2024
Paper – I
ELECTRONICS/ELECTRONICS AND COMMUNICATION ENGINEERING
(Degree Standard)

Duration : Three Hours]   **[Total Marks : 300**

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. You will be supplied with this question booklet 15 minutes prior to the commencement of the examination.

2. This question booklet contains **200** questions. Before answering the questions, you shall check whether all the questions are printed serially and ensure that there are no blank pages in the question booklet. If any defect is noticed in the question booklet, it shall be reported to the invigilator within the first **10** minutes and get it replaced with a complete question booklet. If the defect is reported after the commencement of the examination, it will not be replaced.

3. Answer all the questions. All the questions carry equal marks.

4. You must write your register number in the space provided on the top right side of this page. Do not write anything else on the question booklet.

5. An answer sheet will be supplied to you separately by the room invigilator to shade the answers. Instructions regarding filling of answers etc., which are to be followed mandatorily, are provided in the answer sheet and in the memorandum of admission (Hall Ticket).

6. You shall write and shade your question booklet number in the space provided on page one of the answer sheet with **BLACK INK BALL POINT PEN.** If you do not shade correctly or fail to shade the question booklet number, your answer sheet will be invalidated.

7. Each question comprises of five responses (answers) : i.e. (A), (B), (C), (D) and (E). You have to select ONLY ONE correct answer from (A) or (B) or (C) or (D) and shade the same in your answer sheet. If you feel that there are more than one correct answer, shade the one which you consider the best. **If you do not know the answer, you have to mandatorily shade (E).** In any case, choose ONLY ONE answer for each question. If you shade more than one answer for a question, it will be treated as a wrong answer even if one of the given answers happens to be correct.

8. You should not remove or tear off any sheet from this question booklet. You are not allowed to take this question booklet and the answer sheet out of the examination room during the time of the examination. After the examination, you must hand over your answer sheet to the invigilator. You are allowed to take the question booklet with you only after the examination is over.

9. **You should not make any marking in the question booklet except in the sheets before the last page of the question booklet, which can be used for rough work. This should be strictly adhered to.**

10. Failure to comply with any of the above instructions will render you liable for such action as the Commission may decide at their discretion.

SPACE FOR ROUGH WORK

1. Choose the right answer

   (A) An LTI system is BIBO stable, if its impulse response is not absolutely summable

   (B) An LTI system is BIBO stable, if and only if its impulse response is zero

   (C) An LTI system is BIBO stable, if and only if its impulse response is absolutely summable

   (D) An LTI system is BIBO stable, if and only if its impulse response is one

   (E) Answer not known

2. The given system $y(n) = 5n\, x(n)$. Is linear, causal, time-variant or not?

   (A) Linear, Causal, Time-variant

   (B) Linear, Non- causal, Time-variant

   (C) Linear, Causal, Time-invariant

   (D) Non-linear, Causal, Time-variant

   (E) Answer not known

3. The fundamental period of the discrete time signal
   $x[n] = e^{j(2\pi/3)n} + e^{j(3\pi/4)n}$

   (A) 3   (B) 8

   (C) 24   (D) 11

   (E) Answer not known

4. Find the Z-transform $x(z)$ of the causal sequence $\alpha^n u(n)$

   (A) $x(z) = \dfrac{z}{z + \alpha}$ (B) $x(z) = \dfrac{z}{z - \alpha}$

   (C) $x(z) = \dfrac{1}{1 - \alpha z}$ (D) $x(z) = \dfrac{1}{1 + \alpha z}$

   (E) Answer not known

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5. The z-transform of the signal $x(n) = n\,a^n u(n)$

(A) $x(z) = \dfrac{1}{1 - a\,z^{-1}}$

(B) $x(z) = \dfrac{z^{-1}}{\left(1 - z^{-1}\right)^2}$

(C) $x(z) = \dfrac{a\,z^{-1}}{\left(1 - a\,z^{-1}\right)^2}$

(D) $x(z) = \dfrac{z}{z - a}$

(E) Answer not known

6. Find R_1, R_2 and R_3 resistors value in circuit 2.
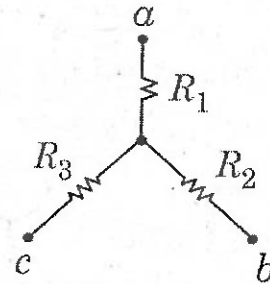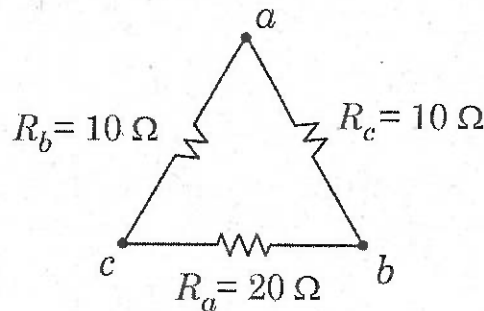
(A) 2.5, 5, 5, ohms

(B) 5, 2.5, 5 ohms

(C) 5, 5, 2.5 ohms

(D) 2.5, 5, 2.5 ohms

(E) Answer not known

7. Impedance matrices of two 2-port networks are $\begin{bmatrix} 3 & 6 \\ 5 & 4 \end{bmatrix}$ and $\begin{bmatrix} 5 & 2 \\ 6 & 3 \end{bmatrix}$ total impedance of series connected network

(A) $\begin{bmatrix} 8 & 8 \\ 11 & 7 \end{bmatrix}$

(B) $\begin{bmatrix} 3 & 6 \\ 5 & 4 \end{bmatrix}$

(C) $\begin{bmatrix} 5 & 2 \\ 6 & 3 \end{bmatrix}$

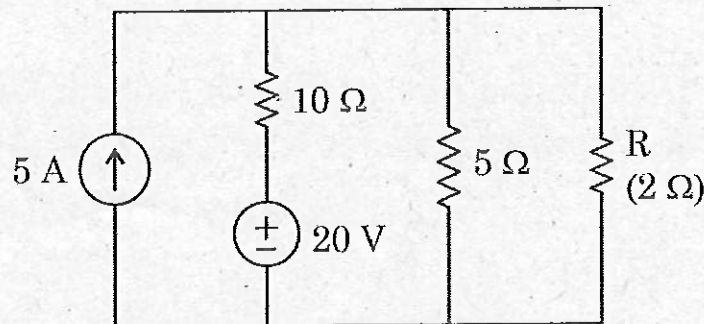(D) $\begin{bmatrix} 10 & 10 \\ 10 & 10 \end{bmatrix}$

(E) Answer not known

8. In a series RLC circuit $R = 2k\,\Omega$, $L = 1\,H$, and $C = \dfrac{1}{400}\,\mu F$. The resonant frequency is

(A) $2 \times 10^4\ Hz$ (B) $2\pi \times 10^4\ Hz$

(C) $10^4\ Hz$ (D) $\dfrac{1}{\pi} \times 10^4\ Hz$

(E) Answer not known

9. Find the Thevenin's resistance R_{th} in the circuit given

(A) $\dfrac{50}{15}\,\Omega$ (B) $\dfrac{10}{7}\,\Omega$

(C) $\dfrac{100}{17}\,\Omega$ (D) $2\,\Omega$

(E) Answer not known

10. How much energy does a 100W electric bulb consume in two hours?

(A) 120 KJ   (B) 240 KJ

(C) 480 KJ   (D) 720 KJ

(E) Answer not known

11. An independent voltage source in series with an impedance $Z_{th} = R_{th} + jX_{th}$ delivers a maximum average power to the load impedance Z_L, when

(A) $Z_L = R_{th} + jX_{th}$

(B) $Z_L = R_{th} - jX_{th}$

(C) $Z_L = R_{th}$

(D) $Z_L = jX_{th}$

(E) Answer not known

12. Using Routh's criterion, the number of roots in the right half of s-plane for the characteristic equation $s^4 + 2s^3 + 2s^2 + 3s + 6 = 0$ is

(A) 2   (B) 1

(C) 4   (D) 3

(E) Answer not known

13. The state model is given by $\dot{x}(t) = Ax(t) + Bu(t)$, $y(t) = cx(t) + Du(t)$ where $\dot{x}(t)$ is the state equation $y(t)$ is the output equation. The transfer function is given as

(A) $B[SI - A]^{-1}D + C$

(B) $A[SI - C]^{-1}D + B$

(C) $D[SI - A]^{-1}C + B$

(D) $C[SI - A]^{-1}B + D$

(E) Answer not known

14. Lag-lead compensator is similar to

   (A) PI controller   (B) PD controller

   (C) PID controller   (D) P controller

   (E) Answer not known

15. Consider the following statements.

   (i)   When a row of Routh tabulation contains all zeros before the tabulation ends, this means that the characteristic equation necessarily has roots on the imaginary axis of the S-plane.

   (ii) When a row of Routh tabulation contains a zero pivot element with atleast one nonzero element, this means that the characteristics equation necessarily has roots on the imaginary axis of the S-plane.

