Total No. of Printed Pages : 13

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A

SET-Y

Ph.D-EE-December, 2024

Electronics & Communication Engineering

10013

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

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(Signature of the Candidate) (Signature of the Invigilator)

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1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There shall be negative marking. A deduction of 0.25 marks shall be there for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SEAL

1. Find the Eigenvalues for the following 2×2 matrix :

$$X = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$$

(1) $-3, 5$ (2) $2, -1$ (3) $-5, 3$ (4) $4, 0$

2. Three coins are tossed at once. What is the probability of getting exactly 2 tails ?
(1) 1/8 (2) 3/8 (3) 5/8 (4) 1/4

3. What is the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 4 & 10 & 18 \end{bmatrix}$

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

4. If $f(0) = 4$ & $f'(x) = \dfrac{3}{x^2+2}$ the lower bound of $f(2)$ estimated by mean value theorem is :
(1) 0 (2) 7 (3) 12 (4) 5

5. Divergence of gradient of a vector function is equivalent to :
(1) Laplacian operation (2) Curl operation
(3) Double gradient operation (4) Null vector

6. Find the gradient of the function given by $x^2 + y^2 + z^2$ at (1, 1, 1) :
(1) $\hat{i} + \hat{j} + \hat{k}$ (2) $2\hat{i} + 2\hat{j} + 2\hat{k}$
(3) $2x\hat{i} + 2y\hat{j} + 2z\hat{k}$ (4) $4x\hat{i} + 2y\hat{j} + 4z\hat{k}$

7. Which of the following theorems use the curl operation ?
(1) Green's theorem (2) Gauss Divergence theorem
(3) Stoke's theorem (4) Maxwell equation

8. Which of the following is obtained by evaluating $\int_C (z-3)^n \, . \, dz$ where C is $|z-3| = 9$?
(1) -1 (2) 2 (3) 1 (4) 0

9. Determine the mean, median and mode values for the set : {26, 31, 21, 29, 32,26,25, 28} :
(1) Mean = 27.25, Median = 27, Mode = 26
(2) Mean = 27.25, Median = 26, Mode = 27
(3) Mean = 32, Median = 29, Mode = 28
(4) Mean = 29, Median = 32, Mode = 26

10. In a Binomial Distribution, if p, q and n are probability of success, failure and number of trials respectively then variance is given by ..... .

(1) np (2) npq (3) np^2q (4) npq^2

11. If Event A and Event B are mutually exclusive, what is $P(A|B)$?

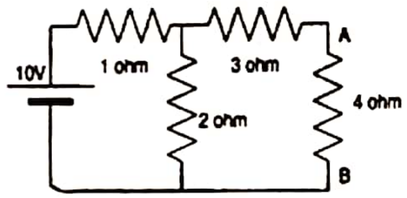
(1) $P(A) + P(B)$ (2) $P(A) - P(B)$

(3) $P(A) * P(B)$ (4) 0

12. For which value of x will $(x-1)(3-x)$ have its maximum ?

(1) 0 (2) 1 (3) 2 (4) -2

13. Calculate the current across the 4 ohm resistor.



(1) 1.23 Amp (2) 0 Amp (3) 0.86 Amp (4) 0.67 Amp

14. A DC source of EMF E volts and internal resistance R ohms is connected to a variable load and it is adjusted such that the load absorbs maximum power from the source. The maximum power delivered from the source to the load is :

(1) $\frac{E^2}{2R}$ (2) $\frac{E^2}{4R}$ (3) $\frac{2E^2}{R}$ (4) $\frac{E^2}{R}$

15. If there are 5 branches and 4 nodes in the graph, then the numbers of mesh equations that can be formed are ?

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

16. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the resistor is ?

(1) 0 degree (2) 90 degree (3) 180 degree (4) 360 degree

17. In a series RL circuit, voltage across resistor and inductor are 3 V and 4 V respectively, then what is the applied voltage ?

(1) 7 (2) 5 (3) 4 (4) 3

18. Transfer function of a system is defined as the ratio of output to input in :

(1) Z-transform (2) Fourier transform

(3) Laplace transform (4) All of these

19. Discrete Fourier Transform is applicable to :

(1) Infinite sequences (2) Finite discrete sequences

(3) Continuous infinite signals (4) Continuous finite sequences

20. The autocorrelation of $x(t) = e^{-at}u(t)$ is ..... .

(1) $\frac{e^{-at}}{a^2}$ (2) $\frac{e^{-at}}{2a}$ (3) $\frac{e^{-a\tau}}{a^2}$ (4) $\frac{e^{-a\tau}}{2a}$

21. For any given signal, average power in its 6 harmonic components is 10 mW each and the fundamental component also has 10 mW power. Then, average power in the periodic signal is ..... .

(1) 70 (2) 60 (3) 10 (4) 5

22. The Fourier transform (FT) of a function $x(t)$ is $X(f)$. The FT of $\frac{dx(t)}{dt}$ will be :

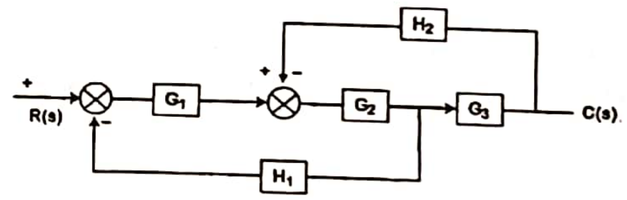
(1) $\frac{dX(f)}{df}$ (2) $2\pi jfX(f)$ (3) $X(f)\,jf$ (4) $\frac{X(f)}{jf}$

23. Which oscillations will be generated in the time domain response, if complex conjugate poles are present with a negative real part ?

(1) Damped oscillations (2) Undamped oscillations

(3) Sustained oscillations (4) No oscillations

24. Determine the transfer function of the given system :



(1) $\frac{G1G2G3}{(1+H2G2G3+G2G1H1)}$ (2) $\frac{G1G2G3}{(1+G1G2G3H2H1)}$

(3) $\frac{G1G2G3}{(1+G1G2G3H1+G1G2G3H2)}$ (4) $\frac{G1G2G3}{(1+G1G2G3H1)}$

25. The step error coefficient of a system $G(s) = \dfrac{1}{(s+2)(s+3)}$ with unity feedback is :

(1) 0 (2) Infinite (3) 1/6 (4) 1

26. An intrinsic semiconductor at absolute zero temperature behaves like :

(1) A perfect conductor (2) A perfect Insulator
(3) A super conductor (4) An amplifier

27. N-channel FETs are preferred to p-channel FETs because :

(1) Holes have higher velocity
(2) Electrons have higher mobility than holes
(3) Electrons have higher diffusivity than holes
(4) Electrons have higher effective mass than holes

28. The depletion width of a Si p-n junction at a reverse bias of 10 V is 2 μm. When the reverse bias is increased to 20 V, the depletion width will be :

(1) 4.0 μm (2) 3.2 μm (3) 2.8 μm (4) 2.4 μm

29. Field Effect Transistor (FET) is an unipolar device because :

(1) V_{DS} of one polarity is used
(2) V_{GS} of one polarity is used
(3) I_D constitutes either electrons or holes
(4) All the charge carriers flow towards a single pole.

30. What is the value of current when the gate to source voltage is less than the pinch off voltage ?

(1) 1 A (2) 5 A (3) 100 A (4) 0A

31. A BJT is a :

(1) Current -Controlled device (2) Voltage - Controlled device
(3) Power- Controlled device (4) Field- Controlled device

32. The phenomenon leading to avalanche breakdown in reverse-biased diodes is known as ..... .

(1) Auger (4) Extract ionization

33. The solar incident light on the cell breaks ..... condition of the diode's junction.

(1) Thermal expansion (2) Breakdown
(3) Thermal equilibrium (4) Nickel plating

34. Which of the following materials cannot be used as solar cells materials ?

(1) Si (2) GaAs (3) CdS (4) PbS

35. Calculate the value of emitter current for a transistor $\alpha_{dc} = 0.98$, $I_{CBO} = 5$ μA and $I_B = 95$ μA

(1) 4.5 mA (2) 5 mA (3) 3.5 mA (4) 10 mA

36. Ripple factor of the half wave rectifier is nearly ..... .

(1) 1.11 (2) 0.87 (3) 1.21 (4) 0.5

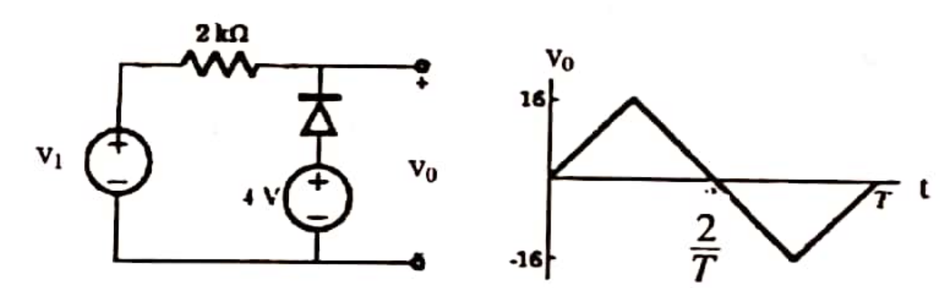
37. If a capacitor is placed in the feedback path of an Op-amp circuit, then the circuit can act as :

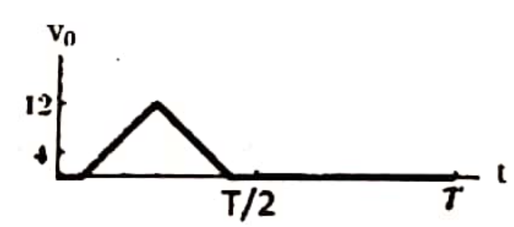
(1) Integrator (2) Differentiator
(3) Multiplier (4) Divider

38. If an Op-amp has a common mode gain of 0.01 and a differential gain of 10^5. Its CMRR would be ..... .

(1) 0 (2) Infinite (3) 10^{-3} (4) 10^7

39. Determine the output waveform from the given circuit and input waveform.



(1)


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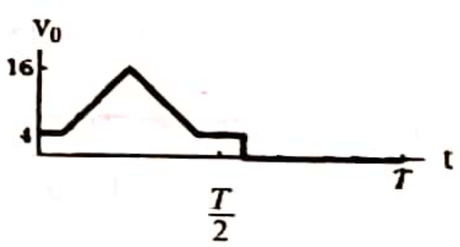

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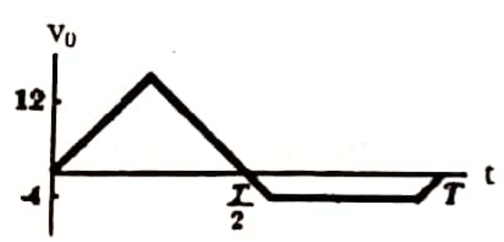

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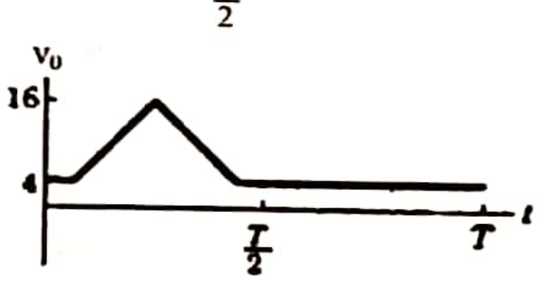
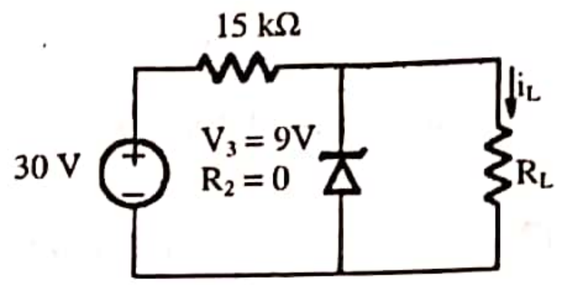


40. The maximum load current that can be drawn from the following circuit is



(1) 1.4 mA (2) 2.3 mA (3) 1.8 mA (4) 2.5 mA

41. Which among the following is Volatile Memory ?

(1) RAM (2) ROM (3) DROM (4) EPROM

42. Fan-in and Fan-out are the characteristics of ..... .

(1) Registers (2) Logic families
(3) Sequential Circuits (4) Combinational Circuits

43. Where the result of an arithmetic and logical operation are stored ?

(1) In Accumulator (2) In Cache Memory
(3) In ROM (4) In Instruction Registry

44. The logic circuits whose outputs at any instant of time depends not only on the present input but also on the past outputs are called ..... .

