parallel connected discrete time systems with impulse responses $h_1(n)$ and $h_2(n)$ can be replaced by a single equivalent discrete time system with impulse response,

(1) $h_1(n) * h_2(n)$ (2) $h_1(n) + h_2(n)$

(3) $h_1(n) - h_2(n)$ (4) $h_1(n) * [\,h_1(n) + h_2(n)]$

61) For a stable LTI discrete time system, poles should lie ____and unit circle should be ____

(1) Outside unit circle, included in ROC

(2) Inside unit circle, outside of ROC

(3) Inside unit circle, included in ROC

(4) Outside unit circle, outside of ROC

62) The discrete time Fourier transform of the signal, $x(n)= 0.5^{(n-1)}\,u(n-1)$ is,

(1) $\frac{e^{-j\omega}}{1-0.5e^{-j\omega}}$ (2) $e^{-j\omega}(1-0.5e^{-j\omega})$ (3) $\frac{0.5e^{-j\omega}}{1-0.5e^{-j\omega}}$ (4) $\frac{0.5e^{j\omega}}{1-0.5e^{-j\omega}}$

63) The characteristic polynomial of a system $q(s)=2s^5+s^4+4s^3+2s^2+2s+1$. The system is

(1) Stable (2) Marginally stable

(3) Unstable (4) Oscillatory

64) The system mode described by this equation $X = \begin{bmatrix} 0 & 1 \\ 2 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$, $y = [1 \quad 1] x$ is

(1) Controllable and observable
(2) Controllable but not observable
(3) Observable but not controllable
(4) Neither controllable nor observable

65) The number of switching functions of 3 variables is

(1) 8 (2) 64 (3) 128 (4) 256

66) In JK Flip flop if we input K with the inverted from of what we input J, the resulted flip flop is

(1) SR flip flop
(2) JK flip-flop itself
(3) D flip flop
(4) T flip flop

67) How many and what are the machine cycles needed for execution of PUSH B?

(1) 2, fetch and memory write
(2) 3, fetch and 2 memory write
(3) 3, fetch, memory write and read
(4) 3, fetch and 2 memory read

68) For successive approximation with N output bits, number of clocks required is

(1) N + 2 or N (2) 2N + 1 (3) 2^N (4) $2^N - 1$

69) The minimum number of flip-flops required in a counter to count 60 pulses is

(1) 4 (2) 6 (3) 8 (4) 10

70) What is the addressing mode used in instruction LXI B0345 H ?

(1) Direct
(2) Indirect
(3) Indexed
(4) Immediate

71) The 8255 programmable peripheral interface consist of _____ 8-bit ports

(1) 2 (2) 3 (3) 4 (4) 6

72) Ready signal is used to
(1) Synchronize fast peripherals with microprocessor
(2) Synchronize slow peripherals with microprocessor
(3) Send request to microprocessor for direct memory access
(4) Send request to microprocessor for interrupt subroutines

73) When the reset pin is activated, the program counter is loaded with
(1) 1000H (2) 2000H (3) 3000H (4) 0000H

74) An 'N' bit Johnson counter can count _____ states
(1) N (2) 2N (3) N–1 (4) 2N–1

75) The 2's compliment of the given number 1011001 is
(1) 1011000H (2) 1011001H (3) 1010110H (4) None.

76) The n-stage register results in a delay of
(1) (n–1) T (2) 2nT (3) n^2T (4) nT/2

77) n-bit variables have 2^n possible combinations and each of these possible combinations is called
(1) Maxterm (2) Minterm
(3) Product of sum (4) Sum of product

78) What is the gray code of $(10010)_2$
(1) 10011 (2) 00100 (3) 11111 (4) 11011

79) The 2's complement representation of the decimal number –4 is
(1) 1000 (2) 1100 (3) 1011 (4) 1010

80) The Fourier series of a periodic signal x(t) with period T will not converge if
(1) |x(t)| is not finite at all values of t
(2) x(t) has more than one maxima in one period T
(3) x(t) is not continuous at all points
(4) x(t) is not a band limited signal

