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RT Heldon 11.10.26 (FN)

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : HCLM-A-DPS

Test Booklet Series

1006617

TEST BOOKLET

GAT-DCIO

A

Time Allowed : Two Hours ***Maximum Marks : 300***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** write ***anything else*** on the Test Booklet.
4. This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case, you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer Sheet***. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. In a typical silicon semiconductor diode, the reverse saturation current (I_s) will just about double in magnitude for every :

(a) 1°C increase in temperature

(b) 5°C increase in temperature

(c) 10°C increase in temperature

(d) 20°C increase in temperature

2. In silicon versus germanium semiconductor diodes, silicon diodes can be used for applications where the temperature rises to about :

(a) 110°C

(b) 200°C

(c) 310°C

(d) 400°C

3. Which one of the following statements is correct regarding a Zener diode ?

(a) An increase in doping will decrease the Zener potential.

(b) Because of its higher temperature and current capability, Germanium is usually preferred in the manufacture of Zener diodes.

(c) Zener diodes are available with Zener potentials of 200 V to 400 V.

(d) Zener diodes are available with power ratings from 50 W to 100 W.

4. For the BJT to be biased in its linear or active operating region, which one of the following statements is correct ?

(a) Base-Emitter junction must be forward-biased and Base-Collector junction must be reverse-biased.

(b) Base-Emitter junction must be reverse-biased and Base-Collector junction must be forward-biased.

(c) Base-Emitter junction must be forward-biased and Base-Collector junction must be forward-biased.

(d) Base-Emitter junction must be reverse-biased and Base-Collector junction must be reverse-biased.

5. For a typical transistor amplifier in the active region, V_{CE} is usually about :

(a) 10% to 15% of V_{CC}

(b) 15% to 20% of V_{CC}

(c) 25% to 75% of V_{CC}

(d) 75% to 95% of V_{CC}

6. In any amplifier employing a transistor, $|V_{BE}|$ decreases by about :

(a) 1·5 mV per degree Celsius (°C) increase in temperature

(b) 2·5 mV per degree Celsius (°C) increase in temperature

(c) 4·5 mV per degree Celsius (°C) increase in temperature

(d) 7·5 mV per degree Celsius (°C) increase in temperature

7. Which one of the following statements is correct regarding the comparison between VMOS FETs and commercially available planar MOSFETs ?

(a) VMOS FETs have reduced channel resistance levels compared with MOSFETs.

(b) MOSFETs have higher current ratings compared with VMOS FETs.

(c) VMOS FETs have lower power ratings compared with MOSFETs.

(d) VMOS FETs have a negative temperature coefficient which will combat the possibility of thermal runaway.

8. Which one of the following statements is correct regarding a BJT transistor amplifier for frequencies in the low to mid-range (typically ≤ 100 kHz) ?

(a) The input impedance is resistive-capacitive in nature.

(b) The input impedance can vary from 10 kilo-ohms to a few mega-ohms.

(c) The output impedance of a BJT transistor amplifier is resistive-capacitive in nature.

(d) The output impedance can vary from a few ohms to a level that can exceed 2 mega-ohms.

9. For any inverting amplifier, the input capacitance will be increased by a Miller effect capacitance sensitive to the gain of the amplifier and the interelectrode capacitance connected :

(a) between the input and output terminals of the active device.

(b) between the input and output terminals of the passive device.

(c) only to the output terminals of the active device.

(d) only to the input terminals of the passive device.

10. What is the output voltage of an op-amp for input voltages of V_{i1} = 160 µV, V_{i2} = 150 µV ? The amplifier has a differential gain of A_d = 2000 and the value of CMRR is 100.

(a) 12·31 mV

(b) 23·10 mV

(c) 28·42 mV

(d) 45·80 mV

11. If $\overline{A}B + CD$ is a simplified Boolean expression of the expression $\overline{A}B + ABCD + \overline{A}\overline{B}CD$, then the "don't care" entry in the K-Map will be in :

(a) 3rd cell (0011)

(b) 6th cell (0110)

(c) 11th cell (1011)

(d) 14th cell (1110)