(1) Combinational circuits (2) Flip-flops
(3) Sequential circuits (4) Latches

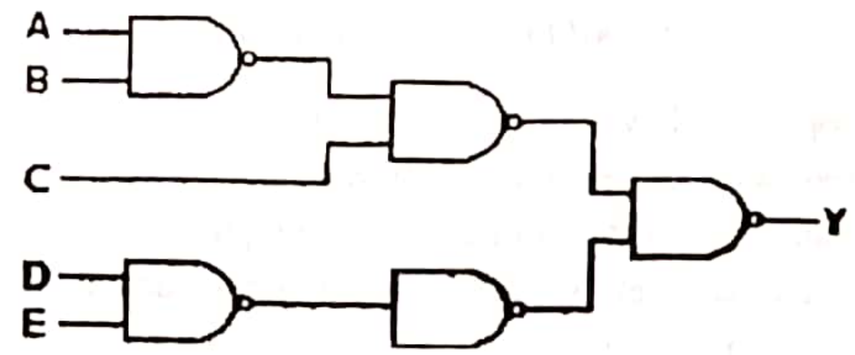
45. Which of the following logic families has the shortest propagation delay ?

(1) CMOS (2) BiCMOS (3) ECL (4) 74SXX

46. Which of the following describes the operation of a positive edge-triggered D flip-flop ?

(1) If both inputs are HIGH, the output will toggle.
(2) The output will follow the input on the leading edge of the clock.
(3) When both inputs are LOW, an invalid state exists.
(4) The input is toggled into the flip-flop on the leading edge of the clock and is passed to the output on the trailing edge of the clock.

47. The circuit of the given figure realizes the function ..... .



(1) $Y = (A' + B')C + (DE)'$ (2) $Y = A' + B' + C + D' + E'$
(3) $Y = (A + B)' + C + (D + E)'$ (4) $Y = AB + C + DE$

48. Which term applies to the maintaining of a given signal level until the next sampling ?

(1) Holding (2) Aliasing
(3) Shannon frequency sampling (4) Stair-stepping

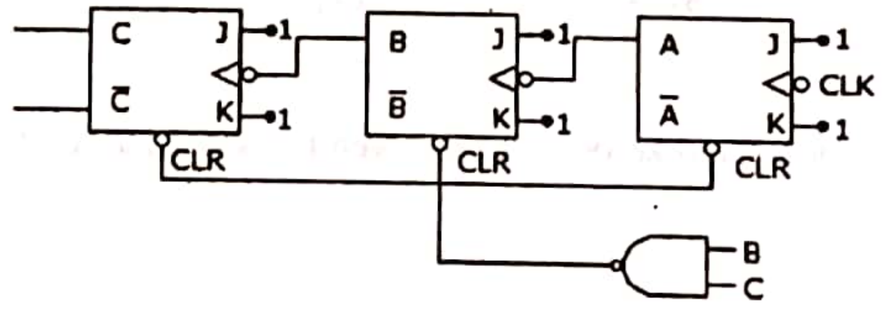
49. A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is .....

(1) 20 KHz square wave (2) 10KHz square wave
(3) Constantly Low (4) Constantly High

50. An analog signal is sampled at 36 kHz and quantized into 256 levels. The time duration of a bit of binary coded signal is :

(1) 5.78 μs (2) 3.47 μs (3) 6.43 ms (4) 7.86 ms

51. The given figure shows which type of counter ?



(1) Mod 6 (2) Mod 3 (3) Mod 8 (4) Decade counter

52. A digital multiplexer is a combinational circuit that selects ..... .

(1) One digital information from several sources and transmits the selected one
(2) Many digital information and convert them into one
(3) Many decimal inputs and transmits the selected information
(4) Many decimal outputs and accepts the selected information

53. Convert binary number into gray code : 100101.

(1) 101101 (2) 001110 (3) 110111 (4) 111001

54. The open-loop control system is one in which :

(1) The output is dependent on the control input
(2) The output is independent of the control input
(3) Only system parameters have an effect on the control output
(4) Output is independent to input

55. The frequency at which maximum amplitude ratio is attained is called the ..... frequency.

(1) Comer (2) Resonant (3) Cross over (4) Natural

56. The open loop transfer function of a plant is given as, $G(s) = \frac{1}{(s^2-1)}$. If the plant is operated in unity feedback configuration, then the lead compensator that can stabilize the control system is :

(1) $\frac{10(s+4)}{(s+2)}$ (2) $\frac{10(s+2)}{(s+10)}$ (3) $\frac{10(s-2)}{(s+10)}$ (4) $\frac{10(s-1)}{(s+2)}$

57. The open loop DC gain of an unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is :

(1) $\frac{4}{13}$ (2) 4 (3) $\frac{4}{9}$ (4) 13

58. Calculate the poles and zeroes for the given transfer function $G(s) = \frac{5(s+2)}{(s^2+3s+2)}$

(1) $-2,(-1,-2)$ (2) $2,(-1,\ 2)$ (3) $2,(1,2)$ (4) $-2,(1,-2)$

59. A system with the polynomial $s^4 + 5s^3 + 3s^2 + 6s + 5 = 0$ is :

(1) Unstable (2) Marginally stable
(3) In equilibrium (4) Stable

60. Viterbi decoding is one of the most commonly used techniques in modern systems that is used to decode the data encoded by ..... .

(1) Block coding (2) Hamming coding
(3) Convolutional coding (4) CRC coding

61. Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in amplitude modulated signal ?

(1) 13.36 W (2) 15.84 W (3) 52 W (4) 176 W

62. The magnitude of open circuit and short circuit input impedances of a transmission line are 100Ω and 25Ω respectively. The characteristic impedance of the line is :

(1) 25 Ω (2) 50 Ω (3) 75 Ω (4) 100 Ω

63. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by :

(1) 6 dB (2) 3 dB (3) 2 dB (4) 0 dB

64. In a communication system, when two finite-power waveforms $x(t)$ and $y(t)$ have the property : $x.y = 0$, then these waveforms are said to be :

(1) Identical (2) Overlap (3) Similar (4) Orthogonal

65. Poynting vector signifies :

(1) Current density vector producing electrostatic field
(2) Power density vector producing electrostatic field
(3) Current density vector producing electromagnetic field
(4) Power density vector producing electromagnetic field

66. Folded dipole antenna belongs to which type of antenna ?

(1) Reflector (2) Aperture (3) Lens (4) Wire

67. An AM wave is given by $S_{AM}(t)=10\ (1 + 0.4 \cos 10^3 t + 0.3 \cos 10^4 t) \cos 10^6 t$. The modulation index is :

(1) 0.4 (2) 0.5 (3) 0.3 (4) 0.9

68. 10 signals, each band-limited to 5 KHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guardband of 1 KHz is used, then the bandwidth of the multiplexed signal will be :

(1) 79 KHz (2) 60 KHz (3) 59 KHz (4) 61 KHz

69. A signal $X(t) = 100 \cos (24 \times 10^3)\ t$ is ideally sampled with a sampling period of 50 sec and then passed through an ideal low pass filter with a cut off frequency of 15 KHz. Which of the following frequencies is/are present at the filter output ?

(1) 12 KHz only (2) 8 KHz only
(3) 12 KHz and 9 KHz (4) 12 KHz and 8 KHz

70. In a twin wire transmission line in air the adjacent voltage maxima are at 12.5 em and 27.5 cm. The operating frequency is :
(1) 300 MHz (2) 1 GHz (3) 2 GHz (4) 6.28 GHz

71. The depth of the penetration of a wave in a lossy dielectric increases with increasing :
(1) Conductivity (2) Permeability (3) Wavelength (4) Permittivity

72. I_C is the dc collector current of a BJT = 2 rnA at room temperature where kT/q=25 mV. Given $h_{fe} = 100$, the value of h_{ie} is given by :
(1) 125 Ω (2) 25 Ω (3) 1250 Ω (4) 2500 Ω

73. Determine the initial value of $x(t)$. The Laplace transform $X(s) = \frac{1}{(s^2+5s-2)}$:
(1) 1 (2) −2 (3) 5 (4) 0

74. Convert 1100101_2 into an octal base system.
(1) 145_8 (2) 340_8 (3) 257_8 (4) 150_8

75. The power spectral density of white noise :
(1) is dependent on frequency (2) varies with inverse of frequency
(3) varies with square of frequency (4) is constant with frequency

76. Efficiency of a centre tapped full wave rectifier is :
(1) 50.2% (2) 44.5% (3) 70.1% (4) 81.2%

77. When does the transistor act like an open switch ?
(1) cut off region (2) inverted region
(3) saturated region (4) active region

78. A successive approximation A/D converter has a resolution of 20 mV. What will be its digital output for an analog input of 2.17 V ?
(1) 01101100 (2) 01101101 (3) 01101011 (4) Insufficient data

79. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfections in clock extraction and waveform regeneration. This effect is known as ..... .
(1) Jitter (2) Aliasing (3) Fading (4) Attenuation

80. Which addressing mode executes its instructions within the CPU without the necessity of reference memory for operands ?
(1) Implied Mode (2) Immediate Mode
(3) Direct Mode (4) Register Mode

81. How is the effective address of base-register calculated ?
(1) By addition of implied register contents to the partial address in instruction
(2) By addition of index register contents to the partial address in instruction
(3) By addition of index register contents to the complete address in instruction
(4) By addition of implied register contents to the complete address in instruction

82. The instruction, Add #45, Rl does ..... .
(1) Adds the value of 45 to the address of R1 and stores 45 in that address
(2) Adds 45 to the value of R1 and stores it in R1
(3) Finds the memory location 45 and adds that content to that of R1
(4) R1 stores the value at memory location to 45

83. What is the principle of fibre optical communication ?
(1) Frequency modulation (2) Population inversion
(3) Total internal reflection (4) Doppler Effect

84. The optical source used for detection of optical signal is ..... .
(1) IR sensors (2) Photodiodes
(3) Zener diodes (4) Light Emitting Diodes

85. Calculate the conduction current density when the resistivity of a material with an electric field of 5 units is 4.5 units.
(1) 22.5 (2) 4.5/5 (3) 5/4.5 (4) 9.5

86. Find the loss tangent of a material with conduction current density of 5 units and displacement current density of 10 units.
(1) 2 (2) 0.5 (3) 5 (4) 10

87. The Maxwell second equation that is valid in any conductor is :
(1) Curl(H) = Jc (2) Curl(E) = Jc (3) Curl(E) = Jd (4) Curl (H) = Jd

88. Which of the following is not used in the VSWR measurement ?
(1) Reflective Klystron (2) Slotted line
(3) Frequency meter (4) Spectrum analyzer

89. If there are no any reflections, then the value of the SWR will be ..... .
(1) 1 (2) 0 (3) ∞ (4) 2

90. The cut off wavelength and the guided wavelength are given by 0.5 and 2 units respectively. Find the wavelength of the wave :
(1) 0.48 (2) 0.32 (3) 0.45 (4) 0.54

91. The product of the phase and the group velocities is given by the :

(1) Speed of light (2) Speed of light/2

(3) 2 × Speed of light (4) (speed of light)/4

92. A linear antenna having length less than $\lambda/8$ is called as ..... .

(1) Short monopole (2) Short dipole

(3) Half-wave dipole (4) Quarter-wave monopole

93. Find the power radiated by an antenna whose radiation resistance is 100Ω and operating with 3A of current at 2GHz frequency ?