   Which one of the following is correct answer?

   (A) Both the statements are false

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

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

   (D) Both the statements are true

   (E) Answer not known

16. Gain cross-over 'w_g' is the frequency at which open-loop transfer function has a ————— gain.

   (A) Unity   (B) 0

   (C) 2   (D) 3

   (E) Answer not known

17. Type 0 system steady - state error with step input

(A) $ess(\infty) = \dfrac{1}{1+K_p}$ (B) $ess(\infty) = \dfrac{1}{K_p}$

(C) $ess(\infty) = \dfrac{1}{K_V}$ (D) $ess(\infty) = \dfrac{1}{K_a}$

(E) Answer not known

18. Overshoot and steady - state error in a feed back control system
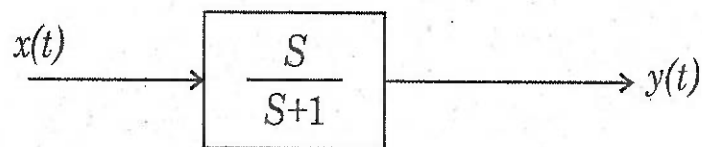
(A) are independent of each other

(B) are dependent of each other

(C) are linked to the overall gain

(D) are directly proportional to each other

(E) Answer not known

19. For the system shown below, the input $x(t) = 2\sin t$. The steady state output of the system is $y(t)$

$$x(t) \longrightarrow \boxed{\dfrac{S}{S+1}} \longrightarrow y(t)$$

The value of $y(t)$ is given by

(A) $\dfrac{1}{\sqrt{2}} \sin\left(t - \dfrac{\pi}{4}\right)$ (B) $\sqrt{2} \cos\left(t - \dfrac{\pi}{4}\right)$

(C) $\dfrac{1}{\sqrt{2}} \sin\left(t + \dfrac{\pi}{4}\right)$ (D) $\sqrt{2} \sin\left(t + \dfrac{\pi}{4}\right)$

(E) Answer not known

20. In force - Voltage analogy

 (A) Velocity - current, mass - inductance, damping - resistance
 (B) Velocity - current, mass - capacitance, damping - inductance
 (C) Velocity - current, mass - resistance, damping - capacitance
 (D) Velocity - voltage, mass - inductance, damping - resistance
 (E) Answer not known

21. A unity feedback system has open - loop transfer function $G(S)$. The steady state error is zero for

 (A) step input and type – 1 $G(S)$
 (B) ramp input and type – 1 $G(S)$
 (C) step input and type – 0 $G(S)$
 (D) ramp input and type – 0 $G(S)$
 (E) Answer not known

22. Find the entropy of a source that emits one of three symbols. A, B and C in a statistically independent sequence with probabilities : $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{4}$ respectively.

 (A) H = 1 bit / symbol
 (B) H = 1.5 bits / symbol
 (C) H = –1.5 bits / symbol
 (D) H = –1 bit / symbol
 (E) Answer not known

23. In information theory, the word entropy refers to

 (A) amount of average information
 (B) rate of information
 (C) a measure of uncertainity
 (D) probability of message
 (E) Answer not known

24. _____ technique enables two DSB-SC modulated waves to occupy the same channel bandwidth, and yet it allows for the separation of the message signals at the receiver output.

   (A) Frequency division multiplexing

   (B) Time division multiplexing

   (C) Quadrature carrier multiplexing

   (D) Independent sideband modulation

   (E) Answer not known

25. The separation between the transmitted signal points for BPSK is _____ times that for BFSK.

   (A) 2

   (B) $\sqrt{2}$

   (C) 3

   (D) $\sqrt{3}$

   (E) Answer not known

26. In an n-Bit PCM system, If the number of bits is increased by 3, then the signal to quantisation noise ratio will

   (A) Increase by 6 dB

   (B) Increase by 18 dB

   (C) Decrease by 6 dB

   (D) Decrease by 18 dB

   (E) Answer not known

27. A frequency modulated signal is given by, $x_c(t) = 10 \cos\left[2\pi \times 10^8 t + 5 . \sin 2\pi * 200 t\right]$ then, determine the carrier frequency

   (A) 200 MHz

   (B) 100 MHz

   (C) 400 Hz

   (D) 400 MHz

   (E) Answer not known

28. The maximum frequency deviation of the FM wave $v = 12\sin\left(6 \times 10^8 t + 5\cos 400\,\pi t\right)$ is

(A) 2000 Hz

(B) 1000 Hz

(C) 6×10^8 Hz

(D) 400 Hz

(E) Answer not known

29. A SSB transmitter radiates 0.36 kW when the modulation percentage is 60%. The amount of total power required to transmit the same message with same amount of depth of modulation by an AM transmitter is,

(A) 0.72 kW

(B) 2.72 kW

(C) 3.72 kW

(D) 4.72 kW

(E) Answer not known

30. What is the bandwidth required for an FM signal in which the modulation frequency is 2 KHz, and maximum deviation is 10 KHz?

(A) 20 KHz

(B) 20 MHz

(C) 24 KHz

(D) 24 MHz

(E) Answer not known

31. The input to a binary communication system denoted by a random variable X, takes on one of two variables 0 or 1 with probabilities $\frac{3}{4}$ and $\frac{1}{4}$ respectively. Due to errors caused by noise in the system, the output Y differs from the input X occasionally. The behaviour of the communication system is modelled by the conditional probabilities $P(Y=1/X=1)=\frac{3}{4}$ and $P(Y=0/X=0)=\frac{7}{8}$. Find $P(Y=1)$ and $P(Y=0)$.

(A) $P(Y=1)=\frac{9}{32}$, $P(Y=0)=\frac{23}{32}$

(B) $P(Y=1)=\frac{23}{32}$, $P(Y=0)=\frac{9}{32}$

(C) $P(Y=1)=\frac{15}{32}$, $P(Y=0)=\frac{4}{32}$

(D) $P(Y=1)=\frac{4}{32}$, $P(Y=0)=\frac{15}{32}$

(E) Answer not known

32. Bi-directional frames (B-frames) can contain —————— macroblocks.

(A) Only intra macroblocks

(B) Intra macroblocks and predicated macroblocks

(C) Only predicted macroblocks

(D) Intra, predicted and bi-predicted macroblocks

(E) Answer not known

33. The process of reducing the amount of data required to represent a given quantity of information refers to

(A) Image Enhancement
(B) Image Compression
(C) Image Restoration
(D) Image Segmentation
(E) Answer not known

34. To avoid aliasing in the output during decimation by D, the input signal of a decimator should be band limited to

(A) $\dfrac{\pi}{2D}$

(B) $\dfrac{2\pi}{D}$

(C) $\dfrac{\pi}{D}$

(D) $\dfrac{\pi}{D^2}$

(E) Answer not known

35. The correct form of truncation error range for 2's complement representation with 'B' bits is

(A) $-2^{-B} \leq \Sigma_T \leq 2^{-B}$

(B) $-2^{-B} \leq \Sigma_T \leq 0$

(C) $\dfrac{-2^{-B}}{2} \leq \Sigma_T \leq \dfrac{2^{-B}}{2}$

(D) $\dfrac{-2^{-B}}{2} \leq \Sigma_T \leq 0$

(E) Answer not known

36. A simple way to generate transposed structure realization by

(A) Reversing the paths

(B) Replacing pick-off nodes by adders and vice versa

(C) Interchanging the input and output nodes

(D) All of the above

(E) Answer not known

37. Choose the best sampling rate conversion method

(A) To pass the digital signal through D/A converter

(B) To pass the analog signal through analog filter

(C) To pass the analog signal through A/D converter

(D) To pass the digital signal through digital filter bank

(E) Answer not known

38. The Hamming window function for causal signal is

(A) $W = \begin{cases} 0.54 + 0.46 \cos\dfrac{2\pi n}{M-1}, & 0 \le n \le M-1 \\ 0 & \text{otherwise} \end{cases}$

(B) $W = \begin{cases} 0.54 + 0.46 \sin\dfrac{2\pi n}{M-1}, & 0 \le n \le \dfrac{M-1}{2} \\ 0 & \text{otherwise} \end{cases}$

(C) $W = \begin{cases} 0.54 - 0.46 \cos\dfrac{2\pi n}{M-1}, & 0 \le 0 \le M-1 \\ 0 & \text{othewise} \end{cases}$

(D) $W = \begin{cases} 0.5 - 0.5 \cos\dfrac{2\pi n}{M-1}, & 0 \le n \le M-1 \\ 0 & \text{otherwise} \end{cases}$