12. An implicant is defined as :

(a) a sum term used to simplify Boolean expressions

(b) a product term that covers minterms of the function

(c) a single variable appearing in a Boolean expression

(d) a don't-care condition in a K-map

13. In the negative-edge-triggered toggle flip-flop, the characteristic equation is :

(a) $Q_{n+1} = T\overline{Q}_n + \overline{T}\overline{Q}_n$

(b) $Q_{n+1} = TQ_n + \overline{T}\overline{Q}_n$

(c) $Q_{n+1} = \overline{T}Q_n + \overline{T}\overline{Q}_n$

(d) $Q_{n+1} = 1 + \overline{T}\overline{Q}_n$

14. For a J-K flip-flop (active LOW inputs), the output state Q_{n+1} for input J = 1 and K = 0, CLK = 1 is :

(a) 1

(b) 0

(c) Q_n

(d) $\overline{Q}_n$

15. A race condition is said to exist in a fundamental-mode circuit when two or more secondary state variables must change value if the circuit is required to make a transition from :

(a) secondary state variables only

(b) one stable state to another stable state

(c) primary state variables only

(d) one stable state to another unstable state

16. For a BJT with $\beta = 99$, $i_B = 25\ \mu A$, and $I_{CBO} = 200$ nA, the DC collector current is approximately equal to :

(a) 1·475 mA

(b) 2·495 mA

(c) 3·500 mA

(d) 4·518 mA

17. The input conditions of a J-K flip-flop for the present and next state 1 and 0 respectively are :

(a) J = 0 and K = 1

(b) J = 1 and K = 0

(c) J = 1 and K = X

(d) J = X and K = 1

18. In CE hybrid parameters, the reverse voltage ratio (h_{re}) for a transistor is defined as :

(a) $h_{re} = \left.\frac{\partial v_{CE}}{\partial v_{BE}}\right|_{Q}$

(b) $h_{re} = \left.\frac{\partial i_C}{\partial i_B}\right|_{Q}$

(c) $h_{re} = \left.\frac{\partial v_{BE}}{\partial v_{CE}}\right|_{Q}$

(d) $h_{re} = \left.\frac{\partial v_{BC}}{\partial v_{CE}}\right|_{Q}$

19. A germanium transistor has $\beta = 100$ and a base-to-collector leakage current I_{CBO} = 5 µA. In the common-emitter configuration, the collector current I_C when the base current $I_B = 0$ is :

(a) 50 µA

(b) 100 µA

(c) 505 µA

(d) 10 µA

20. Clamping is defined as :

(a) a process that amplifies the peaks of an AC signal

(b) a process of setting the positive or negative peak of an input AC waveform to a specific DC level

(c) a method of filtering out the DC component of a signal

(d) a technique used to convert AC to DC

21. What is the unit-sample response h(n) when the input-output pair in a discrete-time LTI system is as follows : $x(n) = \left\{\underset{\uparrow}{1}, 0, 1\right\}$ and $y(n) = \left\{\underset{\uparrow}{3}, 2, 4, 2, 1\right\}$?

(a) $h(n) = \left\{\underset{\uparrow}{3}, 5, 3, 1\right\}$

(b) $h(n) = \left\{\underset{\uparrow}{3}, 2, 1\right\}$

(c) $h(n) = \left\{\underset{\uparrow}{1}, 2, 3\right\}$

(d) $h(n) = \left\{\underset{\uparrow}{1}, 1\right\}$

22. What is the input response x(n), when the system produces $y(n)=\left\{\underset{\uparrow}{3},5,3,1\right\}$ at the output and their unit-sample response h(n) is $\left\{\underset{\uparrow}{3},2,1\right\}$?

(a) $x(n)=\left\{\underset{\uparrow}{1},2,3,2,1\right\}$

(b) $x(n)=\left\{\underset{\uparrow}{3},2,4,2,1\right\}$

(c) $x(n)=\left\{\underset{\uparrow}{1},0,1\right\}$

(d) $x(n)=\left\{\underset{\uparrow}{1},1\right\}$

23. The input-output pair in a discrete-time LTI system is given as : $x(n)=\left\{\underset{\uparrow}{1},0,1\right\}$ and $y(n)=\left\{\underset{\uparrow}{3},2,4,2,1\right\}$. By applying the product property in the z-domain, the unit-sample response h(n) is :

(a) $h(n)=\left\{\underset{\uparrow}{1},2,3,2,1\right\}$

(b) $h(n)=\left\{\underset{\uparrow}{3},4,2,1\right\}$

(c) $h(n)=\left\{\underset{\uparrow}{3},2,1\right\}$

(d) $h(n)=\left\{\underset{\uparrow}{3},5,3,1\right\}$

24. The input-output pair in a discrete-time LTI system is given as : $h(n)=\left\{\underset{\uparrow}{3},2,1\right\}$ and $y(n)=\left\{\underset{\uparrow}{3},5,3,1\right\}$ at the output. What is the input response x(n) by applying the product property in the z-domain of convolution ?