(1) 900W (2) 1800W (3) 450W (4) 700W

94. What is the length of the half-wave dipole with bandwidth 20MHz and Quality factor 30 ?

(1) 5m (2) 0.25m (3) 0.50m (4) 2.5m

95. S parameters of a transmission line are S_{11}, S_{12}, S_{21} and S_{22}, if the transmission line is symmetrical, which of the following condition will be true :

(1) $S_{11} = S_{12}$ (2) $S_{12} = -S_{21}$ (3) $S_{12} = S_{21}$ (4) $S_{11} = S_{22}$

96. If each pulse of the sequence to be detected is in ..... shape, the pulse can be detected without ISI.

(1) Sine (2) Cosine (3) Sinc (4) Square

97. The minimum Nyquist bandwidth for the rectangular spectrum in raised cosine filter is :

(1) 2T (2) 1/2T (3) T/2 (4) 2/T

98. The technique OTDR (Optical time domain reflectometry) is used for the measurement of :

(1) Bandwidth (2) Core diameter

(3) Attenuation (4) Cladding diameter

99. The reverse bias current in a p-n diode is due to :

(1) Minority carriers (2) Majority carriers

(3) Electrons only (4) Holes only

100. Entropy is ..... when both messages are equally likely.

(1) Maximum (2) Minimum (3) 0 (4) 1/2

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B

Ph.D-EE-December, 2024
Electronics & Communication Engineering

Sr. No. 10014 .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

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(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There shall be negative marking. A deduction of 0.25 marks shall be there for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SEAL

1. The depth of the penetration of a wave in a lossy dielectric increases with increasing :
(1) Conductivity (2) Permeability (3) Wavelength (4) Permittivity

2. I_C is the dc collector current of a BJT = 2 rnA at room temperature where kT/q=25 mV. Given $h_{fe} = 100$, the value of h_{ie} is given by :
(1) 125 Ω (2) 25 Ω (3) 1250 Ω (4) 2500 Ω

3. Determine the initial value of $x(t)$. The Laplace transform $X(s) = \frac{1}{(s^2+5s-2)}$:
(1) 1 (2) −2 (3) 5 (4) 0

4. Convert 1100101_2 into an octal base system.
(1) 145_8 (2) 340_8 (3) 257_8 (4) 150_8

5. The power spectral density of white noise :
(1) is dependent on frequency (2) varies with inverse of frequency
(3) varies with square of frequency (4) is constant with frequency

6. Efficiency of a centre tapped full wave rectifier is :
(1) 50.2% (2) 44.5% (3) 70.1% (4) 81.2%

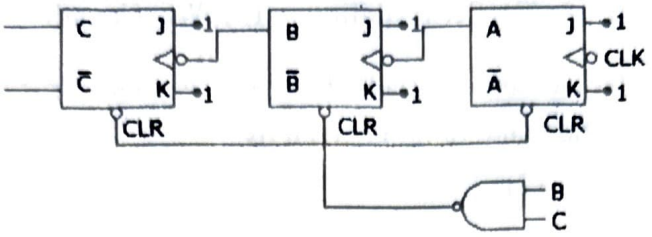
7. When does the transistor act like an open switch ?
(1) cut off region (2) inverted region
(3) saturated region (4) active region

8. A successive approximation A/D converter has a resolution of 20 mV. What will be its digital output for an analog input of 2.17 V ?
(1) 01101100 (2) 01101101 (3) 01101011 (4) Insufficient data

9. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfections in clock extraction and waveform regeneration. This effect is known as .....
(1) Jitter (2) Aliasing (3) Fading (4) Attenuation

10. Which addressing mode executes its instructions within the CPU without the necessity of reference memory for operands ?
(1) Implied Mode (2) Immediate Mode
(3) Direct Mode (4) Register Mode

11. The given figure shows which type of counter ?



(1) Mod 6 (2) Mod 3 (3) Mod 8 (4) Decade counter

12. A digital multiplexer is a combinational circuit that selects ..... .

(1) One digital information from several sources and transmits the selected one
(2) Many digital information and convert them into one
(3) Many decimal inputs and transmits the selected information
(4) Many decimal outputs and accepts the selected information

13. Convert binary number into gray code : 100101.

(1) 101101 (2) 001110 (3) 110111 (4) 111001

14. The open-loop control system is one in which :

(1) The output is dependent on the control input
(2) The output is independent of the control input
(3) Only system parameters have an effect on the control output
(4) Output is independent to input

15. The frequency at which maximum amplitude ratio is attained is called the ..... frequency.

(1) Comer (2) Resonant (3) Cross over (4) Natural

16. The open loop transfer function of a plant is given as, $G(s) = \frac{1}{(s^2-1)}$. If the plant is operated in unity feedback configuration, then the lead compensator that can stabilize the control system is :

(1) $\frac{10(s+4)}{(s+2)}$ (2) $\frac{10(s+2)}{(s+10)}$ (3) $\frac{10(s-2)}{(s+10)}$ (4) $\frac{10(s-1)}{(s+2)}$

17. The open loop DC gain of an unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is :

(1) $\frac{4}{13}$ (2) 4 (3) $\frac{4}{9}$ (4) 13

18. Calculate the poles and zeroes for the given transfer function $G(s) = \frac{5(s+2)}{(s^2+3s+2)}$

(1) $-2,(-1,-2)$ (2) $2,(-1,2)$ (3) $2,(1,2)$ (4) $-2,(1,-2)$

19. A system with the polynomial $s^4 + 5s^3 + 3s^2 + 6s + 5 = 0$ is :

(1) Unstable (2) Marginally stable

(3) In equilibrium (4) Stable

20. Viterbi decoding is one of the most commonly used techniques in modern systems that is used to decode the data encoded by ..... .

(1) Block coding (2) Hamming coding

(3) Convolutional coding (4) CRC coding

21. A BJT is a :

(1) Current -Controlled device (2) Voltage - Controlled device

(3) Power- Controlled device (4) Field- Controlled device

22. The phenomenon leading to avalanche breakdown in reverse-biased diodes is known as ..... .

(1) Auger recombination (2) Mode hopping

(3) Impact ionization (4) Extract ionization

23. The solar incident light on the cell breaks ..... condition of the diode's junction.

(1) Thermal expansion (2) Breakdown

(3) Thermal equilibrium (4) Nickel plating

24. Which of the following materials cannot be used as solar cells materials ?

(1) Si (2) GaAs (3) CdS (4) PbS

25. Calculate the value of emitter current for a transistor $\alpha_{dc} = 0.98$, $I_{CBO} = 5\ \mu A$ and $I_B = 95\ \mu A$

(1) 4.5 mA (2) 5 mA (3) 3.5 mA (4) 10 mA

26. Ripple factor of the half wave rectifier is nearly ..... .

(1) 1.11 (2) 0.87 (3) 1.21 (4) 0.5

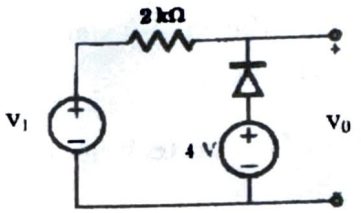
27. If a capacitor is placed in the feedback path of an Op-amp circuit, then the circuit can act as :

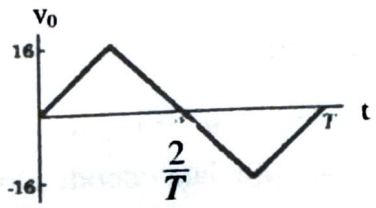
(1) Integrator (2) Differentiator (3) Multiplier (4) Divider

28. If an Op-amp has a common mode gain of 0.01 and a differential gain of 10^5. Its CMRR would be ..... .

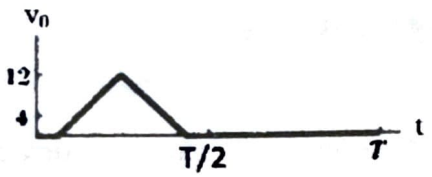
(1) 0 (2) Infinite (3) 10^{-3} (4) 10^7

29. Determine the output waveform from the given circuit and input waveform.

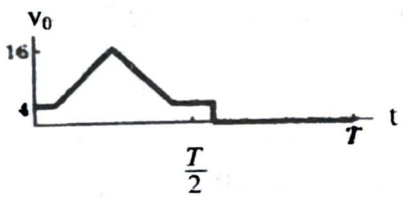




(1)



(2)



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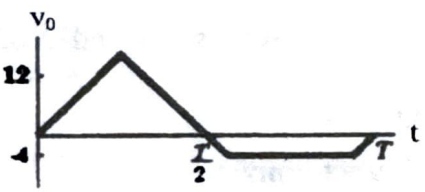
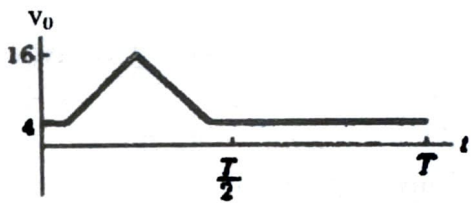
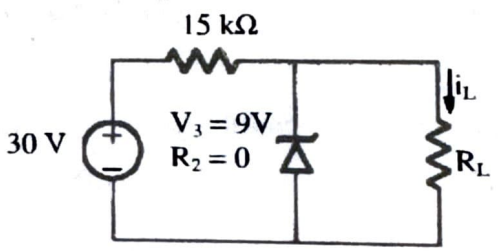


(4)



30. The maximum load current that can be drawn from the following circuit is



(1) 1.4 mA (2) 2.3 mA (3) 1.8 mA (4) 2.5 mA

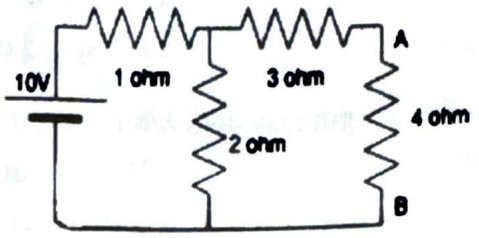
31. If Event A and Event B are mutually exclusive, what is $P(A|B)$?

(1) $P(A) + P(B)$ (2) $P(A) - P(B)$ (3) $P(A) * P(B)$ (4) 0

32. For which value of x will $(x - 1)(3 - x)$ have its maximum ?

(1) 0 (2) 1 (3) 2 (4) -2

33. Calculate the current across the 4 ohm resistor.



(1) 1.23 Amp (2) 0 Amp (3) 0.86 Amp (4) 0.67 Amp

34. A DC source of EMF E volts and internal resistance R ohms is connected to a variable load and it is adjusted such that the load absorbs maximum power from the source. The maximum power delivered from the source to the load is :

(1) $\frac{E^2}{2R}$ (2) $\frac{E^2}{4R}$ (3) $\frac{2E^2}{R}$ (4) $\frac{E^2}{R}$

35. If there are 5 branches and 4 nodes in the graph, then the numbers of mesh equations that can be formed are ?

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

36. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the resistor is ?

(1) 0 degree (2) 90 degree (3) 180 degree (4) 360 degree

37. In a series RL circuit, voltage across resistor and inductor are 3 V and 4 V respectively, then what is the applied voltage ?

(1) 7 (2) 5 (3) 4 (4) 3

38. Transfer function of a system is defined as the ratio of output to input in :

(1) Z-transform (2) Fourier transform
(3) Laplace transform (4) All of these

39. Discrete Fourier Transform is applicable to :

(1) Infinite sequences (2) Finite discrete sequences
(3) Continuous infinite signals (4) Continuous finite sequences

40. The autocorrelation of $x(t) = e^{-at}u(t)$ is .....

(1) $\frac{e^{-at}}{a^2}$ (2) $\frac{e^{-at}}{2a}$ (3) $\frac{e^{-a\tau}}{a^2}$ (4) $\frac{e^{-a\tau}}{2a}$

41. The product of the phase and the group velocities is given by the :
(1) Speed of light
(2) Speed of light/2
(3) 2 × Speed of light
(4) (speed of light)/4

42. A linear antenna having length less than $\lambda/8$ is called as ..... .
(1) Short monopole
(2) Short dipole
(3) Half-wave dipole
(4) Quarter-wave monopole

43. Find the power radiated by an antenna whose radiation resistance is 100Ω and operating with 3A of current at 2GHz frequency ?
(1) 900W (2) 1800W (3) 450W (4) 700W

44. What is the length of the half-wave dipole with bandwidth 20MHz and Quality factor 30 ?
(1) 5m (2) 0.25m (3) 0.50m (4) 2.5m

45. S parameters of a transmission line are S_{11}, S_{12}, S_{21} and S_{22}, if the transmission line is symmetrical, which of the following condition will be true :
(1) $S_{11} = S_{12}$ (2) $S_{12} = -S_{21}$ (3) $S_{12} = S_{21}$ (4) $S_{11} = S_{22}$

46. If each pulse of the sequence to be detected is in ..... shape, the pulse can be detected without ISI.
(1) Sine (2) Cosine (3) Sinc (4) Square

47. The minimum Nyquist bandwidth for the rectangular spectrum in raised cosine filter is :
(1) 2T (2) 1/2T (3) T/2 (4) 2/T

48. The technique OTDR (Optical time domain reflectometry) is used for the measurement of :
(1) Bandwidth
(2) Core diameter
(3) Attenuation
(4) Cladding diameter