(E) Answer not known

39. Bilinear transformation of $H(s) = \dfrac{0.65/T}{s + 0.65/T}$ is

(A) $\dfrac{0.245(1+z)}{1-0.509z}$

(B) $\dfrac{0.245\left(1+z^{-1}\right)}{1-0.509\,z^{-1}}$

(C) $\dfrac{0.245(1-z)}{1+0.509\,z}$

(D) $\dfrac{0.245\left(1-z^{-1}\right)}{1-0.509\,z^{-1}}$

(E) Answer not known

40. In a 8 point FFT algorithm the value of $\sum\limits_{k=0}^{3} W_8^k =$

(A) $1-j\,1.414$

(B) $1+j\,1.414$

(C) $1-j\,2.414$

(D) $1-j\,0.707$

(E) Answer not known

41. ――――――― is the standard TCP/IP protocol used for virtual terminal service, proposed by International Organisation for Standards (ISO)

   (A) IPV 4   (B) IPV 6
   (C) RARP   (D) TELNET
   (E) Answer not known

42. UDP length field includes ――――――― byte header and the data

   (A) 16 bytes   (B) 32 bytes
   (C) 8 bytes   (D) 4 bytes
   (E) Answer not known

43. The idea of having one page point to another called

   (A) Browser   (B) Hypertext
   (C) Hyperlinks   (D) Webpages
   (E) Answer not known

44. If the IPV$_4$ address is 45.123.21.8 and the mask value is 255.192.0.0 then the subnetwork address is

   (A) 45. 64. 21.8   (B) 255. 64. 0. 0
   (C) 255. 192. 21. 8   (D) 45. 64. 0. 0
   (E) Answer not known

45. The target hardware address in the ARP request message is ―――――――

   (A) FF:FF:FF:FF:FF:FF   (B) 00:00:00: 00:00:00
   (C) 11:11:11:11:11:11   (D) 00:01:5E:00:00:01
   (E) Answer not known

46. Following is the one of the congestion prevention policies applied in Data link layer.

(A) Retransmission policy (B) Routing algorithm

(C) Flow control policy (D) Packet discard policy

(E) Answer not known

47. In an IPv4 packet, the value of HLEN is $(1000)_2$. How many bytes of options are being carried by this packet?

(A) 16 bytes (B) 12 bytes

(C) 20 bytes (D) 4 bytes

(E) Answer not known

48. When a host knows its physical address but not its IP address, it can use

(A) Internet Control Message Protocol (ICMP)

(B) Transmission Control Protocol (TCP)

(C) Address Resolution Protocol (ARP)

(D) Reverse Address Resolution Protocol (RARP)

(E) Answer not known

49. Which layer is concerned with controlling the operation of the subnet?

(A) Application layer (B) Session layer

(C) Network layer (D) Transport layer

(E) Answer not known

50. A TCP/IP protocol that allows a host to find its internet address given its physical address is

(A) Address resolution protocol

(B) Reverse address resolution protocol

(C) User datagram protocol

(D) Internet protocol

(E) Answer not known

51. HDLC is a type of

(A) Bit–oriented protocols   (B) Byte–oriented protocols

(C) Word–oriented protocol   (D) It is not a protocol

(E) Answer not known

52. Each frame in a Data-Link layer contains

(A) Frame Header   (B) Payload Field

(C) Frame Trailer   (D) All (A), (B) and (C)

(E) Answer not known

53. The minimum amount of current required to maintain the SCR in its ON state of operation is called as

(A) Breakover current   (B) Conduction current

(C) Holding current   (D) Reverse leakage current

(E) Answer not known

54. Calculate the base current of npn transistor if the current gain of $\beta = 100$ and emitter current of 3mA.

(A) 32 μA (B) 22 μA

(C) 25 μA (D) 29 μA

(E) Answer not known

55. JFET is

(A) Voltage controlled current source

(B) Voltage controlled voltage source

(C) Current controlled current source

(D) Current controlled voltage source

(E) Answer not known

56. A zener diode is made by

(A) Only N-region is heavily doped

(B) Only P-region is heavily doped

(C) Both P and N regions are heavily doped

(D) Both P and N regions are lightly doped

(E) Answer not known

57. The break down voltage of zener diode with a minimum zener current of 10 mA is 5 volts. If the maximum power rating of zener diode is 150 mw, then its allowable maximum current is

(A) 5 mA   (B) 15 mA

(C) 30 mA   (D) 60 mA

(E) Answer not known

58. In PN junction , under reverse biased, reverse saturation current is produced, the word saturation implies that,

(A) Reverse current cannot be increased by increasing reverse bias across PN junction but increase very little with increase in temperature

(B) Reverse current can be increased by increasing RB across PN junction but increase with decrease in temperature

(C) Reverse current can be decreased by decreasing RB across PN junction but decrease with decrease in temperature.

(D) Reverse current cannot be decreased by decreasing RB across PN junction but decrease with decrease in temperature

(E) Answer not known

59.
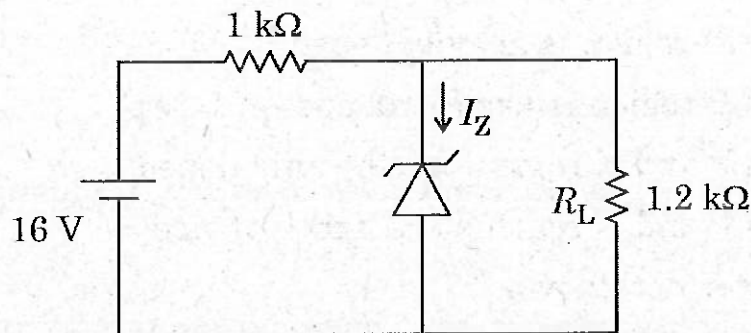
The zener voltage of the zener diode is 10 V. Find I_Z

(A) 0 A

(B) 0.8 mA

(C) 1 mA

(D) 1.2 mA

(E) Answer not known

60. At absolute zero temperature, intrinsic semi conductor behave as a

   (A) Conductor

   (B) Semi conductor

   (C) Insulator

   (D) High conductor

   (E) Answer not known

61. The bandgap energy of Germanium at room temperature is ——————

   (A) 0.3 eV   (B) 0.5 eV

   (C) 0.72 eV   (D) 1.12 eV

   (E) Answer not known

62. Choose the right answer among the following

   (A) The semi conductors have positive temperature coefficient of resistance

   (B) The semi conductors have zero temperature coefficient of resistance

   (C) The semi conductors have negative temperature coefficient of resistance

   (D) The semi conductor is independent of any temperature coefficient of resistance

   (E) Answer not known

63. In voltage follower, the CMRR is

(A) AC_L / AC_M (B) $1/AC_M$

(C) AC_M / AC_L (D) 1

(E) Answer not known

64. A PLL can acquire initial lock for a maximum input frequency of 415 KHz and a minimum input frequency of 385 KHz. The capture range equals

(A) 30 KHz   (B) 83 KHz

(C) 2.075 KHz   (D) – 30 KHz

(E) Answer not known

65. The value of the common mode rejection ratio (CMRR) can be increased by

(A) Increasing the output resistance of the current source

(B) Decreasing the output resistance of the current source

(C) Increasing the output resistance of the voltage source

(D) Decreasing the output resistance of the voltage source

(E) Answer not known

66. Find the value of full scale output for an 8 bit DAC for the 0 to 10 V range

(A) 9.961 V   (B) 7.861 V

(C) 8.861 V   (D) 6.961 V

(E) Answer not known

67. If 'A' is the open loop gain of the amplifier and 'β' be the feedback factor then the condition for sustained oscillation is

(A) $|A\beta| = 1$ $\angle A\beta = 90°$ (B) $|A\beta| = 1$ $\angle A\beta = 180°$

(C) $|A\beta| = 1$ $\angle A\beta = 270°$ (D) $|A\beta| = 1$ $\angle A\beta = 360°$

(E) Answer not known

68. In class–A power amplifier, the current in the output circuit flows for

(A) 90°   (B) 180°

(C) 360°   (D) 270°

(E) Answer not known

69. A multistage amplifier consists of three stages. The voltage gains of stages are 60, 100, 160 respectively. The overall gain is

(A) 960000   (B) 96000

(C) 960   (D) 9600000

(E) Answer not known

70. The Q-point of a power amplifier is located below the maximum collector dissipation curve because

(A) Removing quickly the heat produced

(B) It eliminates undesirable dc current through the load resistance

(C) Then the power dissipation remains with in the safe limit

(D) The load impedance at harmonic frequencies are large compared to that resonance frequency

(E) Answer not known

71. For the emitter bias circuit shown below, determine I_B and I_C for $\beta = 50$
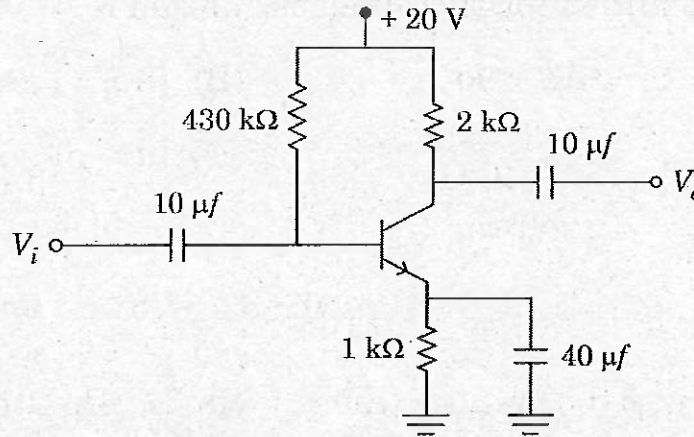
(A) $I_B = 40.1\,\mu A, I_C = 2.01\,mA$