81) When the input to an LTI system is a unit step function, the output is a bounded signal. Which of the following inferences is correct?
(1) The system is not necessarily stable
(2) The system is not definitely stable
(3) The system is definitely unstable
(4) None of the above

82) Which of the following signal is an example for deterministic signal?
(1) step (2) ramp
(3) exponential (4) all of the above

83) The Z– transform of $a^{-n}\, u(-n-1)$ is,
(1) $\frac{-z}{z-1/a}$ (2) $\frac{z}{z-1/a}$ (3) $\frac{z}{z-a}$ (4) $\frac{-z}{z-a}$

84) The ROC of the signal $x(n)= a^n$ for $-5 < n < 5$ is,
(1) entire z-plane
(2) entire z-plane except $z=0$ and $z=\infty$
(3) entire z-plane except $z=0$
(4) entire z-plane except $z=\infty$

85) If a signal is folded about the origin in time, then its
(1) magnitude spectrum undergoes change in sign
(2) phase spectrum undergoes change in sign
(3) magnitude remains unchanged
(4) both 2 and 3

86) If $s^3+3s^2+4s+A=0$,then all the roots of this equation are in the left half plane provide that
(1) $A>12$ (2) $-3<A<4$ (3) $0<A<12$ (4) $5<A<12$

87) The gain margin of the system with open loop transfer function $G(s)H(s)=\frac{2(1+s)}{s^2}$
(1) ∞ (2) 0 (3) 1 (4) $-\infty$

88) The Nyquist plot of a loop transfer function G(jω)H(jω) of a system encloses the (–1,j0) point, the gain margin of the system is

(1) Less than zero (2) Zero

(3) Greater than zero (4) Infinity

89) Number of NAND gates required for Ex-NOR implementation

(1) 4 (2) 6 (3) 5 (4) 8

90) To implement n-bit parallel adder requires _____Full adders

(1) n (2) n – 1 (3) n+1 (4) none

91) The most widely used bipolar technology for digital ICs

(1) DTL (2) TTL (3) ECL (4) None

92) Output of JK flip flop toggles when

(1) J=1, K=0 (2) J=0, K=1 (3) J=1, K=1 (4) J=0, K=0

93) The word size of 8085 microprocessor is

(1) 4-bit (2) 16-bit (3) 20-bit (4) 8-bit

94) The octal equivalent of the decimal number 375 is.

(1) 560 (2) 567 (3) 565 (4) none

95) Fan-out for the 74 series is

(1) 4 (2) 5 (3) 8 (4) 10

96) Multiplexer can be named as

(1) Data Selector

(2) One to many Circuit

(3) Serial to parallel converter

(4) None

97) The fundamental period T of a periodic-continuous time signal x(t), is
(1) the smallest positive constant satisfying the relation x(t) = x(t+mT) for every t and any integer m
(2) the positive constant satisfying the relation x(t) = x(t+mT) for every t and any integer m
(3) the largest positive constant satisfying the relation x(t) = x(t+mT) for any t and any integer m
(4) the smallest positive integer satisfying the relation x(t) = x(t+mT) for any t and any m

98) An instruction used to set the carry flag in a computer can be classified as
(1) Data transfer
(2) Arithmetic
(3) Program control
(4) Logical Instruction

99) It is possible to compute the cross-correlation $R_{xy}(\tau)$ between two signals x(t) and y(t) directly from their convolution provided
(1) x(t) has even symmetry
(2) x(t) has odd symmetry
(3) y(t) has odd symmetry
(4) y(t) has even symmetry

100) The transfer function of a phase lead controller is $\frac{1+3Ts}{1+Ts}$, the maximum value of phase provided by this controller
(1) 90° (2) 60° (3) 45° (4) 30°

101) A random variable is uniformly distributed between 3 and 6. Its variance is
(1) 0.75 (2) 0.25 (3) 0.5 (4) 1