49. The reverse bias current in a p-n diode is due to :
(1) Minority carriers
(2) Majority carriers
(3) Electrons only
(4) Holes only

50. Entropy is ..... when both messages are equally likely.
(1) Maximum (2) Minimum (3) 0 (4) 1/2

51. Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in amplitude modulated signal ?
(1) 13.36 W (2) 15.84 W (3) 52 W (4) 176 W

52. The magnitude of open circuit and short circuit input impedances of a transmission line are 100Ω and 25Ω respectively. The characteristic impedance of the line is :
(1) 25 Ω (2) 50 Ω (3) 75 Ω (4) 100 Ω

53. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by :
(1) 6 dB (2) 3 dB (3) 2 dB (4) 0 dB

54. In a communication system, when two finite-power waveforms $x(t)$ and $y(t)$ have the property : $x.y = 0$, then these waveforms are said to be :
(1) Identical (2) Overlap (3) Similar (4) Orthogonal

55. Poynting vector signifies :
(1) Current density vector producing electrostatic field
(2) Power density vector producing electrostatic field
(3) Current density vector producing electromagnetic field
(4) Power density vector producing electromagnetic field

56. Folded dipole antenna belongs to which type of antenna ?
(1) Reflector (2) Aperture (3) Lens (4) Wire

57. An AM wave is given by $S_{AM}(t)=10\ (1 + 0.4 \cos 10^3 t + 0.3 \cos 10^4 t) \cos 10^6 t$. The modulation index is :
(1) 0.4 (2) 0.5 (3) 0.3 (4) 0.9

58. 10 signals, each band-limited to 5 KHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guardband of 1 KHz is used, then the bandwidth of the multiplexed signal will be :
(1) 79 KHz (2) 60 KHz (3) 59 KHz (4) 61 KHz

59. A signal $X(t) = 100 \cos (24 \times 10^3)$ t is ideally sampled with a sampling period of 50 sec and then passed through an ideal low pass filter with a cut off frequency of 15 KHz. Which of the following frequencies is/are present at the filter output ?
(1) 12 KHz only (2) 8 KHz only
(3) 12 KHz and 9 KHz (4) 12 KHz and 8 KHz

60. In a twin wire transmission line in air the adjacent voltage maxima are at 12.5 em and 27.5 cm. The operating frequency is :
(1) 300 MHz (2) 1 GHz (3) 2 GHz (4) 6.28 GHz

61. How is the effective address of base-register calculated ?
(1) By addition of implied register contents to the partial address in instruction
(2) By addition of index register contents to the partial address in instruction
(3) By addition of index register contents to the complete address in instruction
(4) By addition of implied register contents to the complete address in instruction

62. The instruction, Add #45, Rl does ..... .
(1) Adds the value of 45 to the address of R1 and stores 45 in that address
(2) Adds 45 to the value of R1 and stores it in R1
(3) Finds the memory location 45 and adds that content to that of R1
(4) R1 stores the value at memory location to 45

63. What is the principle of fibre optical communication ?
(1) Frequency modulation (2) Population inversion
(3) Total internal reflection (4) Doppler Effect

64. The optical source used for detection of optical signal is ..... .
(1) IR sensors (2) Photodiodes
(3) Zener diodes (4) Light Emitting Diodes

65. Calculate the conduction current density when the resistivity of a material with an electric field of 5 units is 4.5 units.
(1) 22.5 (2) 4.5/5 (3) 5/4.5 (4) 9.5

66. Find the loss tangent of a material with conduction current density of 5 units and displacement current density of 10 units.
(1) 2 (2) 0.5 (3) 5 (4) 10

67. The Maxwell second equation that is valid in any conductor is :
(1) Curl(H) = Jc (2) Curl(E) = Jc (3) Curl(E) = Jd (4) Curl (H) = Jd

68. Which of the following is not used in the VSWR measurement ?
(1) Reflective Klystron (2) Slotted line
(3) Frequency meter (4) Spectrum analyzer

69. If there are no any reflections, then the value of the SWR will be ..... .
(1) 1 (2) 0 (3) ∞ (4) 2

70. The cut off wavelength and the guided wavelength are given by 0.5 and 2 units respectively. Find the wavelength of the wave :
(1) 0.48 (2) 0.32 (3) 0.45 (4) 0.54

71. Which among the following is Volatile Memory ?
(1) RAM (2) ROM (3) DROM (4) EPROM

72. Fan-in and Fan-out are the characteristics of ..... .
(1) Registers (2) Logic families
(3) Sequential Circuits (4) Combinational Circuits

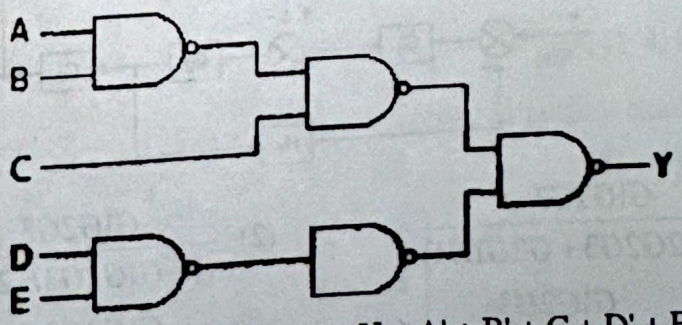
73. Where the result of an arithmetic and logical operation are stored ?
(1) In Accumulator (2) In Cache Memory
(3) In ROM (4) In Instruction Registry

74. The logic circuits whose outputs at any instant of time depends not only on the present input but also on the past outputs are called ..... .
(1) Combinational circuits (2) Flip-flops
(3) Sequential circuits (4) Latches

75. Which of the following logic families has the shortest propagation delay ?
(1) CMOS (2) BiCMOS (3) ECL (4) 74SXX

76. Which of the following describes the operation of a positive edge-triggered D flip-flop ?
(1) If both inputs are HIGH, the output will toggle.
(2) The output will follow the input on the leading edge of the clock.
(3) When both inputs are LOW, an invalid state exists.
(4) The input is toggled into the flip-flop on the leading edge of the clock and is passed to the output on the trailing edge of the clock.

77. The circuit of the given figure realizes the function ..... .



(1) $Y = (A' + B')C + (DE)'$ (2) $Y = A' + B' + C + D' + E'$
(3) $Y = (A + B)' + C + (D + E)'$ (4) $Y = AB + C + DE$

78. Which term applies to the maintaining of a given signal level until the next sampling ?
(1) Holding (2) Aliasing
(3) Shannon frequency sampling (4) Stair-stepping

79. A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is .....
(1) 20 KHz square wave (2) 10KHz square wave
(3) Constantly Low (4) Constantly High

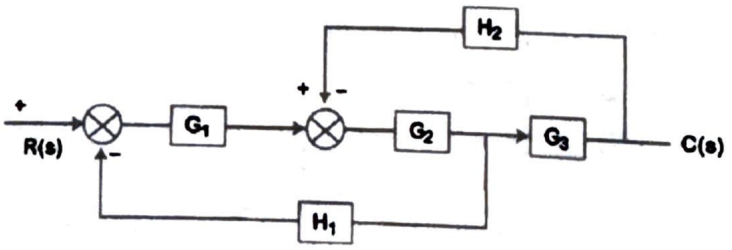
80. An analog signal is sampled at 36 kHz and quantized into 256 levels. The time duration of a bit of binary coded signal is :
(1) 5.78 µs (2) 3.47 µs (3) 6.43 ms (4) 7.86 ms

81. For any given signal, average power in its 6 harmonic components is 10 mW each and the fundamental component also has 10 mW power. Then, average power in the periodic signal is ..... .
(1) 70 (2) 60 (3) 10 (4) 5

82. The Fourier transform (FT) of a function $x(t)$ is $X(f)$. The FT of $\frac{dx(t)}{dt}$ will be :
(1) $\frac{dX(f)}{df}$ (2) $2\pi jfX(f)$ (3) $X(f)\,jf$ (4) $\frac{X(f)}{jf}$

83. Which oscillations will be generated in the time domain response, if complex conjugate poles are present with a negative real part ?
(1) Damped oscillations (2) Undamped oscillations
(3) Sustained oscillations (4) No oscillations

84. Determine the transfer function of the given system :



(1) $\frac{G1G2G3}{(1+H2G2G3+G2G1H1)}$ (2) $\frac{G1G2G3}{(1+G1G2G3H2H1)}$
(3) $\frac{G1G2G3}{(1+G1G2G3H1+G1G2G3H2)}$ (4) $\frac{G1G2G3}{(1+G1G2G3H1)}$

85. The step error coefficient of a system $G(s) = \dfrac{1}{(s+2)(s+3)}$ with unity feedback is :

(1) 0 (2) Infinite (3) 1/6 (4) 1

86. An intrinsic semiconductor at absolute zero temperature behaves like :

(1) A perfect conductor (2) A perfect Insulator

(3) A super conductor (4) An amplifier

87. N-channel FETs are preferred to p-channel FETs because :

(1) Holes have higher velocity

(2) Electrons have higher mobility than holes

(3) Electrons have higher diffusivity than holes

(4) Electrons have higher effective mass than holes

88. The depletion width of a Si p-n junction at a reverse bias of 10 V is 2 μm. When the reverse bias is increased to 20 V, the depletion width will be :

(1) 4.0 μm (2) 3.2 μm (3) 2.8 μm (4) 2.4 μm

89. Field Effect Transistor (FET) is an unipolar device because :

(1) V_{DS} of one polarity is used

(2) V_{GS} of one polarity is used

(3) I_D constitutes either electrons or holes

(4) All the charge carriers flow towards a single pole.

90. What is the value of current when the gate to source voltage is less than the pinch off voltage ?

(1) 1 A (2) 5 A (3) 100 A (4) 0A

91. Find the Eigenvalues for the following 2×2 matrix :

$$X = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$$

(1) $-3, 5$ (2) $2, -1$ (3) $-5, 3$ (4) $4, 0$

92. Three coins are tossed at once. What is the probability of getting exactly 2 tails ?

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

93. What is the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 4 & 10 & 18 \end{bmatrix}$

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

94. If $f(0) = 4$ & $f'(x) = \dfrac{3}{x^2+2}$ the lower bound of $f(2)$ estimated by mean value theorem is :

(1) 0 (2) 7 (3) 12 (4) 5

95. Divergence of gradient of a vector function is equivalent to :

(1) Laplacian operation (2) Curl operation

(3) Double gradient operation (4) Null vector

96. Find the gradient of the function given by $x^2 + y^2 + z^2$ at (1, 1, 1) :

(1) $\hat{i} + \hat{j} + \hat{k}$ (2) $2\hat{i} + 2\hat{j} + 2\hat{k}$

(3) $2x\hat{i} + 2y\hat{j} + 2z\hat{k}$ (4) $4x\hat{i} + 2y\hat{j} + 4z\hat{k}$

97. Which of the following theorems use the curl operation ?

(1) Green's theorem

(2) Gauss Divergence theorem

(3) Stoke's theorem

(4) Maxwell equation

98. Which of the following is obtained by evaluating $\int_C (z-3)^n \, . \, dz$ where C is $|z-3| = 9$?

(1) -1 (2) 2 (3) 1 (4) 0

99. Determine the mean, median and mode values for the set : {26, 31, 21, 29, 32,26,25, 28} :

(1) Mean = 27.25, Median = 27, Mode = 26

(2) Mean = 27.25, Median = 26, Mode = 27

(3) Mean = 32, Median = 29, Mode = 28

(4) Mean = 29, Median = 32, Mode = 26

100. In a Binomial Distribution, if p, q and n are probability of success, failure and number of trials respectively then variance is given by ..... .