(B) $I_B = 30.1\,\mu A$, $I_C = 4.12\,mA$

(C) $I_B = 20.2\,\mu A$, $I_C = 3.6\,mA$

(D) $I_B = 10.5\,\mu A$, $I_C = 1.2\,mA$

(E) Answer not known

72. What type of feedback is applied in a self biased common emitter amplifier?

(A) Voltage Series

(B) Current Series

(C) Voltage Shunt

(D) Current Shunt

(E) Answer not known

73. Calculate the radiation resistance of a dipole antenna $\dfrac{\lambda}{8}$ long is nearly

(A) $9\,\Omega$

(B) $12\,\Omega$

(C) $15\,\Omega$

(D) $18\,\Omega$

(E) Answer not known

74. If a transmission line of $Z_0 = 100\,\Omega$ is terminated with $Z_L = 300 + j100\,\Omega$. Then the normalized load impedance is

(A) $1/3 + j1\,\Omega$ (B) $1/3 - j1\,\Omega$

~~(C)~~ $3 + j\,\Omega$ (D) $3 - j\,\Omega$

(E) Answer not known

75. The reactance looking towards the shorted end on transmission line will be

(A) Capacitive reactance   (B) Resistive reactance

~~(C)~~ Inductive reactance   (D) Opposite reactance

(E) Answer not known

76. If 'Γ' is the reflection coefficient of a plane wave. Then the transmission coefficient 'τ' is :

(A) $\tau = 1 - \Gamma$ (B) $\tau = \Gamma$

(C) $\tau = \dfrac{1}{\Gamma}$ ~~(D)~~ $\tau = 1 + \Gamma$

(E) Answer not known

77. Identify the polarization of the wave $E = 2\left[\cos\,(wt)\,a_y + \sin\,(wt)\,a_z\right]v/m$

(A) Linear   (B) Elliptical

~~(C)~~ Circular   (D) Non-Linear

(E) Answer not known

78. Find the group velocity of a wave, with a phase velocity of 60×10^9 is

~~(A)~~ 1.5×10^6 m/s   (B) 2×10^6 m/s

(C) 0.15×10^6 m/s   (D) 0.2×10^6 m/s

(E) Answer not known

79. The given vector 'F' is irrotational

(A) $\nabla \times F = 0$ (B) $\nabla \cdot F = 0$

(C) $\nabla \times F \neq 0$ (D) $\nabla \cdot F \neq 0$

(E) Answer not known

80. The electric field vector in free space is given by $\vec{E} = -10 \sin(10^9 t + kz) \hat{x} \dfrac{V}{m}$. The displacement current density vector $\vec{J_d}$ is given by

(A) $8.854 \times 10^{-20} \cos(10^9 t + \pi z) \hat{x} \dfrac{A}{m^2}$

(B) $-8.854 \times 10^{-20} \cos(10^9 t + \pi z) \hat{x} \dfrac{A}{m^2}$

(C) $0.9 \cos(10^9 t + \pi z) \hat{x} \dfrac{A}{m^2}$

(D) $-0.09 \cos(10^9 t + kz) \hat{x} \dfrac{A}{m^2}$

(E) Answer not known

81. Faraday's law of electromagnetic induction is mathematically described by which one of the following equations?

(A) $\nabla \cdot \overline{B} = 0$ (B) $\nabla \cdot \overline{D} = \rho_v$

(C) $\nabla \times \overline{E} = \dfrac{-\partial \overline{B}}{\partial t}$ (D) $\nabla \times \overline{H} = \sigma \overline{E} + \dfrac{\partial \overline{D}}{\partial t}$

(E) Answer not known

82. Equalization defines any signal processing technique used at the receiver to alleviate the

    (A) ICI problem caused by delay spread
    (B) ISI problem caused by delay spread
    (C) SNR problem caused by delay spread
    (D) BER problem caused by delay spread
    (E) Answer not known

83. In fast frequency hopping, the hopping rate is

    (A) Lesser than the message bit rate
    (B) Equal to the message bit rate
    (C) Greater than the message bit rate
    (D) Half of the message bit rate
    (E) Answer not known

84. In the OFDM, the cyclic prefix (CP) helps to eliminate

    (A) Delay dispersion   (B) Time dispersion
    (C) Inter symbol interference   (D) Delay and time dispersion
    (E) Answer not known

85. Among the following, which one is not a non linear equalization technique

    (A) Decision feedback equalization
    (B) Maximum likelihood symbol detection
    (C) Maximum likelihood sequence estimation
    (D) Lattice equalization
    (E) Answer not known

86. With respect to OFDM reception, arrange the following processes in order.

    1.   Serial to parallel

    2.   Parallel to serial

    3.   Data sink

    4.   FFT operation

    (A) 1, 4, 2, 3   (B) 4, 1, 2, 3

    (C) 1, 2, 3, 4   (D) 3, 4, 1, 2

    (E) Answer not known

87. When does the Doppler spread effect negligible at the receiver?

    (A) If the baseband signal Bandwidth is much higher than doppler spread

    (B) If the baseband signal Bandwidth is much higher than Bandwidth of the channel

    (C) If the baseband signal Bandwidth is much lower than doppler spread

    (D) If the baseband signal Bandwidth is much lower than bandwidth of the channel

    (E) Answer not known

88. When the signal's strength and quality deteriorate below a predefined threshold, the network arranges for a hand off to another channel is called as

    (A) Mobile-Assisted Hand Off (MAHO)

    (B) Network-Controlled Handoff (NCHO)

    (C) Mobile-Controlled Handoff (MCHO)

    (D) Soft Handoff

    (E) Answer not known

89. The angle at which no reflection occurs in the medium of origin is called

(A) Angle of incidence
(B) Angle of reflection
(C) Critical angle
(D) Brewster angle
(E) Answer not known

90. Find the wave length of a digital cellular system is $f_c = 900\,mHz$

(A) 0.22 m
(B) 0.11 m
(C) 0.44 m
(D) 0.33 m
(E) Answer not known

91. Consider a transmitter which radiates a sinusoidal carrier frequency of 900 MHz. For a vehicle moving 70 km/n, compute the received carrier frequency if the mobile is moving directly toward the transmitter

(A) 58.9091 MHz
(B) 900 MHz
(C) 900.6000589 MHz
(D) 9091 MHz
(E) Answer not known

92. Which of the following conditions are true about frequency selective fading.

(i) Bandwidth of the signal < Bandwidth of the channel
(ii) Bandwidth of the signal > Bandwidth of the channel
(iii) Delay spread < Symbol period
(iv) Delay spread > Symbol period

(A) (ii) and (iv)
(B) (iii) only
(C) (ii) and (iii)
(D) (iv) only
(E) Answer not known

93. In 8085 microprocessor, the value of the most significant bit of the result following the execution of any arithmetic or Boolean instruction is stored in

(A) Carry flag
(B) Auxiliary carry flag
(C) Sign flag
(D) The zero status flag
(E) Answer not known

94. The storage cell in a SRAM is

(A) a flipflop
(B) a capacitor
(C) a fuse
(D) a magnetic domain
(E) Answer not known

95. Match the following

(a) PROM 1. Programmable and array and programmable or array
(b) PAL   2. Programmable and array and fixed or array
(c) PLA   3. Fixed and array and programmable or array

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

(E) Answer not known

96. A 4 bit synchronous counter uses flip-flops with propagation delay time of 15ns each. The maximum possible time required for change of state will be

(A) 15 ns
(B) 30 ns
(C) 45 ns
(D) 60 ns
(E) Answer not known

97. Which of the following is not true for an active low input $\bar{S} - \bar{R}$ latch?

(i) $\bar{S} = 1, \bar{R} = 1, Q = NC, \bar{Q} = NC$

(ii) $\bar{S} = 0, \bar{R} = 1, Q = 1, \bar{Q} = 0$

(iii) $\bar{S} = 1, \bar{R} = 0, Q = 1, \bar{Q} = 0$

(iv) $\bar{S} = 0, \bar{R} = 0, Q = 1, \bar{Q} = 1$

(A) (i) only

(B) (i) and (iii)

(C) (ii) only

(D) (ii) and (iv)