102) x(t)=3 $\cos^2 250\pi t$. This signal is sampled at regular intervals of T seconds. The maximum value of T for which x(t) may be recovered from the sampled version without any distortion, is equal to
(1) 1 ms (2) 2 ms (3) 4 ms (4) 0.5 ms

103) A message signal with its amplitude uniformly distributed between –2 V and +2 V is transmitted by a 4-bit binary PCM system. The $(SNR)_q$ is equal to

(1) 256 (2) 1024 (3) 512 (4) 768

104) In a 16-ary PSK, the symbol rate is 10 kbps. The bit rate is

(1) 160 kbps (2) 40 kbps (3) 2.5 kbps (4) (10/16) kbps

105) For any 4-ary FSK, the signal set is given by

$$s_k(t)=\sqrt{\frac{2E}{T}}\cos\left[\frac{\pi}{4}(n+k)t\right];\quad 0\le t\le T \qquad k=1,2,3,4$$

The dimension of its signal space is

(1) 1 (2) 2 (3) 3 (4) 4

106) In the filter method of generation of SSB-SC, in order to make the filter specifications less stringent,

(1) it is ensured that the modulating signal has no high-frequency components

(2) a high-frequency carrier is used initially for generating the DSB-SC signal

(3) only those modulating signals which have high dc and low frequency content are used

(4) a low-frequency carrier is used initially for generating the DSB-SC signal

107) The occurrence of double spotting indicates

(1) that the IF is too high

(2) that the selectivity is poor

(3) that image rejection capability of the receiver is inadequate

(4) that the local oscillator frequency is less than that of the incoming signal

108) If in a rectangular waveguide for which a=2b, the cutoff frequency for TE_{02} mode is 12GHz, the cutoff frequency for TM_{11} mode is

(1) 3GHz (2) $3\sqrt{5}$ GHz (3) 12 GHz (4) $6\sqrt{5}$ GHz

109) An electric potential field is produced by point charges 1μC and 4μC located at (–2,1,5) and (1,3, –1), respectively. The energy stored in the field is

(1) 2.57mJ (2) 5.14mJ

(3) 10.28mJ (4) None of these

110) A plane wave propagates in water ($\varepsilon_r = 81$).If the peak electric field is 20π v/m, then the Peak magnetic field intensity will be

(1) 1.5 A/m (2) 5.0 A/m (3) 10 π A/m (4) 20 A/m

111) Wave propagating in +Z direction, E is given $E_x = 2\cos t$ $E_y = 2\cos(t+90^0)$ .The wave is

(1) Linear polarized

(2) right circular polarized

(3) left circular polarized

(4) elliptically polarized

112) If the velocity of EM wave in free space is 3×10^8m/s the velocity in a medium with $\varepsilon_r = 4.5$, $\mu_r = 2$ Would be .....

(1) 1×10^8m/s (2) 2×10^6 m/s

(3) 2.5×10^6 m/s (4) 3×10^8m/s.

113) The input impedance of short circuited lossless line of length less than a quarter wavelength is.....

(1) purely resistive (2) purely inductive

(3) purely capacitive (4) complex

114) A 50Ω loss less transmission line is terminated in 100Ω load and is exited by a 30MHz source of internal resistance of 50Ω.What should be the length of transmission line for maximum power transfer.....

(1) 5.0m (2) 1.25m (3) 2.5m (4) 10.0m

115) The electric field measured in the far field of an antenna at a distance of 50m is 1V/m. The average power density at a distance of 500 m from the antenna is

(1) 26.6 μW/m² (2) 0.1 μW/m² (3) 10 μW/m² (4) 13.3 μW/m²

116) X is a random variable with variance σ_x^2. The variance of $(X + a)$ where a is a constant is

(1) $(\sigma_x+a)^2$ (2) σ_x^2 (3) $(\sigma_x^2+a^2)$ (4) $(\sigma_x^2-a^2)$

117) Two random processes X and Yare such that $R_{XY}(t_1,t_2)=0$ for all t_1 and t_2 and further one of them has zero mean. The processes are