(1) np (2) npq (3) np^2q (4) npq^2

Total No. of Printed Pages : 13

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C

SET-Y

Ph.D-EE-December, 2024
Electronics & Communication Engineering

10011

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There shall be negative marking. A deduction of 0.25 marks shall be there for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SEAL

1. Which among the following is Volatile Memory ?
   (1) RAM (2) ROM (3) DROM (4) EPROM

2. Fan-in and Fan-out are the characteristics of ..... .
   (1) Registers
   (2) Logic families
   (3) Sequential Circuits
   (4) Combinational Circuits

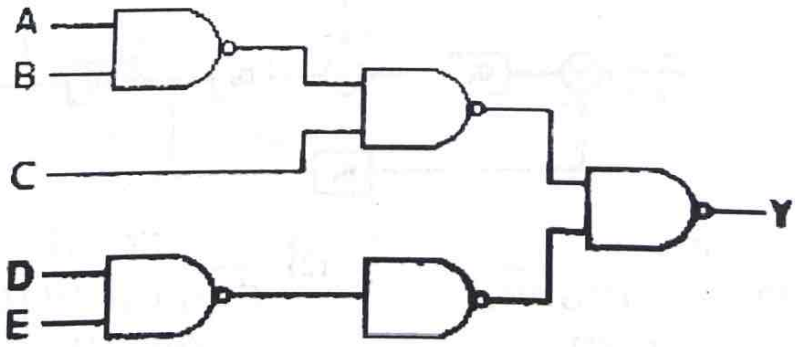
3. Where the result of an arithmetic and logical operation are stored ?
   (1) In Accumulator
   (2) In Cache Memory
   (3) In ROM
   (4) In Instruction Registry

4. The logic circuits whose outputs at any instant of time depends not only on the present input but also on the past outputs are called ..... .
   (1) Combinational circuits
   (2) Flip-flops
   (3) Sequential circuits
   (4) Latches

5. Which of the following logic families has the shortest propagation delay ?
   (1) CMOS (2) BiCMOS (3) ECL (4) 74SXX

6. Which of the following describes the operation of a positive edge-triggered D flip-flop ?
   (1) If both inputs are HIGH, the output will toggle.
   (2) The output will follow the input on the leading edge of the clock.
   (3) When both inputs are LOW, an invalid state exists.
   (4) The input is toggled into the flip-flop on the leading edge of the clock and is passed to the output on the trailing edge of the clock.

7. The circuit of the given figure realizes the function ..... .



   (1) $Y = (A' + B')C + (DE)'$
   (2) $Y = A' + B' + C + D' + E'$
   (3) $Y = (A + B)' + C + (D + E)'$
   (4) $Y = AB + C + DE$

8. Which term applies to the maintaining of a given signal level until the next sampling ?
   (1) Holding (2) Aliasing
   (3) Shannon frequency sampling (4) Stair-stepping

9. A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is .....
   (1) 20 KHz square wave (2) 10KHz square wave
   (3) Constantly Low (4) Constantly High

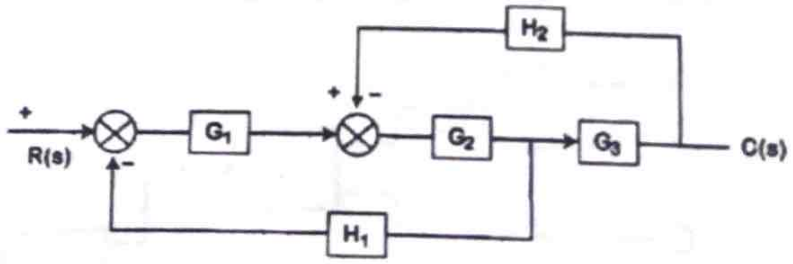
10. An analog signal is sampled at 36 kHz and quantized into 256 levels. The time duration of a bit of binary coded signal is :
   (1) 5.78 µs (2) 3.47 µs (3) 6.43 ms (4) 7.86 ms

11. For any given signal, average power in its 6 harmonic components is 10 mW each and the fundamental component also has 10 mW power. Then, average power in the periodic signal is ..... .
   (1) 70 (2) 60 (3) 10 (4) 5

12. The Fourier transform (FT) of a function $x(t)$ is $X(f)$. The FT of $\frac{dx(t)}{dt}$ will be :
   (1) $\frac{dX(f)}{df}$ (2) $2\pi jfX(f)$ (3) $X(f)\,jf$ (4) $\frac{X(f)}{jf}$

13. Which oscillations will be generated in the time domain response, if complex conjugate poles are present with a negative real part ?
   (1) Damped oscillations (2) Undamped oscillations
   (3) Sustained oscillations (4) No oscillations

14. Determine the transfer function of the given system :



   (1) $\frac{G1G2G3}{(1+H2G2G3+G2G1H1)}$ (2) $\frac{G1G2G3}{(1+G1G2G3H2H1)}$
   (3) $\frac{G1G2G3}{(1+G1G2G3H1+G1G2G3H2)}$ (4) $\frac{G1G2G3}{(1+G1G2G3H1)}$

15. The step error coefficient of a system $G(s) = \dfrac{1}{(s+2)(s+3)}$ with unity feedback is :

(1) 0 (2) Infinite (3) 1/6 (4) 1

16. An intrinsic semiconductor at absolute zero temperature behaves like :

(1) A perfect conductor
(2) A perfect Insulator
(3) A super conductor
(4) An amplifier

17. N-channel FETs are preferred to p-channel FETs because :

(1) Holes have higher velocity
(2) Electrons have higher mobility than holes
(3) Electrons have higher diffusivity than holes
(4) Electrons have higher effective mass than holes

18. The depletion width of a Si p-n junction at a reverse bias of 10 V is 2 μm. When the reverse bias is increased to 20 V, the depletion width will be :

(1) 4.0 μm (2) 3.2 μm (3) 2.8 μm (4) 2.4 μm

19. Field Effect Transistor (FET) is an unipolar device because :

(1) V_{DS} of one polarity is used
(2) V_{GS} of one polarity is used
(3) I_D constitutes either electrons or holes
(4) All the charge carriers flow towards a single pole.

20. What is the value of current when the gate to source voltage is less than the pinch off voltage ?

(1) 1 A (2) 5 A (3) 100 A (4) 0A

21. Find the Eigenvalues for the following 2×2 matrix :

$$X = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$$

(1) $-3, 5$ (2) $2, -1$ (3) $-5, 3$ (4) $4, 0$

22. Three coins are tossed at once. What is the probability of getting exactly 2 tails ?

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

23. What is the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 4 & 10 & 18 \end{bmatrix}$

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

24. If $f(0) = 4$ & $f'(x) = \dfrac{3}{x^2+2}$ the lower bound of $f(2)$ estimated by mean value theorem is :

(1) 0 (2) 7 (3) 12 (4) 5

25. Divergence of gradient of a vector function is equivalent to :

(1) Laplacian operation (2) Curl operation

(3) Double gradient operation (4) Null vector

26. Find the gradient of the function given by $x^2 + y^2 + z^2$ at (1, 1, 1) :

(1) $\hat{i} + \hat{j} + \hat{k}$ (2) $2\hat{i} + 2\hat{j} + 2\hat{k}$

(3) $2x\hat{i} + 2y\hat{j} + 2z\hat{k}$ (4) $4x\hat{i} + 2y\hat{j} + 4z\hat{k}$

27. Which of the following theorems use the curl operation ?

(1) Green's theorem (2) Gauss Divergence theorem

(3) Stoke's theorem (4) Maxwell equation

28. Which of the following is obtained by evaluating $\int_C (z-3)^n \, . \, dz$ where C is $|z - 3| = 9$?

(1) -1 (2) 2 (3) 1 (4) 0

29. Determine the mean, median and mode values for the set : {26, 31, 21, 29, 32,26,25, 28} :

(1) Mean = 27.25, Median = 27, Mode = 26

(2) Mean = 27.25, Median = 26, Mode = 27

(3) Mean = 32, Median = 29, Mode = 28

(4) Mean = 29, Median = 32, Mode = 26

30. In a Binomial Distribution, if p, q and n are probability of success, failure and number of trials respectively then variance is given by ..... .

(1) np (2) npq (3) np^2q (4) npq^2

31. The product of the phase and the group velocities is given by the :

(1) Speed of light (2) Speed of light/2

(3) 2 × Speed of light (4) (speed of light)/4

32. A linear antenna having length less than $\lambda/8$ is called as ..... .

(1) Short monopole (2) Short dipole

(3) Half-wave dipole (4) Quarter-wave monopole

33. Find the power radiated by an antenna whose radiation resistance is 100Ω and operating with 3A of current at 2GHz frequency ?
(1) 900W (2) 1800W (3) 450W (4) 700W

34. What is the length of the half-wave dipole with bandwidth 20MHz and Quality factor 30 ?
(1) 5m (2) 0.25m (3) 0.50m (4) 2.5m

35. S parameters of a transmission line are S_{11}, S_{12}, S_{21} and S_{22}, if the transmission line is symmetrical, which of the following condition will be true :
(1) $S_{11} = S_{12}$ (2) $S_{12} = -S_{21}$ (3) $S_{12} = S_{21}$ (4) $S_{11} = S_{22}$

36. If each pulse of the sequence to be detected is in ..... shape, the pulse can be detected without ISI.
(1) Sine (2) Cosine (3) Sinc (4) Square

37. The minimum Nyquist bandwidth for the rectangular spectrum in raised cosine filter is :
(1) 2T (2) 1/2T (3) T/2 (4) 2/T

38. The technique OTDR (Optical time domain reflectometry) is used for the measurement of :
(1) Bandwidth (2) Core diameter (3) Attenuation (4) Cladding diameter

39. The reverse bias current in a p-n diode is due to :
(1) Minority carriers (2) Majority carriers
(3) Electrons only (4) Holes only

40. Entropy is ..... when both messages are equally likely.
(1) Maximum (2) Minimum (3) 0 (4) 1/2

41. Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in amplitude modulated signal ?
(1) 13.36 W (2) 15.84 W (3) 52 W (4) 176 W

42. The magnitude of open circuit and short circuit input impedances of a transmission line are 100Ω and 25Ω respectively. The characteristic impedance of the line is :
(1) 25 Ω (2) 50 Ω (3) 75 Ω (4) 100 Ω

43. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by :
(1) 6 dB (2) 3 dB (3) 2 dB (4) 0 dB

44. In a communication system, when two finite-power waveforms $x(t)$ and $y(t)$ have the property : $x.y = 0$, then these waveforms are said to be :
(1) Identical (2) Overlap (3) Similar (4) Orthogonal

45. Poynting vector signifies :
(1) Current density vector producing electrostatic field
(2) Power density vector producing electrostatic field
(3) Current density vector producing electromagnetic field
(4) Power density vector producing electromagnetic field

46. Folded dipole antenna belongs to which type of antenna ?
(1) Reflector (2) Aperture (3) Lens (4) Wire

47. An AM wave is given by $S_{AM}(t)=10\ (1 + 0.4 \cos 10^3 t + 0.3 \cos 10^4 t) \cos 10^6\ t$. The modulation index is :
(1) 0.4 (2) 0.5 (3) 0.3 (4) 0.9

48. 10 signals, each band-limited to 5 KHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guardband of 1 KHz is used, then the bandwidth of the multiplexed signal will be :
(1) 79 KHz (2) 60 KHz (3) 59 KHz (4) 61 KHz

49. A signal $X(t) = 100 \cos (24 \times 10^3)$ t is ideally sampled with a sampling period of 50 sec and then passed through an ideal low pass filter with a cut off frequency of 15 KHz. Which of the following frequencies is/are present at the filter output ?
(1) 12 KHz only (2) 8 KHz only
(3) 12 KHz and 9 KHz (4) 12 KHz and 8 KHz

50. In a twin wire transmission line in air the adjacent voltage maxima are at 12.5 em and 27.5 cm. The operating frequency is :
(1) 300 MHz (2) 1 GHz (3) 2 GHz (4) 6.28 GHz

51. A BJT is a :
(1) Current -Controlled device (2) Voltage - Controlled device
(3) Power- Controlled device (4) Field- Controlled device

52. The phenomenon leading to avalanche breakdown in reverse-biased diodes is known as ..... .
(1) Auger recombination (2) Mode hopping
(3) Impact ionization (4) Extract ionization

53. The solar incident light on the cell breaks ..... condition of the diode's junction.
(1) Thermal expansion (2) Breakdown
(3) Thermal equilibrium (4) Nickel plating

54. Which of the following materials cannot be used as solar cells materials ?
(1) Si (2) GaAs (3) CdS (4) PbS

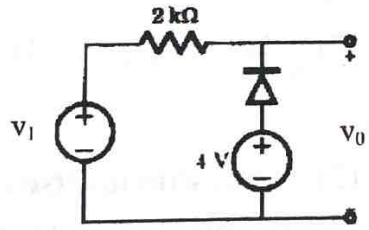
55. Calculate the value of emitter current for a transistor $\alpha_{dc} = 0.98$, $I_{CBO} = 5\ \mu A$ and $I_B = 95\ \mu A$
(1) 4.5 mA (2) 5 mA (3) 3.5 mA (4) 10 mA