(E) Answer not known

98. In a half subtractor circuit with X and Y as inputs the Borrow (B) and Difference (D = X − Y) are given by

(A) $D = XY, B = X \oplus Y$ (B) $D = X \oplus Y, B = X\bar{Y}$

(C) $D = X \oplus Y, B = \bar{X}Y$ (D) $D = \overline{X \oplus Y}, B = \bar{X}Y$

(E) Answer not known

99. The reduced form of the boolean function $F = AB + BC + \bar{A}C$ is

(A) $AB + \bar{A}C$

(B) $BC + \bar{A}C$

(C) $AB + BC$

(D) BC

(E) Answer not known

100. The hexadecimal addition of $(E52FB)_{16}$ and $(C564D)_{16}$ gives

    (A) $(AA948)_{16}$ (B) $(1AA948)_{16}$

    (C) $(AAA948)_{16}$ (D) $(FAA948)_{16}$

    (E)   Answer not known

101. Match correctly the signed binary numbers :

    Column A   Column B

    (a)   Signed 2's complement of –5   1.   0101

    (b)   Signed 2's complement of +5   2.   1101

    (c)   Signed 1's complement of –5   3.   1011

    (d)   Signed magnitude of –5   4.   1010

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

    (E)   Answer not known

102. Match the gray code for the decimal equivalents :

    (a)   2   1.   1111

    (b)   10   2.   0011

    (c)   9   3.   1000

    (d)   15   4.   1101

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

    (E)   Answer not known

103. Fourier Transform of signum function of signal is

(A) $\pi + \dfrac{1}{jw}$

(B) $\dfrac{2}{jw}$

(C) $2\pi + \dfrac{1}{jw}$

(D) $\pi + \dfrac{2}{jw}$

(E) Answer not known

104. Which of the following statements are true about the properties of 'z' transform

(i) The region of convergence (ROC) contain n-number of poles

(ii) The ROC of $x(z)$ consist of a ring in the 'z' plane centered about the origin

(iii) If $x(n)$ is a left sided sequence, and if the circle $|z| = r_0$ is in the ROC, then all values of z for which $0 > |z| > r_0$ will also be in the ROC

(iv) If $x(n)$ is a right sided sequence, and if the circle $|z| = r_0$ is in the ROC, then all finite values of z for which $|z| > r_0$ will also be in the ROC.

(A) (i) and (iv) only

(B) (ii) and (iv) only

(C) (i), (ii) and (iii) only

(D) (iii) and (iv) only

(E) Answer not known

105. The period of the function $\cos\dfrac{\pi}{4}(t-1)$ is

(A) $\dfrac{1}{8}s$

(B) $8\,s$

(C) $4\,s$

(D) $\dfrac{1}{4}s$

(E) Answer not known

106. The average power of unit step signal is

(A) 1

(B) $\dfrac{1}{2}$

(C) 2

(D) 0

(E) Answer not known

107. State True / False :

Assertion [A] : Fourier series is increasingly the better approximation to the square wave except at discontinuities.

Reason [R] : Number of terms becomes infinite ; Fourier series converges to square wave at every value of T.
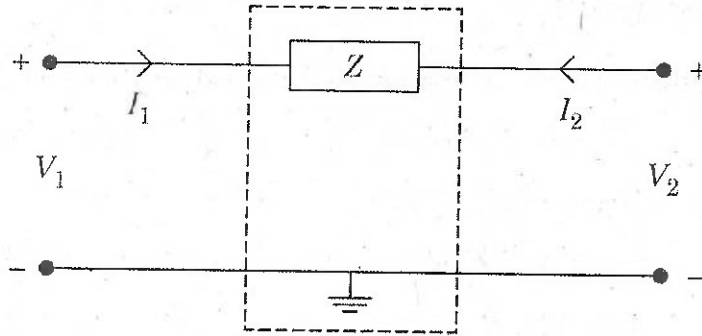
(A) [A] is true, but [R] is false

(B) [A] and [R] are true, [R] is correct explanation for [A]

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

(D) [A] and [R] are true, [R] is not correct explanation for [A]

(E) Answer not known

108. The short circuit admittance matrix of the network shown below is

(A) $\begin{bmatrix} \frac{1}{z} & 1 \\ 1 & \frac{1}{z} \end{bmatrix}$

(B) $\begin{bmatrix} \frac{1}{z} & -\frac{1}{z} \\ \frac{1}{z} & \frac{1}{z} \end{bmatrix}$

(C) $\begin{bmatrix} \frac{1}{z} & -\frac{1}{z} \\ -\frac{1}{z} & \frac{1}{z} \end{bmatrix}$

(D) Does not exist

(E) Answer not known

109. Delta $(\Delta) - Wy_e\ (y)$ conversion rule state that

(A) Each resistor in the y networks is the sum of the resistors in the two adjacent Δ branches, divided by the product of the three Δ resistors

(B) Each resistor in the Δ network in the sum of all possible product of y resistors taken two at a time, divided by the opposite y resistors

(C) Each resistor in the y network is the product of the resistors in the two adjacent Δ branches, divided by the sum of three Δ resistors

(D) Each resistors in the Δ network is the product of all possible sum of y resistors taken two at a time divided by the opposite y resistors

(E) Answer not known

110. To find Thevenin equivalent resistance practical independent sources are replaced by

(A) Voltage source by short circuit, current source by open circuit

(B) Current source by short circuit, voltage source by open circuit

(C) Both replaced by their internal resistances

(D) Both can be either short circuit or open circuit

(E) Answer not known

111. Find the current I_2 in the given circuit.
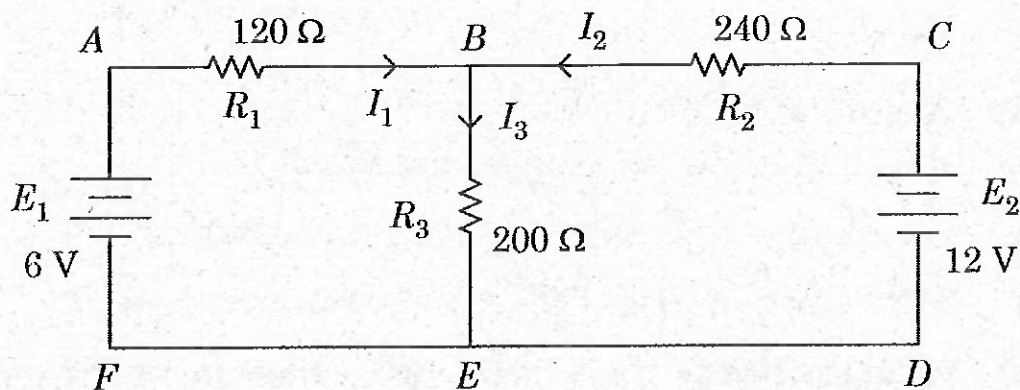
(A) 25.19 mA

(B) 26.19 mA

(C) 27.19 mA

(D) 24.19 mA

(E) Answer not known

112. According to Kirchoff's current law at junction

(A) Sum of entering currents is zero

(B) Sum of entering currents is equal to sum of leaving currents

(C) Sum of leaving currents is zero

(D) None

(E) Answer not known

113. The first element of each of the rows of a Routh-Hurwitz stability test showed the sign as follows

Rows   I   II   III   IV   V   VI   VII

Sign   +   −   +   +   +   −   +

The number of roots of the system lying on the right half of the 'S' plane is

(A)   2   (B) 3

~~(C)~~   4   (D) 5

(E)   Answer not known

114. Which of the following statements are correct for lead compensator?

(i)   Increase the Bandwidth of the system

(ii)   Gain and phase margin gets improved

(iii)   Attenuates the high frequency noise signals

(iv)   Transient response of the system becomes slower

(A)   (i) and (iv) only   ~~(B)~~   (i) and (ii) only

(C)   (i) and (iii) only   (D) (ii) and (iv) only

(E)   Answer not known

115. For the closed loop transfer function $\dfrac{C(s)}{R(s)} = \dfrac{K}{s(s^2 + s + 1)(s + 2) + K}$ determine the range of K for stability

(A) $K > 0$ (B) $K < \dfrac{14}{9}$

(C) $14 > K > 9$ ~~(D)~~ $\dfrac{14}{9} > K > 0$

(E)   Answer not known

116. The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant frequency.

(A) 3.66 rad/sec   (B) 4.66 rad/sec

(C) 5.66 rad/sec   (D) 6.66 rad/sec

(E) Answer not known

117. The poles of characteristic equation $1 + G(S) H(S)$ are

(A) Same as poles of open - loop TF $G(S) H(S)$

(B) Same as zeros of open - loop TF $G(S) H(S)$

(C) Same as zeros of characteristic equation

(D) same as zeros of characteristic equation with non-unity feedback

(E) Answer not known

118. In a bode magnitude plot, the initial slope exhibited by a Type 3 system is

(A) – 100 dB / decade   (B) – 80 dB / decade

(C) – 60 dB / decade   (D) – 40 dB / decade

(E) Answer not known

119. Advantage of bode plot is

(A) Many transfer functions show simple variation

(B) Bode magnitude computed separately

(C) Large and smaller values are expressed in the same order

(D) All the above

(E) Answer not known

[Turn over

120. The transfer function of the system is
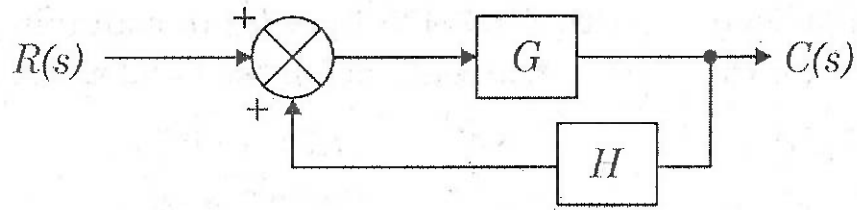
    (A) $\dfrac{G}{1+GH}$ (B) $\dfrac{G}{1-GH}$

    (C) $\dfrac{H}{1+GH}$ (D) $\dfrac{H}{1-GH}$

    (E) Answer not known

121. Consider a first - order system described by the transfer function $\dfrac{Y(S)}{R(S)} = \dfrac{K}{\tau s + 1}$, where τ is the time constant of the system. For a unit ramp input $r(t) = tu(t)$, find $y(t)$.