(1) Uncorrelated but not orthogonal
(2) Orthogonal but not uncorrelated
(3) Statistically independent and orthogonal
(4) Orthogonal and uncorrelated

118) Auto-correlation function $R_X(\tau)$ of a stationary process X(t) is

(1) a deterministic function with maximum value at $\tau=0$
(2) a deterministic function which is periodic
(3) a stationary random process
(4) a periodic stationary process

119) In the mid-tread type of quantizer, any input value lying between –0.5 to +0.5 is mapped into an output value of

(1) 0.5 (2) 1
(3) –0.5 (4) 0

120) One of the following bandpass digital modulation schemes is not suitable for transmission over nonlinear bandpass channels:

(1) FSK (2) ASK
(3) PSK (4) QFSK

121) For M-ary PSK systems, the best trade-off between bandwidth efficiency and transmitted power is given for a value of M equal to

(1) 2 (2) 4
(3) 8 (4) 16

122) Mutual information $I(X ; Y)$ between two discrete random variables X and Y is given by

(1) $H(X) + H(Y) - H(X,Y)$
(2) $H(X) - H(Y|X)$
(3) $H(Y) - H(X|Y)$
(4) $H(X) + H(Y) + H(X,Y)$

123) An amplitude modulated wave is given by

$x_c(t)=10\cos 1200\pi t + 40\cos 1400\pi t + 10\cos 1600\pi t$

The modulating signal frequency and modulation index are

(1) 200 Hz, 0.5
(2) 400 Hz,0.25
(3) 200 Hz,0.25
(4) 400 Hz,0.5

124) When sinusoidally modulated, the r.m.s. value of the current in the antenna of an AM transmitter increases 15% over its unmodulated value. The modulation index is

(1) 0.6
(2) 0.8
(3) 0.5
(4) 0.707

125) For a frequency-modulated signal, the modulation index is doubled. The average power of the modulated signal is

(1) quadrupled
(2) doubled
(3) unaltered
(4) none of these

126) A narrow band FM signal is generated using a phase modulator. The maximum deviation at the output of a phase modulator is about

(1) ± 250 Hz
(2) ± 1 kHz
(3) ± 1 MHz
(4) ± 25 Hz

127) In an AM broadcast superheterodyne receiver, the local oscillator frequency is arranged to be higher than the incoming signal frequency in order to

(1) provide better image rejection
(2) make tracking easier
(3) produce the correct intermediate frequency, since a lower LO frequency will not permit generation of correct IF
(4) enable us to cover the required frequency range with the practically possible ratio of maximum to minimum values of the variable capacitors

128) At the output of the discriminator in a FM receiver, the PSD of the noise

(1) increases linearly with frequency
(2) decreases as the square of the frequency
(3) increases as the square of the frequency
(4) decreases linearly with frequency

129) 'Pre-emphasis' is

(1) boosting up of the high -frequency components of the message signal after detection in the receiver

(2) boosting up of the high- frequency components of the message signal at the transmitter before the modulation

(3) boosting up of the low- frequency components of the message signal after detection in the receiver

(4) boosting up of the low- frequency components of the message signal at the transmitter before the modulation

130) What is the major factor for determining whether a medium is free space, lossless dielectric, lossy dielectric, or good conductor?