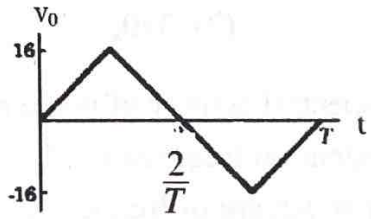
56. Ripple factor of the half wave rectifier is nearly ..... .
(1) 1.11 (2) 0.87 (3) 1.21 (4) 0.5

57. If a capacitor is placed in the feedback path of an Op-amp circuit, then the circuit can act as :
(1) Integrator (2) Differentiator (3) Multiplier (4) Divider

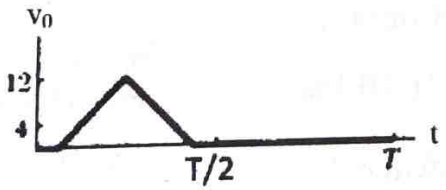
58. If an Op-amp has a common mode gain of 0.01 and a differential gain of 10^5. Its CMRR would be ..... .
(1) 0 (2) Infinite (3) 10^{-3} (4) 10^7

59. Determine the output waveform from the given circuit and input waveform.





(1)



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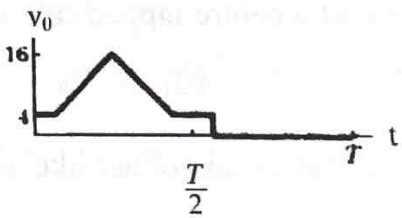
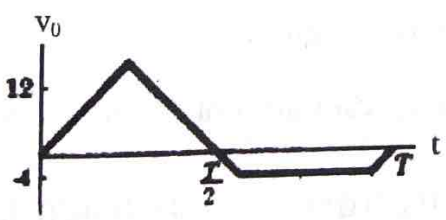
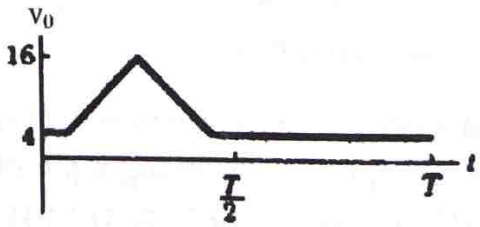


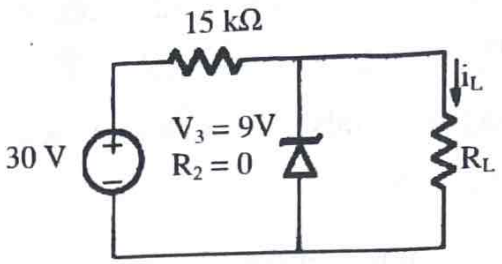
(3)



(4)



60. The maximum load current that can be drawn from the following circuit is



(1) 1.4 mA (2) 2.3 mA (3) 1.8 mA (4) 2.5 mA

61. The depth of the penetration of a wave in a lossy dielectric increases with increasing :

(1) Conductivity (2) Permeability (3) Wavelength (4) Permittivity

62. I_C is the dc collector current of a BJT = 2 mA at room temperature where kT/q=25 mV. Given $h_{fe} = 100$, the value of h_{ie} is given by :

(1) 125 Ω (2) 25 Ω (3) 1250 Ω (4) 2500 Ω

63. Determine the initial value of $x(t)$. The Laplace transform $X(s) = \dfrac{1}{(s^2 + 5s - 2)}$:

(1) 1 (2) −2 (3) 5 (4) 0

64. Convert 1100101_2 into an octal base system.

(1) 145_8 (2) 340_8 (3) 257_8 (4) 150_8

65. The power spectral density of white noise :

(1) is dependent on frequency (2) varies with inverse of frequency
(3) varies with square of frequency (4) is constant with frequency

66. Efficiency of a centre tapped full wave rectifier is :

(1) 50.2% (2) 44.5% (3) 70.1% (4) 81.2%

67. When does the transistor act like an open switch ?

(1) cut off region (2) inverted region
(3) saturated region (4) active region

68. A successive approximation A/D converter has a resolution of 20 mV. What will be its digital output for an analog input of 2.17 V ?

(1) 01101100 (2) 01101101 (3) 01101011 (4) Insufficient data

69. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfections in clock extraction and waveform regeneration. This effect is known as ..... .

(1) Jitter (2) Aliasing (3) Fading (4) Attenuation

70. Which addressing mode executes its instructions within the CPU without the necessity of reference memory for operands ?

(1) Implied Mode (2) Immediate Mode
(3) Direct Mode (4) Register Mode

71. How is the effective address of base-register calculated ?

(1) By addition of implied register contents to the partial address in instruction
(2) By addition of index register contents to the partial address in instruction
(3) By addition of index register contents to the complete address in instruction
(4) By addition of implied register contents to the complete address in instruction

72. The instruction, Add #45, Rl does ..... .

(1) Adds the value of 45 to the address of R1 and stores 45 in that address
(2) Adds 45 to the value of R1 and stores it in R1
(3) Finds the memory location 45 and adds that content to that of R1
(4) R1 stores the value at memory location to 45

73. What is the principle of fibre optical communication ?

(1) Frequency modulation (2) Population inversion
(3) Total internal reflection (4) Doppler Effect

74. The optical source used for detection of optical signal is ..... .

(1) IR sensors (2) Photodiodes
(3) Zener diodes (4) Light Emitting Diodes

75. Calculate the conduction current density when the resistivity of a material with an electric field of 5 units is 4.5 units.

(1) 22.5 (2) 4.5/5 (3) 5/4.5 (4) 9.5

76. Find the loss tangent of a material with conduction current density of 5 units and displacement current density of 10 units.

(1) 2 (2) 0.5 (3) 5 (4) 10

77. The Maxwell second equation that is valid in any conductor is :

(1) Curl(H) = Jc (2) Curl(E) = Jc

(3) Curl(E) = Jd (4) Curl (H) = Jd

78. Which of the following is not used in the VSWR measurement ?

(1) Reflective Klystron (2) Slotted line

(3) Frequency meter (4) Spectrum analyzer

79. If there are no any reflections, then the value of the SWR will be ..... .

(1) 1 (2) 0 (3) ∞ (4) 2

80. The cut off wavelength and the guided wavelength are given by 0.5 and 2 units respectively. Find the wavelength of the wave :

(1) 0.48 (2) 0.32 (3) 0.45 (4) 0.54

81. If Event A and Event B are mutually exclusive, what is $P(A|B)$?

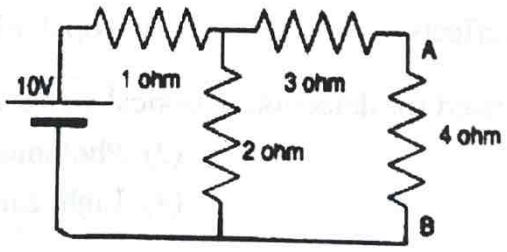
(1) $P(A) + P(B)$ (2) $P(A) - P(B)$

(3) $P(A) * P(B)$ (4) 0

82. For which value of x will $(x - 1)(3 - x)$ have its maximum ?

(1) 0 (2) 1 (3) 2 (4) –2

83. Calculate the current across the 4 ohm resistor.



(1) 1.23 Amp (2) 0 Amp (3) 0.86 Amp (4) 0.67 Amp

84. A DC source of EMF E volts and internal resistance R ohms is connected to a variable load and it is adjusted such that the load absorbs maximum power from the source. The maximum power delivered from the source to the load is :

(1) $\frac{E^2}{2R}$ (2) $\frac{E^2}{4R}$ (3) $\frac{2E^2}{R}$ (4) $\frac{E^2}{R}$

85. If there are 5 branches and 4 nodes in the graph, then the numbers of mesh equations that can be formed are ?

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

86. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the resistor is ?

(1) 0 degree (2) 90 degree (3) 180 degree (4) 360 degree

87. In a series RL circuit, voltage across resistor and inductor are 3 V and 4 V respectively, then what is the applied voltage ?

(1) 7 (2) 5 (3) 4 (4) 3

88. Transfer function of a system is defined as the ratio of output to input in :

(1) Z-transform (2) Fourier transform

(3) Laplace transform (4) All of these

89. Discrete Fourier Transform is applicable to :

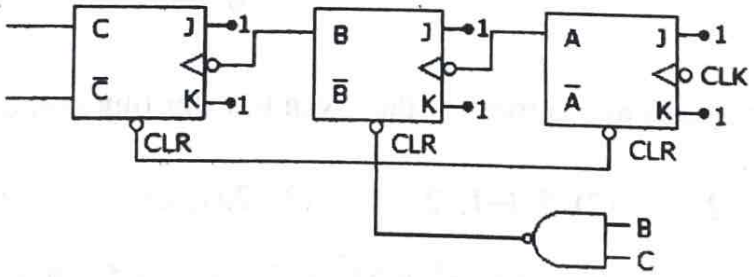
(1) Infinite sequences (2) Finite discrete sequences

(3) Continuous infinite signals (4) Continuous finite sequences

90. The autocorrelation of $x(t) = e^{-at}u(t)$ is ..... .

(1) $\frac{e^{-at}}{a^2}$ (2) $\frac{e^{-at}}{2a}$ (3) $\frac{e^{-a\tau}}{a^2}$ (4) $\frac{e^{-a\tau}}{2a}$

91. The given figure shows which type of counter ?



(1) Mod 6 (2) Mod 3 (3) Mod 8 (4) Decade counter

92. A digital multiplexer is a combinational circuit that selects ..... .

(1) One digital information from several sources and transmits the selected one

(2) Many digital information and convert them into one

(3) Many decimal inputs and transmits the selected information

(4) Many decimal outputs and accepts the selected information

93. Convert binary number into gray code : 100101.

(1) 101101 (2) 001110 (3) 110111 (4) 111001

94. The open-loop control system is one in which :

(1) The output is dependent on the control input

(2) The output is independent of the control input

(3) Only system parameters have an effect on the control output

(4) Output is independent to input

95. The frequency at which maximum amplitude ratio is attained is called the ..... frequency.

(1) Comer (2) Resonant (3) Cross over (4) Natural

96. The open loop transfer function of a plant is given as, $G(s) = \frac{1}{(s^2-1)}$. If the plant is operated in unity feedback configuration, then the lead compensator that can stabilize the control system is :

(1) $\frac{10(s+4)}{(s+2)}$ (2) $\frac{10(s+2)}{(s+10)}$ (3) $\frac{10(s-2)}{(s+10)}$ (4) $\frac{10(s-1)}{(s+2)}$

97. The open loop DC gain of an unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is :

(1) $\frac{4}{13}$ (2) 4 (3) $\frac{4}{9}$ (4) 13

98. Calculate the poles and zeroes for the given transfer function $G(s) = \frac{5(s+2)}{(s^2+3s+2)}$

(1) $-2,(-1,-2)$ (2) $2,(-1,\ 2)$ (3) $2,(1,\ 2)$ (4) $-2,(1,-2)$

99. A system with the polynomial $s^4 + 5s^3 + 3s^2 + 6s + 5 = 0$ is :

(1) Unstable (2) Marginally stable

(3) In equilibrium (4) Stable

100. Viterbi decoding is one of the most commonly used techniques in modern systems that is used to decode the data encoded by ..... .