(a) $x(n)=\left\{\underset{\uparrow}{1},1\right\}$

(b) $x(n)=\left\{\underset{\uparrow}{1},0,1\right\}$

(c) $x(n)=\left\{\underset{\uparrow}{3},2,4,2,1\right\}$

(d) $x(n)=\left\{\underset{\uparrow}{1},2,3,2,1\right\}$

25. What is the output response using the associative property when $x(t) = \cos(\omega_0 t)$, $h_1(t) = ae^{-at}u(t)$, $h_2(t) = \delta(t) - h_1(t)$ and $\omega_0 = a$?

(a) $0{\cdot}5\cos(\omega_0 t)$

(b) $0{\cdot}5\sin(\omega_0 t)$

(c) $0{\cdot}25\cos(\omega_0 t)$

(d) $\cos(\omega_0 t)$

26. The theory of the Fourier transform is applicable only to time functions that satisfy :

(a) Euler conditions

(b) Dirichlet conditions

(c) Boundary conditions

(d) Periodic conditions

27. Which one of the following is the major practical limitation of Amplitude Modulation ?

(a) Amplitude Modulation is wasteful of transmitted frequency.

(b) Amplitude Modulation is wasteful of transmitted power.

(c) Amplitude Modulation is wasteful of transmitted phase.

(d) Amplitude Modulation is used for long-distance transmission.

28. In VSB modulation, if f_v is the vestigial bandwidth and W is the message bandwidth, then the transmission bandwidth B_T is :

(a) $B_T = f_v + W$

(b) $B_T = f_v - W$

(c) $B_T = 2W$

(d) $B_T = 2f_v$

29. Which one of the following corrective measures is used before sampling to attenuate high-frequency components of a message signal that are not essential to the information being conveyed by the signal ?

(a) High-pass filter

(b) Band-stop filter

(c) Low-pass anti-alias filter

(d) Envelope detector

30. Which one of the following line coding methods represents symbol 1 by a positive pulse followed by a negative pulse, with both pulses having equal amplitude and half-symbol width ?

(a) NRZ code

(b) Manchester code

(c) RZ code

(d) AMI code

31. The matched filter has a frequency response that is equal to :

(a) the transmitted signal spectrum multiplied by the phase factor

(b) the received signal spectrum multiplied by the phase factor

(c) the complex conjugate of the received signal spectrum multiplied by the phase factor

(d) the complex conjugate of the transmitted signal spectrum multiplied by the phase factor

32. The minimum value of SNR per bit needed for reliable communication is :

(a) 1·6 dB

(b) – 1·6 dB

(c) 6 dB

(d) – 6 dB

33. The spectral bit rate is the ratio of :

(a) Bit rate of the signalling scheme to the bandwidth of it

(b) Signalling dimensionality to the bandwidth of it

(c) Bandwidth to the bit rate of the signalling

(d) Error probability to the bandwidth of it

34. Which one of the following channels is the best example of a power-limited channel that has sufficiently large bandwidth to accommodate a large number of signals ?

(a) Telephone channel

(b) Digital microwave radio channel

(c) Deep-space communication channel

(d) Voice channel

35. The required length of the code words on fading channels is largely dependent on which one of the following factors ?

(a) Coherence time of the channel

(b) SNR of the channel

(c) Signal strength of the channel

(d) Complex time of the channel

36. A short-circuited $\frac{\lambda}{2}$-transmission-line resonator has a characteristic impedance Z_0 and an attenuation constant α. What is its unloaded quality factor Q_0 near resonance ?

(a) $\frac{\beta}{2\alpha}$

(b) $\frac{\alpha}{\beta}$

(c) $\frac{2\alpha}{3\beta}$

(d) $\frac{\pi}{2\alpha\lambda}$

37. A 90° quadrature hybrid coupler receives 10 W at Port 1. If the coupler is ideal and equal-splitting, what is the power output at the isolated port (Port 4) ?