(1) Attenuation constant

(2) Constitutive parameters (σ, ε, μ)

(3) Loss tangent

(4) Reflection coefficient

131) For a lossy transmission line, the characteristic impedance does not depend on

(1) The operating frequency of the line

(2) The length of the line

(3) The load terminating the line

(4) both 2 and 3

132) At microwave frequencies, we prefer waveguides to transmission lines for transporting EM energy because of all the following except that

(1) Losses in transmission lines are prohibitively large

(2) Waveguides have larger bandwidths and lower signal attenuation

(3) Transmission lines are larger than waveguides

(4) Transmission lines support only TEM mode

133) When the electric field is at its maximum value, the magnetic energy of a cavity is
(1) At its maximum value
(2) At $\sqrt{2}$ of its maximum value
(3) At 1/2 of its maximum value
(4) Zero

134) Given field $\mathbf{A}=3x^2yz\mathbf{a}_x + x^3z\mathbf{a}_y + x^3y - 2z\mathbf{a}_z$, it can be said that **A** is
(1) Conservative
(2) Divergenceless
(3) Solenoidal
(4) Rotational

135) The divergence of vector $\bar{A} = [yz\bar{a}_x + zx\bar{a}_y + xy\bar{a}_z]$ is
(1) rotational (2) irrotational
(3) solenoidal (4) both 2 & 3

136) For the vectors $\bar{A} = x\bar{a}_x + y\bar{a}_y$ and $\bar{B} = z\bar{a}_z$ .so $\nabla.(A \times B)$ is
(1) xz (2) 0 (3) 1 (4) yz

137) For free space $E = 50 \cos(10^8 t + \beta x)$, then the value of β .....
(1) 0.333 rad/m (2) 2/3
(3) 4/3 (4) 0.316

138) The radiation pattern of loop antenna is
(1) cardiod (2) semi-circle
(3) circle (4) none of these

139) A Half wave dipole at a frequency of 100 MHz has a length of
(1) 100 m (2) 3 m (3) 1.5m (4) 0.75

140) Multiple number of antennas are arranged in arrays in order to enhance
(1) Both directivity and bandwidth
(2) Only directivity
(3) Only bandwidth
(4) Neither directivity nor bandwidth

141) The variance σ^2 of a random variable X is given by

(1) $E[X^2]$ (2) $\{E[X]\}^2$

(3) $E[X^2]-\{E[X]\}^2$ (4) $E[X^2]+\{E[X]\}^2$

142) In a linear DM system,

(1) only granular noise will be present

(2) only slope overload noise will be present

(3) both granular noise and slope overload noise can be eliminated

(4) granular noise will be present but slope overload noise can be avoided by proper design

143) P_e for a DPSK system is

(1) $\exp\left[-\frac{Eb}{\eta}\right]$ (2) $\exp\left[-\sqrt{\frac{Eb}{\eta}}\right]$

(3) $\frac{1}{2}\exp\left[-\frac{Eb}{\eta}\right]$ (4) $\frac{1}{2}\exp\left[\frac{Eb}{\eta}\right]$

144) The Foster-Seeley discriminator responds to the input FM signal's

(1) amplitude variations only

(2) amplitude as well as frequency variations

(3) frequency variations only

(4) variations neither in amplitude nor in frequency

145) A superheterodyne AM broadcast receiver has an IF of 455 kHz. If it is tuned to a frequency of 700 kHz, the image frequency is

(1) 1610 kHz (2) 1155 kHz

(3) 245 kHz (4) 210 kHz

146) Which is not an example of convection current?

(1) A moving charged belt

(2) Electronic movement in a vacuum tube

(3) An electron beam in a television tube

(4) Electric current flowing in a copper wire

147) The value of electric field at a distance of 1 m from an infinite line charge density 1 c/m is

(1) $2\pi\varepsilon_0$ (2) $\frac{1}{2}\pi\varepsilon_0$

(3) $\varepsilon_0/2\pi$ (4) $2\pi/\varepsilon_0$

148) A line terminated in its characteristic impedance has a SWR of.....

(1) infinity (2) unity

(3) zero (4) two

149) Which one of the following modes has the highest cut-off wavelength in a rectangular waveguide?

(1) TE_{10} (2) TE_{01}

(3) TM_{01} (4) TM_{11}

150) In end fire array the principal direction of radiation

(1) Is perpendicular to the array axis

(2) Is perpendicular to the array axis and also to the plane containing the array elements

(3) Coincides with the direction of the array axis

(4) Is at 45 degrees to the direction of array axis.