(1) Block coding (2) Hamming coding

(3) Convolutional coding (4) CRC coding

Total No. of Printed Pages : 13

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D

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Ph.D-EE-December, 2024
Electronics & Communication Engineering

10012

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

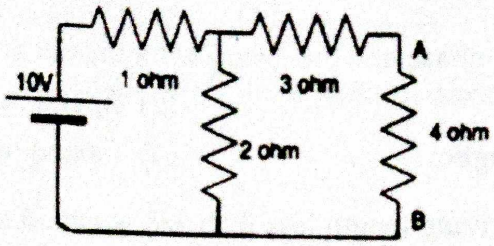
1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There shall be negative marking. A deduction of 0.25 marks shall be there for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SEAL

1. If Event A and Event B are mutually exclusive, what is $P(A|B)$?
   (1) $P(A) + P(B)$ (2) $P(A) - P(B)$ (3) $P(A) * P(B)$ (4) 0

2. For which value of x will $(x-1)(3-x)$ have its maximum ?
   (1) 0 (2) 1 (3) 2 (4) -2

3. Calculate the current across the 4 ohm resistor.



   (1) 1.23 Amp (2) 0 Amp (3) 0.86 Amp (4) 0.67 Amp

4. A DC source of EMF E volts and internal resistance R ohms is connected to a variable load and it is adjusted such that the load absorbs maximum power from the source. The maximum power delivered from the source to the load is :
   (1) $\frac{E^2}{2R}$ (2) $\frac{E^2}{4R}$ (3) $\frac{2E^2}{R}$ (4) $\frac{E^2}{R}$

5. If there are 5 branches and 4 nodes in the graph, then the numbers of mesh equations that can be formed are ?
   (1) 2 (2) 4 (3) 6 (4) 8

6. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the resistor is ?
   (1) 0 degree (2) 90 degree (3) 180 degree (4) 360 degree

7. In a series RL circuit, voltage across resistor and inductor are 3 V and 4 V respectively, then what is the applied voltage ?
   (1) 7 (2) 5 (3) 4 (4) 3

8. Transfer function of a system is defined as the ratio of output to input in :
   (1) Z-transform (2) Fourier transform
   (3) Laplace transform (4) All of these

9. Discrete Fourier Transform is applicable to :
(1) Infinite sequences
(2) Finite discrete sequences
(3) Continuous infinite signals
(4) Continuous finite sequences

10. The autocorrelation of $x(t) = e^{-at}u(t)$ is ..... .
(1) $\frac{e^{-at}}{a^2}$
(2) $\frac{e^{-at}}{2a}$
(3) $\frac{e^{-a\tau}}{a^2}$
(4) $\frac{e^{-a\tau}}{2a}$

11. The product of the phase and the group velocities is given by the :
(1) Speed of light
(2) Speed of light/2
(3) 2 × Speed of light
(4) (speed of light)/4

12. A linear antenna having length less than λ/8 is called as ..... .
(1) Short monopole
(2) Short dipole
(3) Half-wave dipole
(4) Quarter-wave monopole

13. Find the power radiated by an antenna whose radiation resistance is 100Ω and operating with 3A of current at 2GHz frequency ?
(1) 900W
(2) 1800W
(3) 450W
(4) 700W

14. What is the length of the half-wave dipole with bandwidth 20MHz and Quality factor 30 ?
(1) 5m
(2) 0.25m
(3) 0.50m
(4) 2.5m

15. S parameters of a transmission line are S_{11}, S_{12}, S_{21} and S_{22}, if the transmission line is symmetrical, which of the following condition will be true :
(1) $S_{11} = S_{12}$
(2) $S_{12} = -S_{21}$
(3) $S_{12} = S_{21}$
(4) $S_{11} = S_{22}$

16. If each pulse of the sequence to be detected is in ..... shape, the pulse can be detected without ISI.
(1) Sine
(2) Cosine
(3) Sinc
(4) Square

17. The minimum Nyquist bandwidth for the rectangular spectrum in raised cosine filter is :
(1) 2T
(2) 1/2T
(3) T/2
(4) 2/T

18. The technique OTDR (Optical time domain reflectometry) is used for the measurement of :
(1) Bandwidth
(2) Core diameter
(3) Attenuation
(4) Cladding diameter

19. The reverse bias current in a p-n diode is due to :
(1) Minority carriers (2) Majority carriers
(3) Electrons only (4) Holes only

20. Entropy is ..... when both messages are equally likely.
(1) Maximum (2) Minimum (3) 0 (4) 1/2

21. The depth of the penetration of a wave in a lossy dielectric increases with increasing :
(1) Conductivity (2) Permeability (3) Wavelength (4) Permittivity

22. I_C is the dc collector current of a BJT = 2 mA at room temperature where kT/q=25 mV. Given $h_{fe} = 100$, the value of h_{ie} is given by :
(1) 125 Ω (2) 25 Ω (3) 1250 Ω (4) 2500 Ω

23. Determine the initial value of $x(t)$. The Laplace transform $X(s) = \frac{1}{(s^2+5s-2)}$:
(1) 1 (2) −2 (3) 5 (4) 0

24. Convert 1100101_2 into an octal base system.
(1) 145_8 (2) 340_8 (3) 257_8 (4) 150_8

25. The power spectral density of white noise :
(1) is dependent on frequency (2) varies with inverse of frequency
(3) varies with square of frequency (4) is constant with frequency

26. Efficiency of a centre tapped full wave rectifier is :
(1) 50.2% (2) 44.5% (3) 70.1% (4) 81.2%

27. When does the transistor act like an open switch ?
(1) cut off region (2) inverted region
(3) saturated region (4) active region

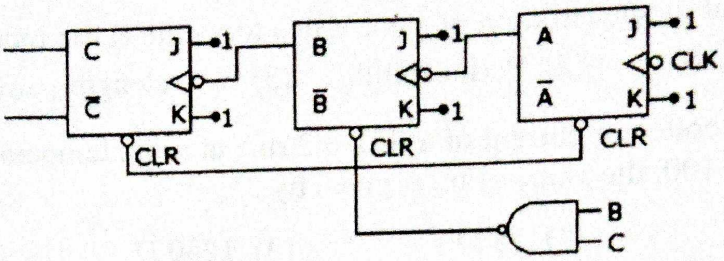
28. A successive approximation A/D converter has a resolution of 20 mV. What will be its digital output for an analog input of 2.17 V ?
(1) 01101100 (2) 01101101 (3) 01101011 (4) Insufficient data

29. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfections in clock extraction and waveform regeneration. This effect is known as ..... .
(1) Jitter (2) Aliasing (3) Fading (4) Attenuation

30. Which addressing mode executes its instructions within the CPU without the necessity of reference memory for operands ?

(1) Implied Mode
(2) Immediate Mode
(3) Direct Mode
(4) Register Mode

31. The given figure shows which type of counter ?



(1) Mod 6 (2) Mod 3 (3) Mod 8 (4) Decade counter

32. A digital multiplexer is a combinational circuit that selects ..... .

(1) One digital information from several sources and transmits the selected one
(2) Many digital information and convert them into one
(3) Many decimal inputs and transmits the selected information
(4) Many decimal outputs and accepts the selected information

33. Convert binary number into gray code : 100101.

(1) 101101 (2) 001110 (3) 110111 (4) 111001

34. The open-loop control system is one in which :

(1) The output is dependent on the control input
(2) The output is independent of the control input
(3) Only system parameters have an effect on the control output
(4) Output is independent to input

35. The frequency at which maximum amplitude ratio is attained is called the ..... frequency.

(1) Comer (2) Resonant (3) Cross over (4) Natural

36. The open loop transfer function of a plant is given as, $G(s) = \frac{1}{(s^2-1)}$. If the plant is operated in unity feedback configuration, then the lead compensator that can stabilize the control system is :

(1) $\frac{10(s+4)}{(s+2)}$ (2) $\frac{10(s+2)}{(s+10)}$ (3) $\frac{10(s-2)}{(s+10)}$ (4) $\frac{10(s-1)}{(s+2)}$

37. The open loop DC gain of an unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is :

(1) $\frac{4}{13}$ (2) 4 (3) $\frac{4}{9}$ (4) 13

38. Calculate the poles and zeroes for the given transfer function $G(s) = \frac{5(s+2)}{(s^2+3s+2)}$

(1) $-2,(-1,-2)$ (2) $2,(-1,\ 2)$ (3) $2,(1,2)$ (4) $-2,(1,-2)$

39. A system with the polynomial $s^4 + 5s^3 + 3s^2 + 6s + 5 = 0$ is :

(1) Unstable (2) Marginally stable
(3) In equilibrium (4) Stable

40. Viterbi decoding is one of the most commonly used techniques in modern systems that is used to decode the data encoded by ..... .

(1) Block coding (2) Hamming coding
(3) Convolutional coding (4) CRC coding

41. A BJT is a :

(1) Current -Controlled device (2) Voltage - Controlled device
(3) Power- Controlled device (4) Field- Controlled device

42. The phenomenon leading to avalanche breakdown in reverse-biased diodes is known as ..... .

(1) Auger recombination (2) Mode hopping
(3) Impact ionization (4) Extract ionization

43. The solar incident light on the cell breaks ..... condition of the diode's junction.

(1) Thermal expansion (2) Breakdown
(3) Thermal equilibrium (4) Nickel plating

44. Which of the following materials cannot be used as solar cells materials ?

(1) Si (2) GaAs (3) CdS (4) PbS

45. Calculate the value of emitter current for a transistor $\alpha_{dc} = 0.98$, $I_{CBO} = 5\ \mu A$ and $I_B = 95\ \mu A$

(1) 4.5 mA (2) 5 mA (3) 3.5 mA (4) 10 mA

P. T. O.

46. Ripple factor of the half wave rectifier is nearly ..... .

(1) 1.11 (2) 0.87 (3) 1.21 (4) 0.5

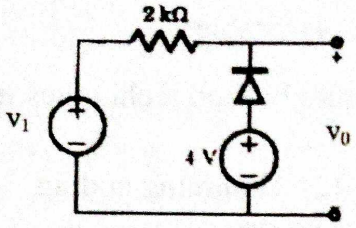
47. If a capacitor is placed in the feedback path of an Op-amp circuit, then the circuit can act as :

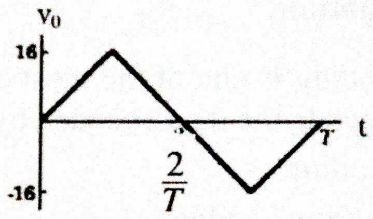
(1) Integrator (2) Differentiator (3) Multiplier (4) Divider

48. If an Op-amp has a common mode gain of 0.01 and a differential gain of 10^5. Its CMRR would be ..... .

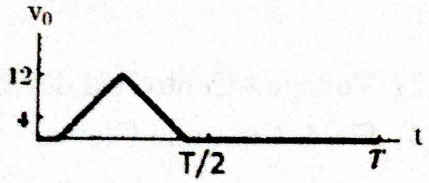
(1) 0 (2) Infinite (3) 10^{-3} (4) 10^7

49. Determine the output waveform from the given circuit and input waveform.

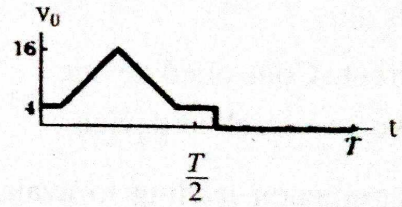




(1)



(2)



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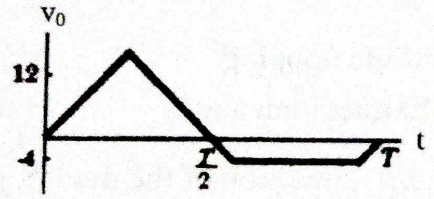

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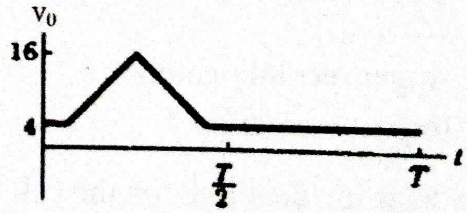
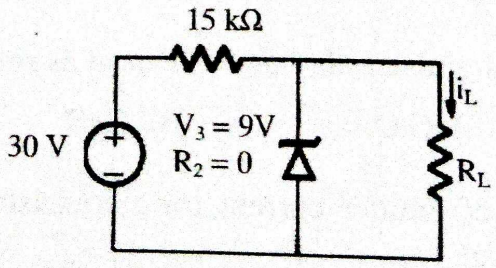


50. The maximum load current that can be drawn from the following circuit is



(1) 1.4 mA (2) 2.3 mA (3) 1.8 mA (4) 2.5 mA

51. For any given signal, average power in its 6 harmonic components is 10 mW each and the fundamental component also has 10 mW power. Then, average power in the periodic signal is ..... .

(1) 70 (2) 60 (3) 10 (4) 5

52. The Fourier transform (FT) of a function $x(t)$ is $X(f)$. The FT of $\frac{dx(t)}{dt}$ will be :

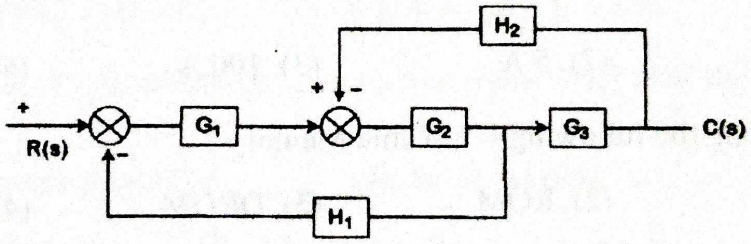
(1) $\frac{dX(f)}{df}$ (2) $2\pi jfX(f)$ (3) $X(f)\,jf$ (4) $\frac{X(f)}{jf}$

53. Which oscillations will be generated in the time domain response, if complex conjugate poles are present with a negative real part ?