(a) 5 W

(b) 2·5 W

(c) 1 W

(d) 0 W

38. Kuroda's identities are used in distributed filter design primarily to :

(a) Convert a low-pass filter prototype into a high-pass filter

(b) Eliminate all resistors from the filter schematic

(c) Separate filter stubs with transmission-line unit elements and convert series stubs to shunt stubs

(d) Increase the stop band insertion loss

39. A ferrimagnetic material biased with a static magnetic field exhibits Faraday rotation. This phenomenon arises from different propagation constants for which of the following pairs of wave types ?

(a) TE and TM waveguide modes

(b) Parallel and perpendicular linearly polarized waves

(c) Right-hand and left-hand circularly polarized (RHCP and LHCP) waves

(d) Active and passive waves

40. In LNA design, to achieve a noise figure $F > F_{min}$ with a specific source impedance, which graphical tool on the Smith chart does the designer use ?

(a) Constant-gain circles

(b) Constant-noise-figure circles (noise circles)

(c) Stability circles

(d) Constant-power contours

41. An audio signal in a communication system occupies a frequency range of 200 Hz to 4200 Hz. If this signal is transmitted as a single sideband (SSB) signal instead of a conventional amplitude modulation signal, what are the bandwidth saving and the percentage of absolute saving in AM transmission bandwidth respectively ?

(a) 2000 Hz, 50%

(b) 4000 Hz, 50%

(c) 8000 Hz, 25%

(d) 8400 Hz, 25%

42. An engineer is designing an FM modulator stage using a high-gain FET reactance modulator. The target equivalent capacitive reactance ($X_{C_{eq}}$) required to shift the tank circuit frequency correctly is exactly 400 Ω. The gate-to-drain impedance (Z_{gd}) is constrained to be exactly 12 times the gate-to-source impedance (Z_{gs}). If the circuit operates at a localized frequency of 4 MHz, what is the required transconductance (g_m) of the active device ?

(a) 3·33 ms

(b) 12·5 ms

(c) 30·0 ms

(d) 48·0 ms

43. A high-frequency RF transmitter utilizes a capacitive FET reactance modulator stage operating at a localized carrier frequency of 2·5 MHz. The active FET has an accurately biased transconductance (g_m) of 12 ms. The feedback network is configured such that the gate-to-source impedance (Z_{gs}) is precisely $\frac{1}{6}$ of the gate-to-drain impedance (Z_{gd}). What are the exact parameters for the equivalent injected capacitance (C_{eq}) and the equivalent capacitive reactance ($X_{C_{eq}}$) exhibited by the modulator circuit ?

(a) $C_{eq} = \frac{200}{\pi}$ pF, $X_{C_{eq}} = 250\ \Omega$

(b) $C_{eq} = 400\pi$ pF, $X_{C_{eq}} = 500\ \Omega$

(c) $C_{eq} = \frac{400}{\pi}$ pF, $X_{C_{eq}} = 500\ \Omega$

(d) $C_{eq} = \frac{400}{\pi}$ pF, $X_{C_{eq}} = 750\ \Omega$

44. A plane wave is normally incident from air onto a perfect conductor. If the total electric field has a node (zero) at a distance of 15 cm from the conductor surface, what is the minimum possible frequency of the wave ?

(a) 1·0 GHz

(b) 2·0 GHz

(c) 3·0 GHz

(d) 4·0 GHz

45. A lossless transmission line of characteristic impedance $Z_0 = 50\ \Omega$ is terminated in a load impedance $Z_L = 100 + j50\ \Omega$. What is the complex reflection coefficient Γ at the load ?

(a) 0·2 + j0·4

(b) 0·4 + j0·2

(c) 0·36 + j0·28

(d) 0·28 + j0·36

46. What is the constant value of Fourier transform of the periodic signal $x(t) = \cos^4(\omega_0 t)$?

(a) $\frac{1}{8}$

(b) $\frac{3}{8}$

(c) $\frac{3}{4}$

(d) $\frac{1}{2}$

47. In a DSP system, the sampling rate of a given signal is 8 kHz and the anti-aliasing filter is a second-order Butterworth low-pass filter with a cut-off frequency of 3·4 kHz. What is the percentage of aliasing level at the cut-off frequency ?