    (A) $t + \tau\, e^{-t/\tau}$ (B) $t + \tau - \tau\, e^{-t/\tau}$

    (C) $y(t) = K\left(t - \tau + \tau\, e^{-t/\tau}\right)$ (D) $\tau - \tau\, e^{-t/\tau}$

    (E) Answer not known

122. Which of the following statements are correct?

    1. Transfer function — stability analysis

    2. Transfer function — independent of the input applied to the system

    3. Transfer function — independent of its internal structure

    4. Transfer function — independent of its internal components

    (A) 2 and 4 are correct   (B) 1 and 3 are correct

    (C) 3 and 4 are correct   (D) 1 and 2 are correct

    (E) Answer not known

123. A modulated information of 4 KHz bandwidth is transmitted through a Gaussian channel with SNR of 7. In order to maintain the same channel capacity, if the SNR is increased as 15, the band width needed is

(A) 5 KHz   (B) 15 KHz

(C) 30 KHz   ~~(D)~~ 3 KHz

(E) Answer not known

124. The redundancy of the source encoder can be written as

~~(A)~~ $1-\eta$ (B) $1+\eta$

(C) $1+\eta^2$ (D) $1-\eta^2$

(E) Answer not known

125. A message signal $V_m = 5\cos\left(4000\,\pi\,t + \dfrac{\pi}{3}\right) + 2\sin(2000\,t)$ is sampled at

Nyquist rate and quantized to 16 levels for binary PCM transmission. The transmitted bit rate of the PCM system is

(A) 2000 bps   (B) 4000 bps

(C) 8000 bps   ~~(D)~~ 16000 bps

(E) Answer not known

126. The correlation receiver consist of

(A) A multiplier and differentiator

~~(B)~~ A multiplier and integrator

(C) An adder and integrator

(D) An adder and differentiator

(E) Answer not known

127. The average probability of symbol error for BPSK signal is

(A) $\frac{1}{2} ERFC\left(\sqrt{\frac{Eb}{N_0}}\right)$ ✓

(B) $\frac{1}{2} ERFC\left(\sqrt{\frac{Eb}{2N_0}}\right)$

(C) $ERFC\left(\sqrt{\frac{E_b}{N_0}}\right)$

(D) $ERFC\left(\sqrt{\frac{E_b}{2N_0}}\right)$

(E) Answer not known

128. A 107.6 MHz carrier is frequency modulated by 7 KHz fine wave. The resultant FM signal has frequency deviation of 50 KHz. Determine the modulation index of the FM wave

(A) 7.142 ✓

(B) 7.012

(C) 6.912

(D) 6.811

(E) Answer not known

129. State True / False :

Assertion [A] : The high signal frequencies and small adjacent channel separation problems are solved by double heterodyne receivers.

Reason [R] : Double heterodyne receivers uses a high first IF to get good gain and a low second IF to get good image rejection.

(A) [A] is True; [R] is False ✓

(B) Both [A] and [R] are True; and [R] is correct explanation of [A]

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

(D) Both [A] and [R] are true, and [R] is not a correct explanation of [A]

(E) Answer not known

130. A radio transmitter is radiating a total power of 100 KW when the modulation index is 0.8. What is the carrier power being radiated by the transmitter?

(A)   24.2 KW

(B)   75.8 KW

(C)   100 KW

(D)   80 KW

(E)   Answer not known

131. A 500 W carrier is modulated to a depth of 60%. The percentage of power saved in DSB-SC compared to conventional AM is

(A)   84.74   (B)   68.91

(C)   75.32   (D)   91.23

(E)   Answer not known

132. White noise is the signal whose frequency spectrum

(A)   has spectral density varying as $\dfrac{1}{f}$

(B)   has flat spectral density

(C)   extends over finite range

(D)   has limited number of frequency components

(E)   Answer not known

133. The type of transform used in JPEG image compression standard is

(A) DFT (B) FFT
(C) DCT (D) DTFT
(E) Answer not known

134. Arrange the following color image enhancement sequence in chronological order.

1. RGB input image
2. Inverse coordinate transformation
3. Display
4. Monochrome image enhancement
5. Co-ordinate conversion

(A) 1, 4, 5, 2, 3 (B) 1, 5, 4, 2, 3
(C) 1, 5, 2, 3, 4 (D) 1, 2, 3, 5, 4
(E) Answer not known

135. Consider the following 2-bit image of size 5×5,

$$\begin{matrix} 0 & 1 & 3 & 2 & 1 \\ 0 & 2 & 3 & 3 & 1 \\ 1 & 3 & 2 & 1 & 3 \\ 1 & 0 & 2 & 0 & 2 \\ 2 & 1 & 0 & 0 & 2 \end{matrix}$$

The intensity levels are in the range $[0, 3]$. The histogram components are

(A) 0.25, 0.30, 0.28, 0.20 (B) 0.24, 0.28, 0.28, 0.20
(C) 0.25, 0.30, 0.30, 0.20 (D) 0.24, 0.27, 0.27, 0.20
(E) Answer not known

136. Approximate Transition width of main lobe is $4\pi/M$ is for

   (A) Rectangular window
   (B) Bartlett window
   (C) Hanning window
   (D) Hamming window
   (E) Answer not known

137. In impulse invariant method the mapping formula maps the analog frequency Ω to the Frequency variable w in the digital domain is

   (A) One-to-one
   (B) Many-to-one
   (C) One-to-many
   (D) Many-to-many
   (E) Answer not known

138. The magnitude Response was equiripple passband and maximally flat stopband is seen in ———————— filter approximation.

   (A) Butterworth Filter
   (B) Chebyshev – Type I Filter
   (C) Chebyshev – Type II Filter
   (D) FIR Filter
   (E) Answer not known

139. Which of the following are the true advantages of FIR filter?

   1. They are always stable
   2. Less storage requirements
   3. Can be realized in both recursive and non recursive structures
   4. They have exact linear phase

   (A) 1 and 3
   (B) 1 and 4
   (C) 1, 3 and 4
   (D) 1, 2 and 3
   (E) Answer not known

140. How many complex additions are performed in computing the N-point DFT of a sequence using divide – and – conquer method if N=LM?

(A) N(L+M+2)   (B) N(L+M−2)

(C) N(L+M−1)   (D) N(L+M+1)

(E) Answer not known

141. Compute the DFT of the given sequence X = [1, 0, −1, 0] is ;

(A) [0, 2, 0 , 2]   (B) [2, 0, 2, 0]

(C) [0, 2, 2, 0]   (D) [2, 0, 0, 2]

(E) Answer not known

142. Calculate the complex multiplication in FFT algorithm if N = 32 points

(A) 1024   (B) 992

(C) 80   (D) 160

(E) Answer not known

143. Efficient computational algorithms to evaluate DFT are

(1) Divide and Conquer

(2) Goertzel

(3) Chirp z Transform

(A) (1) and (2)   (B) (1) only

(C) (1) and (3)   (D) (1), (2) and (3)

(E) Answer not known

144. Which of the following is a seed as broadcast address in DHCP.

(A) 127.0.0.0   (B) 255.255.255.255

(C) 10.0.0.0   (D) 192.168.0.0

(E) Answer not known

145. Difference between ARP and RARP is

   (A) RARP finds both Ethernet and Ip addresses

   (B) ARP finds both Ethernet and Ip addresses

   (C) ARP finds Ethernet addresses

   (D) RARP finds Ip addresses

   (E) Answer not known

146. Class A Ip Address formats the host address start from

   (A) 128.0.0.0

   (B) 1.0.0.0

   (C) 192.0.0.0

   (D) 240.0.0.0

   (E) Answer not known

147. Match the correct terms in OSPF terminology

   (a) Point – to – point   1. Connected to only one router

   (b) Transient   2. Connect two routers without any other host in between

   (c) Stub   3. Several routers attached to it

   (d) Virtual   4. Longer path through several routers

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

   (E) Answer not known

148. The simplified Boolean function for the k-map below is

	CD			
AB	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	X	X	X	X
10	1	1	X	X