(1) Damped oscillations (2) Undamped oscillations

(3) Sustained oscillations (4) No oscillations

54. Determine the transfer function of the given system :



(1) $\frac{G1G2G3}{(1+H2G2G3+G2G1H1)}$ (2) $\frac{G1G2G3}{(1+G1G2G3H2H1)}$

(3) $\frac{G1G2G3}{(1+G1G2G3H1+G1G2G3H2)}$ (4) $\frac{G1G2G3}{(1+G1G2G3H1)}$

55. The step error coefficient of a system $G(s) = \frac{1}{(s+2)(s+3)}$ with unity feedback is :

(1) 0 (2) Infinite (3) 1/6 (4) 1

56. An intrinsic semiconductor at absolute zero temperature behaves like :

(1) A perfect conductor (2) A perfect Insulator

(3) A super conductor (4) An amplifier

57. N-channel FETs are preferred to p-channel FETs because :
(1) Holes have higher velocity
(2) Electrons have higher mobility than holes
(3) Electrons have higher diffusivity than holes
(4) Electrons have higher effective mass than holes

58. The depletion width of a Si p-n junction at a reverse bias of 10 V is 2 μm. When the reverse bias is increased to 20 V, the depletion width will be :
(1) 4.0 μm (2) 3.2 μm (3) 2.8 μm (4) 2.4 μm

59. Field Effect Transistor (FET) is an unipolar device because :
(1) V_{DS} of one polarity is used
(2) V_{GS} of one polarity is used
(3) I_D constitutes either electrons or holes
(4) All the charge carriers flow towards a single pole.

60. What is the value of current when the gate to source voltage is less than the pinch off voltage ?
(1) 1 A (2) 5 A (3) 100 A (4) 0A

61. Which among the following is Volatile Memory ?
(1) RAM (2) ROM (3) DROM (4) EPROM

62. Fan-in and Fan-out are the characteristics of ..... .
(1) Registers (2) Logic families
(3) Sequential Circuits (4) Combinational Circuits

63. Where the result of an arithmetic and logical operation are stored ?
(1) In Accumulator (2) In Cache Memory
(3) In ROM (4) In Instruction Registry

64. The logic circuits whose outputs at any instant of time depends not only on the present input but also on the past outputs are called ..... .
(1) Combinational circuits (2) Flip-flops
(3) Sequential circuits (4) Latches

65. Which of the following logic families has the shortest propagation delay ?
(1) CMOS (2) BiCMOS (3) ECL (4) 74SXX

82. Three coins are tossed at once. What is the probability of getting exactly 2 tails ?

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

83. What is the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 4 & 10 & 18 \end{bmatrix}$

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

84. If $f(0) = 4$ & $f'(x) = \dfrac{3}{x^2+2}$ the lower bound of $f(2)$ estimated by mean value theorem is :

(1) 0 (2) 7 (3) 12 (4) 5

85. Divergence of gradient of a vector function is equivalent to :

(1) Laplacian operation (2) Curl operation
(3) Double gradient operation (4) Null vector

86. Find the gradient of the function given by $x^2 + y^2 + z^2$ at (1, 1, 1) :

(1) $\hat{i} + \hat{j} + \hat{k}$ (2) $2\hat{i} + 2\hat{j} + 2\hat{k}$
(3) $2x\hat{i} + 2y\hat{j} + 2z\hat{k}$ (4) $4x\hat{i} + 2y\hat{j} + 4z\hat{k}$

87. Which of the following theorems use the curl operation ?

(1) Green's theorem (2) Gauss Divergence theorem
(3) Stoke's theorem (4) Maxwell equation

88. Which of the following is obtained by evaluating $\int_C (z-3)^n \, . \, dz$ where C is $|z-3| = 9$?

(1) -1 (2) 2 (3) 1 (4) 0

89. Determine the mean, median and mode values for the set : {26, 31, 21, 29, 32,26,25, 28} :

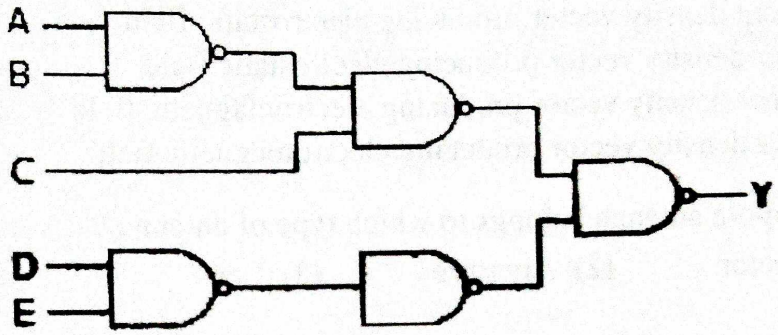
(1) Mean = 27.25, Median = 27, Mode = 26
(2) Mean = 27.25, Median = 26, Mode = 27
(3) Mean = 32, Median = 29, Mode = 28
(4) Mean = 29, Median = 32, Mode = 26

90. In a Binomial Distribution, if p, q and n are probability of success, failure and number of trials respectively then variance is given by ..... .

(1) np (2) npq (3) np^2q (4) npq^2

66. Which of the following describes the operation of a positive edge-triggered D flip-flop ?
(1) If both inputs are HIGH, the output will toggle.
(2) The output will follow the input on the leading edge of the clock.
(3) When both inputs are LOW, an invalid state exists.
(4) The input is toggled into the flip-flop on the leading edge of the clock and is passed to the output on the trailing edge of the clock.

67. The circuit of the given figure realizes the function ..... .



(1) $Y = (A' + B')C + (DE)'$ (2) $Y = A' + B' + C + D' + E'$
(3) $Y = (A + B)' + C + (D + E)'$ (4) $Y = AB + C + DE$

68. Which term applies to the maintaining of a given signal level until the next sampling ?
(1) Holding (2) Aliasing
(3) Shannon frequency sampling (4) Stair-stepping

69. A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is .....
(1) 20 KHz square wave (2) 10KHz square wave
(3) Constantly Low (4) Constantly High

70. An analog signal is sampled at 36 kHz and quantized into 256 levels. The time duration of a bit of binary coded signal is :
(1) 5.78 µs (2) 3.47 µs (3) 6.43 ms (4) 7.86 ms

71. Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in amplitude modulated signal ?
(1) 13.36 W (2) 15.84 W (3) 52 W (4) 176 W

72. The magnitude of open circuit and short circuit input impedances of a transmission line are 100Ω and 25Ω respectively. The characteristic impedance of the line is :
(1) 25 Ω (2) 50 Ω (3) 75 Ω (4) 100 Ω

73. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by :
(1) 6 dB (2) 3 dB (3) 2 dB (4) 0 dB

74. In a communication system, when two finite-power waveforms $x(t)$ and $y(t)$ have the property : $x.y = 0$, then these waveforms are said to be :
(1) Identical (2) Overlap (3) Similar (4) Orthogonal

75. Poynting vector signifies :
(1) Current density vector producing electrostatic field
(2) Power density vector producing electrostatic field
(3) Current density vector producing electromagnetic field
(4) Power density vector producing electromagnetic field

76. Folded dipole antenna belongs to which type of antenna ?
(1) Reflector (2) Aperture (3) Lens (4) Wire

77. An AM wave is given by $S_{AM}(t)=10\ (1 + 0.4 \cos 10^3 t + 0.3 \cos 10^4 t) \cos 10^6 t$. The modulation index is :
(1) 0.4 (2) 0.5 (3) 0.3 (4) 0.9

78. 10 signals, each band-limited to 5 KHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guardband of 1 KHz is used, then the bandwidth of the multiplexed signal will be :
(1) 79 KHz (2) 60 KHz (3) 59 KHz (4) 61 KHz

79. A signal $X(t) = 100 \cos (24 \times 10^3)\ t$ is ideally sampled with a sampling period of 50 sec and then passed through an ideal low pass filter with a cut off frequency of 15 KHz. Which of the following frequencies is/are present at the filter output ?
(1) 12 KHz only (2) 8 KHz only
(3) 12 KHz and 9 KHz (4) 12 KHz and 8 KHz

80. In a twin wire transmission line in air the adjacent voltage maxima are at 12.5 em and 27.5 cm. The operating frequency is :
(1) 300 MHz (2) 1 GHz (3) 2 GHz (4) 6.28 GHz

81. Find the Eigenvalues for the following 2×2 matrix :

$$X = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$$

(1) $-3, 5$ (2) $2, -1$ (3) $-5, 3$ (4) $4, 0$

91. How is the effective address of base-register calculated ?
(1) By addition of implied register contents to the partial address in instruction
(2) By addition of index register contents to the partial address in instruction
(3) By addition of index register contents to the complete address in instruction
(4) By addition of implied register contents to the complete address in instruction

92. The instruction, Add #45, Rl does ..... .
(1) Adds the value of 45 to the address of R1 and stores 45 in that address
(2) Adds 45 to the value of R1 and stores it in R1
(3) Finds the memory location 45 and adds that content to that of R1
(4) R1 stores the value at memory location to 45

93. What is the principle of fibre optical communication ?
(1) Frequency modulation (2) Population inversion
(3) Total internal reflection (4) Doppler Effect

94. The optical source used for detection of optical signal is ..... .
(1) IR sensors (2) Photodiodes
(3) Zener diodes (4) Light Emitting Diodes

95. Calculate the conduction current density when the resistivity of a material with an electric field of 5 units is 4.5 units.
(1) 22.5 (2) 4.5/5 (3) 5/4.5 (4) 9.5

96. Find the loss tangent of a material with conduction current density of 5 units and displacement current density of 10 units.
(1) 2 (2) 0.5 (3) 5 (4) 10

97. The Maxwell second equation that is valid in any conductor is :
(1) Curl(H) = Jc (2) Curl(E) = Jc (3) Curl(E) = Jd (4) Curl (H) = Jd

98. Which of the following is not used in the VSWR measurement ?
(1) Reflective Klystron (2) Slotted line
(3) Frequency meter (4) Spectrum analyzer

99. If there are no any reflections, then the value of the SWR will be ..... .
(1) 1 (2) 0 (3) ∞ (4) 2

100. The cut off wavelength and the guided wavelength are given by 0.5 and 2 units respectively. Find the wavelength of the wave :
(1) 0.48 (2) 0.32 (3) 0.45 (4) 0.54

Answer keys of PH.D (E.C.E)-UIET entrance exam dated 05.12.2024				
Q. NO.	A	B	C	D
1	1	3	1	4
2	2	3	2	3
3	3	2	1	3
4	4	1	3	2
5	1	4	3	1
6	2	4	2	1
7	3	1	1	2
8	4	1	1	3
9	1	1	2	2
10	2	4	2	4
11	4	1	2	4
12	3	3	2	1
13	3	3	1	1
14	2	2	1	2
15	1	2	3	4
16	1	4	2	3
17	2	3	2	2
18	3	1	3	3
19	2	1	3	1
20	4	3	4	1
21	2	1	1	3
22	2	3	2	3
23	1	3	3	2
24	1	4	4	1
25	3	2	1	4
26	2	3	2	4
27	2	1	3	1
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31	1	4	4	1
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35	2	1	4	2
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39	4	2	1	1
40	1	4	1	3
41	1	4	2	1
42	2	1	2	3
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44	3	2	4	4
45	3	4	4	2
46	2	3	4	3
47	1	2	2	1
48	1	3	3	4
49	2	1	4	4
50	2	1	2	1

Answer keys of PH.D (E.C.E)-UIET entrance exam dated 05.12.2024				
Q. NO.	A	B	C	D
51	1	2	1	2
52	3	2	3	2
53	3	2	3	1
54	2	4	4	1
55	2	4	2	3
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57	3	2	1	2
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64	4	2	1	3
65	4	3	4	3
66	4	2	4	2
67	2	1	1	1
68	3	4	1	1
69	4	1	1	2
70	2	1	4	2
71	3	1	2	2
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74	1	3	2	4
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90	1	4	4	2
91	4	1	1	2
92	1	2	3	2
93	1	3	3	3
94	2	4	2	2
95	4	1	2	3
96	3	2	4	2
97	2	3	3	1
98	3	4	1	4
99	1	1	1	1
100	1	2	3	1