(a) 23·05%

(b) 52·28%

(c) 67·80%

(d) 75·00%

48. In a DSP system, the sampling rate of a given signal is 8 kHz and the anti-aliasing filter is a second-order Butterworth low-pass filter with a cut-off frequency of 3·4 kHz. What is the percentage of aliasing level at a frequency of 1 kHz ?

(a) 23·05%

(b) 52·28%

(c) 67·80%

(d) 75·00%

49. In a DSP system with a sampling rate of 8 kHz and a hold circuit used after DAC, what is the percentage of distortion at a cut-off frequency of 3·4 kHz ?

(a) 23·05%

(b) 27·17%

(c) 53·05%

(d) 67·80%

50. What is the percentage of power saved when the carrier and one of the sidebands are removed in an amplitude modulated wave with a modulation factor of 0·5 ?

(a) 53%

(b) 66%

(c) 83·3%

(d) 94·4%

51. Which one of the following data hazards occurs if the write operations take place in the reverse order of the intended sequence ?

(a) Antidependency

(b) True dependency

(c) Input dependency

(d) Output dependency

52. Which one of the following approaches is used to replicate the initial portions of the pipeline and allow the pipeline to fetch both instructions from both streams by making use of two streams ?

(a) Divide and conquer approach

(b) Brute-force approach

(c) Dynamic approach

(d) Static approach

53. Which one of the following multithreading approaches is involved when the processor deals with two or more thread contexts at a time, switching from one thread to another at each clock cycle, and if a thread is blocked because of data dependencies or memory latencies, that thread is skipped and a ready thread is executed ?

(a) Interleaved multithreading

(b) Blocked multithreading

(c) Simultaneous multithreading

(d) Chip multithreading

54. Which one of the following logic gate configurations is used to store binary values in Static Random-Access Memory (SRAM) ?

(a) NAND/NOR-based latch (flip-flop circuit)

(b) AND gate only

(c) XOR gate only

(d) Half-adder circuit

55. Consider a dynamic RAM that must be given 64 refresh cycles per millisecond . Each refresh operation takes 150 ns to complete, while a normal memory access cycle takes 250 ns. What is the percentage of total memory operating time that is consumed by refresh operations ?

(a) 0·48%

(b) 0·96%

(c) 1·20%

(d) 2·50%

56. How many bits are used to represent each character in the standard ASCII (International Reference Alphabet) code ?

(a) 6 bits

(b) 7 bits

(c) 8 bits

(d) 16 bits

57. Which one of the following layers is ***not*** available in the TCP/IP reference model compared to the OSI reference model ?

(a) Application

(b) Network

(c) Transport

(d) Session

58. A client-server system uses a satellite network, with the satellite at a height of 50,000 km. What is the best-case delay in response to a request ?

(a) 667 ms

(b) 533 ms

(c) 760 ms

(d) 701 ms

59. Television channels are 6 MHz wide. How many bits per second can be sent if four-level digital signals are used ? (Assume a noiseless channel)

(a) 24 Gbps

(b) 24 Mbps

(c) 32 Gbps

(d) 32 Mbps

60. The technique of temporarily delaying outgoing acknowledgements so that they can be hooked onto the next outgoing data frame is known as :

(a) Backtracking

(b) Reverse Acknowledgement

(c) Piggybacking

(d) Reverse Feedbacking

61. Which one of the following statements is ***not*** correct with respect to a Jumbo Frame ?

(a) It allows a maximum size of 2500 bytes per frame only.

(b) It allows for frames to be longer than 1500 bytes.

(c) It allows for frames up to 9 KB.

(d) It is related to Gigabit Ethernet.

62. What is the baud rate of classic 10-Mbps Ethernet ?

(a) 10 Mbps

(b) 20 Mbps

(c) 100 Mbps

(d) 200 Mbps

63. Which of the following are methods for prioritizing handoffs ?

(a) Sectoring and queuing of handoff requests

(b) Increasing the reuse factor and sectoring

(c) Guard channel concept and increasing the reuse factor

(d) Guard channel concept and queuing of handoff requests

64. Which one of the following is a measure of the number of users who can be offered a particular Grade of Service (GOS) with a particular configuration of fixed channels ?