(A) $B + \overline{C}\,\overline{D} + CD$

(B) $\overline{B} + C\,\overline{D} + CD$

(C) $\overline{B} + \overline{C}\,\overline{D} + CD$

(D) $B + \overline{C}D + C\overline{D}$

(E) Answer not known

149. Match correctly the duties of different layers.

(a) Application   1. Provide hop to hop delivery
(b) Transport   2. Allow access to Network resources
(c) Network   3. Process to process message delivery
(d) Data link   4. Provide internetworking

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

(E) Answer not known

150. In OSI model, which layer is responsible for dialog control, token management and synchronization?

(A) Presentation Layer

(B) Session Layer

(C) Data link Layer

(D) Application Layer

(E) Answer not known

151. The Field Effect Transistor (FET) is associated with

  (A) Depletion capacitance
  (B) Junction capacitance
  (C) Channel length modulation
  (D) Charge storage capacitance
  (E) Answer not known

152. A transistor is connected in common base configuration, $\alpha = 0.95$, $I_E = 1$ mA calculate I_C and I_B

  (A) $I_C = 0.95$ and $I_B = 0.05$
  (B) $I_C = 1$ and $I_B = 0.02$
  (C) $I_C = 2$ and $I_B = 1$
  (D) $I_C = 0.05$ and $I_B = 0.95$
  (E) Answer not known

153. If the drain and gate in an enhancement type N-MOSFET are shorted together, then MOSFET operates in

  (A) Linear Region
  (B) Saturation Region
  (C) Cut-off Region
  (D) First cut off, then saturation
  (E) Answer not known

154. An NPN BJT is operating in the active region. If the reverse bias across the base collector junction is increased then

  (A) The effective base width increases and common emitter current gain increases

  (B) The effective base width increases and common emitter current gain decreases

  (C) The effective base width decreases and common emitter current gain increases

  (D) The effective base width decreases and common emitter current gain decreases

  (E) Answer not known

155. A schottky diode has ————— capacitance and operated at —————, frequencies.

(A) Very high capacitance and high frequencies

(B) Very little capacitance and high frequencies

(C) Minimum capacitance and minimum frequencies

(D) Maximum capacitance and minimum frequencies

(E) Answer not known

156. In LED, a digit "O' can be formed by

(A) Grounding all terminals except 'G'

(B) 5V to all terminals

(C) Grounding all terminals

(D) A, B, C, D and G are connected

(E) Answer not known

157. ————— Valve of series resistor is required to limit the current through a LED to 20mA with a forward voltage drop of 2V when connected to a 10V supply.

(A) 395 Ω

(B) 400 Ω

(C) 405 Ω

(D) 420 Ω

(E) Answer not known

158. Which of the following statements are true about zener diode?

(i) The location of the zener region can be controlled by varying the doping level.

(ii) Increase in doping, will increase zener potential

(iii) Increase in doping that produces an increase in the number of added impurities

(iv) The location of the zener region can be controlled by varying the input voltage

(A) (i) and (ii) only

(B) (i) and (iii) only

(C) (ii), (iii) and (iv) only

(D) (i) and (iv) only

(E) Answer not known

159. Under reverse biasing and small forward biasing, the dominant current component in most Si pn junction diodes maintained at room temperature which of the following current is produced?

(A) Diffusion current

(B) Drift current

(C) Ideal-diode current

(D) Recombination - Generation current

(E) Answer not known

160. A bar of intrinsic germanium 6cm long is subjected to a potential difference of 12V. If velocity of electrons in bar is 73 m/s, then the mobility of electrons is

(A) 200/73

(B) 70/200

(C) 73/200

(D) 73 × 200

(E) Answer not known

161. A silicon step junction maintained at room temperature under equilibrium conditions has a p-side doping of $N_A = 2 \times 10^{15}/cm^3$ and an n-side doping of $N_D = 10^{15}/cm^3$. Compute the built-in potential.

Use thermal voltage, $V_T = \dfrac{KT}{q} = 26\,mV$ at 300 K and intrinsic carrier concentration, $n_i = 1 \times 10^{10}/cm^3$

(A) 0.6167 V   (B) 0.5007 V

(C) 0.8237 V   (D) 0.4327 V

(E) Answer not known

162. In phase locked loop circuit, the aligning of output phase of voltage controlled oscillator with reference is called

(A) Phase alignment   (B) Phase detecting

(C) Phase locking   (D) Phase compensation

(E) Answer not known

163. An OP-AMP has common mode gain of 0.01 and a differential mode gain of 10^5, CMRR is

(A) 10^5 (B) 10^7

(C) 10^{-7} (D) 10^{-3}

(E) Answer not known

164. The output voltage of phase detector in phase-locked loop circuit is

(A) Phase voltage   (B) Error voltage

(C) Free running voltage   (D) Low filter output voltage

(E) Answer not known

165. A differential amplifier should possess _____ differential gain and _____ common mode gain.

(A) High, Low
(B) Low, Low
(C) Low, High
(D) High, High
(E) Answer not known

166. The smallest change in the input signal that can be detected by an instrument is called

(A) Accuracy
(B) Resolution
(C) Sensitivity
(D) Precision
(E) Answer not known

167. Determine the gain of the given circuit
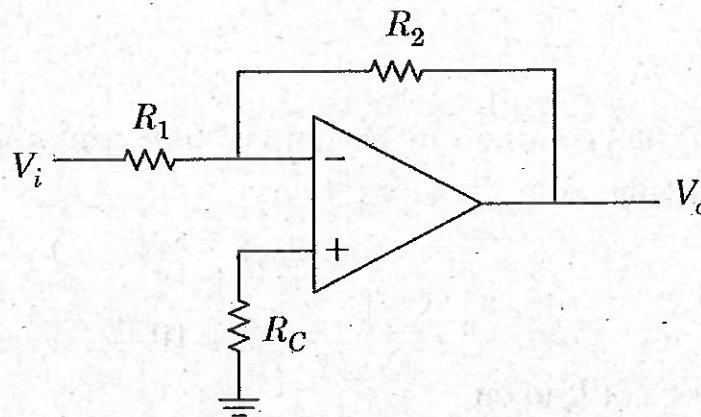
(A) $A = -\dfrac{R_C}{R_2}$

(B) $A = -\dfrac{R_2}{R_1}$

(C) $A = 1 + \dfrac{R_2}{R_1}$

(D) $A = -\dfrac{R_1}{R_2}$

(E) Answer not known

168. The major advantage of MOSFET for digital switching is

   (A) that the oxide layer between the gate and channel prevents the d.c. current from flowing through the gate

   (B) That they do not have the larger capacitance factor imposed by the gate

   (C) that the oxide layer between the gate and channel allows the d.c. current from flowing through the gate

   (D) that they have the larger capacitance factor imposed by gate

   (E) Answer not known

169. The normal operation of BJT, the Q-point of transistor is selected midway between the saturation and cut-off point, the condition is

   (A) $V_{CE} = \frac{1}{2} V_{CC}$

   (B) $V_{CE} = V_{CC}$

   (C) $V_{CE} = 2 V_{CC}$

   (D) $V_{CE} = 3 V_{CC}$

   (E) Answer not known

170. For the following circuit, calculate I_D
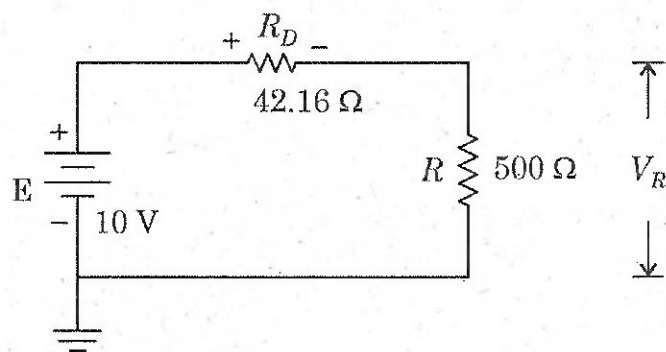
   (A) $I_D = 10.5 \, mA$

   (B) $I_D = 20.5 \, mA$

   (C) $I_D = 34.5 \, mA$

   (D) $I_D = 18.5 \, mA$

   (E) Answer not known

171. The radiation efficiency of a half wave dipole antenna having loss resistance of 27 Ω is

(A) 27%   (B) 2.7%

(C) 73%   (D) 97.3%

(E) Answer not known

172. In an end-fire array with antenna spacing of $\lambda/2$, the elements are fed

(A) In phase   (B) 90° out of phase

(C) 180° out of phase   (D) 60° out of phase

(E) Answer not known

173. An air-filled rectangular waveguide has dimensions a = 2 cm and b = 1 cm. Determine the range of frequencies over which the guide will operate single mode (TE_{10}).

(A) $7\,GHz < f < 15\,GHz$ (B) $7.5\,GHz < f < 15\,GHz$

(C) $8\,GHz < f < 15\,GHz$ (D) $9\,GHz < f < 15\,GHz$

(E) Answer not known

174. Wave velocity for lossless propagation in a transmission line is

(A) $V = \sqrt{\dfrac{L}{C}}$ (B) $V = \sqrt{LC}$

(C) $V = LC$ (D) $V = \dfrac{1}{\sqrt{LC}}$

(E) Answer not known

175. A uniform plane wave of 250 mHz, propagating through a free space medium with maximum electric field magnitude as 0.5 V/m. If the wave is propagating along negative Z direction, then the magnitude of magnetic field is

(A) 1.3 mA/m
(B) 13 mA/m
(C) 4.2 mA/m
(D) 42 mA/m
(E) Answer not known

176. According to Biot-Savart law, the magnetic field 'H' is

(A) Directly proportional to square distance
(B) Inversely proportional to square distance
(C) Independent of distance 'R'
(D) Dependent of distance $'R^{4'}$
(E) Answer not known

177. Stoke's theorem for any vector field 'H' is

(A) $\oint_L H.dL = \int_V (\nabla \times H).dv$

(B) $\oint_L H.dL = \int_S (\nabla \times H).ds$

(C) $\oint_L H.dL = \int_S D.ds$

(D) $\oint_L H.dL = \int_S (\nabla .E).ds$

(E) Answer not known

178. The diameter of a conductors is 1 mm and conductivity 5×10^7 s/m has 10^{29} free electrons per cubic meter when an electric field of 10 mV/m is applied. The current density of conductor is

(A) 100 kA/m^2
(B) 200 kA/m^2
(C) 400 kA/m^2
(D) 500 kA/m^2
(E) Answer not known

179. The medium in which both Poisson's equation and Laplace's equation are same is

(A) Perfect conductor
(B) Lossy Dielectric
(C) Free space
(D) Practical dielectric
(E) Answer not known

180. The magnetic field of a uniform plane wave travelling in free space is given as

$\overline{H}_{(z,\ t)} = a_y\ 2.5 \cos(6 \times 10^9\ t - K_o z)\ mA/m$. It's phase constant K_0 is

(A) 40 rad/m
(B) 20 rad/m
(C) 18 rad/m
(D) 2 rad/m
(E) Answer not known

181. The equation which describes the ampere's circuital law for time varying fields is

(A) $\nabla \times \vec{H} = I + \dfrac{\partial \vec{E}}{\partial t}$

(B) $\oint \vec{H} \cdot \vec{dl} = \sigma \vec{E} + \varepsilon \dfrac{\partial \vec{E}}{\partial t}$

(C) $\nabla \times \vec{H} = \int \left(\sigma \vec{E} + \varepsilon \dfrac{\partial \vec{E}}{\partial t} \right) \cdot \vec{dl}$

(D) $\oint \vec{H} \cdot \vec{dl} = \int_S \left(\sigma \vec{E} + \dfrac{\partial \vec{D}}{\partial t} \right) \cdot \vec{dS}$

(E) Answer not known

182. Precoding uses the same idea as frequency equalization, except that the fading is inverted at the transmitter instead of at the

(A) Channel
(B) Receiver
(C) Modulator
(D) Demodulator
(E) Answer not known

183. A vertical $\frac{\lambda}{4}$ monopole antenna is used at a mobile terminal with a gain of 3 on linear scale and carrier frequency of 800 MHz. The effective aperture of the antenna is ————— square meter.

(A) 0.0111   (B) 0.0222

(C) 0.0333   (D) 0.0444

(E) Answer not known

184. The two types of capacity possible in flat fading MIMO systems are

(A) Channel capacity and outage capacity

(B) Ergodic capacity and channel capacity

(C) Ergodic capacity and signal capacity

(D) Ergodic capacity and outage capacity

(E) Answer not known

185. Arrange the blocks in an order for OFDM transmission from the Data source

1. Serial to parallel conversion

2. Encoder

3. Parallel to serial conversion

4. Cyclic prefix

5. Inverse fast Fourier Transform

(A) 1, 3, 5, 4, 2   (B) 3, 2, 4, 5, 1

(C) 4, 2, 3, 5, 1   (D) 2, 1, 5, 3, 4

(E) Answer not known

186. The design process of selecting and allocating channels groups for all of the cellular base stations within a system is called

    (A)   Frequency splitting
    (B) Frequency Multiplexing
    (C)   Frequency Translation
    (D) Frequency Reuse
    (E)   Answer not known

187. Basic propagation models are

    (A)   Attenuation, Absorption, Filtering
    (B)   Attenuation, Reflection, Scattering
    (C)   Reflection, Diffraction, Scattering
    (D)   Diffraction, Scattering, Attenuation
    (E)   Answer not known

188. For a certain multipath channel in the outdoor environment, RMS delay spread is $2.37\,\mu s$. The coherence band width of the channel is _____, assuming the frequency correlation function is above 0.5.

    (A)   137 kHz
    (B)   84 kHz
    (C)   146 kHz
    (D) 92 kHz
    (E)   Answer not known

189. A spectrum of 30 mHz is allocated to a wireless FDD cellular system which uses two 25kHz simple channels to provide full duplex voice and control channels. Find the number of channels available per cell, If the system uses four cell reuse.

    (A)   50 channels
    (B)   100 channels
    (C)   150 channels
    (D) 200 channels
    (E)   Answer not known

190. Assertion [A] : Linear Time Invariant (LTI) systems does not have frequency component different from the input signal.

Reason [R] : No frequency shift Occurs.

(A) [A] is True, [R] is false

(B) Both [A] and [R] are True and [R] is correct explanation for [A]

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

(D) Both [A] and [R] is True and [R] is not correct explanation for [A]

(E) Answer not known

191. Assume the content of accumulator is 47H, and the carry flag is reset. What is the condition of accumulation and carry flag after execution of instruction RAL?

(A) 53, 1

(B) 4E, 0

(C) 53, 0

(D) 4E, 1

(E) Answer not known

192. Consider the following

(1) Input devices

(2) ALU

(3) Control unit

(4) Auxiliary memory

(5) Main memory

(6) Registers

Which of these form part of CPU?

(A) (1), (4) and (6)

(B) (2), (3) and (6)

(C) (2), (4) and (5)

(D) (2), (3) and (5)

(E) Answer not known

193. Assertion [A] :   Ripple counters are not synchronous.

Reason [R]   :   Some or all of the flip flops are not triggered by the common clock but rather by the transition that occurs in other flip flops.

(A)   [A] is true but [R] is false

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

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

(D)   Both [A] and [R] are false

(E)   Answer not known

194. A 6-bit dia converter has an output of voltage range 0 to 9V. Find the resolution of the system

(A)   833 mV   (B)   156 mV

(C)   230 mV   (D)   143 mV

(E)   Answer not known

195. What is the output caused by the LSB BIT of a 5 bit ladder, if the levels are 0 = 0V and 1 = +10V?

(A)   +0 V   (B)   +0.625 V

(C)   +2.5 V   (D)   +0.3125 V

(E)   Answer not known

196. In a D-Flipflop, the minimum time during which the D input must be maintained at a constant value prior to the occurrence of the clock transition is
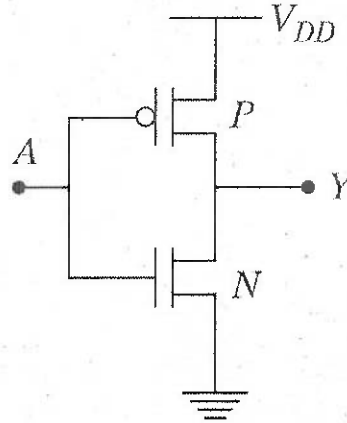
(A)   Propagation delay   (B)   Hold time

(C)   Critical path delay   (D)   Setup time

(E)   Answer not known

197. Find out the type of logic circuit from the following CMOS circuit

(A) AND gate   (B) OR gate
(C) NAND gate   (D) Inverter
(E) Answer not known

198. 8 Bit 2's complement representation of a decimal number is '11111001', the number is

(A) -7 (B) $+7$
(C) -8 (D) $+8$
(E) Answer not known

199. The Boolean expression for the output of EX-NOR gate with inputs A and B is

(A) $A\overline{B} + \overline{AB}$ (B) $A\overline{B} + \overline{A}B$
(C) $(A+B)(A+B)$ (D) $(\overline{A}+B)(A+\overline{B})$
(E) Answer not known

200. The binary equivalent of decimal number 0.95 is

(A) 1111001   (B) 0111001
(C) 1011001   (D) 1101001
(E) Answer not known

SPACE FOR ROUGH WORK

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