(a) Spectral efficiency

(b) Channel efficiency

(c) Frequency efficiency

(d) Trunking efficiency

65. Which of the following techniques are used in practice to expand the capacity of cellular systems ?

(a) Cell splitting, Reducing interference and Sectoring

(b) Coverage zone, Reducing interference and Sectoring

(c) Cell splitting, Coverage zone and Reducing interference

(d) Cell splitting, Sectoring and Coverage zone

66. If 50 watts of power are applied to a unity gain antenna with a 900 MHz carrier frequency, what is P_r (10 km) ? Assume P_r is the received power, unity gain for the receiver antenna, and the transmitter produces 50 watts of power. [Take $\log_{10}(3{\cdot}5) = 0{\cdot}54$]

(a) P_r (10 km) = – 75 dBm

(b) P_r (10 km) = 75 dBm

(c) P_r (10 km) = – 64·5 dBm

(d) P_r (10 km) = 64·5 dBm

67. Consider a transmitter which radiates a sinusoidal carrier of frequency 1850 MHz. For a vehicle moving at a speed of 60 miles per hour, what is the received carrier frequency if the mobile is moving directly towards the transmitter ? (Take 1 mile = 1·6 km)

(a) 1650·6161 MHz

(b) 1750·616161 MHz

(c) 1850·00016 MHz

(d) 1950·898989 MHz

68. In a slow fading channel, the channel impulse response changes at a rate much slower than that of the transmitted baseband signal s(t). Which one of the following statements is correct with respect to slow fading ?

(a) Doppler spread of the channel is much lesser than the bandwidth of the baseband signal.

(b) Doppler spread of the channel is much higher than the bandwidth of the baseband signal.

(c) Coherence time should be less than the symbol period.

(d) Channel variations are faster than baseband signal variations.

69. Which one of the following statements is ***not*** relevant to Artificial Intelligence ?

(a) The study of mental faculties through the use of computational models.

(b) The automation of activities associated with human thinking, such as decision-making and problem-solving.

(c) The study of how to make computers perform tasks at which people are currently better.

(d) The study of natural processes occurring in plants for food production through photosynthesis.

70. Which one of the following data structures is used for the frontier in Breadth-First Search ?

(a) Stack

(b) Priority Queue

(c) FIFO Queue

(d) Linked List

71. Which one of the following search strategies has a space complexity of O(bl), where l is the depth limit ?

(a) Depth-Limited Search

(b) Breadth-First Search

(c) Uniform-Cost Search

(d) Bidirectional Search

72. Which one of the following hill-climbing variants offers the best chance of finding a goal despite the presence of many local maxima ?

(a) Steepest-Ascent Hill Climbing

(b) Stochastic Hill Climbing

(c) First-Choice Hill Climbing

(d) Random-Restart Hill Climbing

73. Which one of the following search strategies is an example of forward pruning ?

(a) Breadth-First Search

(b) Uniform-Cost Search

(c) Beam Search

(d) Depth-First Search

74. Which one of the following forms of knowledge representation is used in a forward-chaining system ?

(a) Arbitrary first-order logic statements

(b) Definite clauses (Horn clauses)

(c) Only negative literals

(d) Only conjunctions

75. Which one of the following architectures is used to ensure interoperability among heterogeneous devices ?

(a) Service-oriented architecture

(b) Industrial Internet of Things architecture

(c) Fog computing architecture

(d) Cloud computing architecture

76. Which of the following IoT Communication Protocols are listed as having tree architecture ?

(a) AMQP and DDS

(b) CoAP and MQTT

(c) XMPP and ZeroMQ

(d) UPnP and AMQP

77. Which one of the following IoT programming frameworks supports for broadcast communication, RESTful API support and virtual machine support ?

(a) PyoT

(b) Mobile Fog

(c) ELIoT

(d) Simurgh

78. Which one of the following attacks specifically targets the routing path by attracting traffic through a malicious node ?

(a) Hello-flood attack

(b) Sinkhole attack

(c) Clone-ID attack

(d) Sybil attack

79. Which of the following frequency bands are commonly used by Sigfox for data transmission ?

(a) 2·4 GHz or 5 GHz

(b) 433 MHz or 600 MHz

(c) 868 MHz or 915 MHz

(d) 1800 MHz or 2100 MHz

80. Which one of the following layers in the IoT protocol stack includes 6LoWPAN as a protocol ?

(a) Physical/device layer

(b) Link layer

(c) Network layer

(d) Routing protocol layer

81. Which one of the following is a system utility that reads a C++ program, moving the text between lines and adjusting the indentation so as to improve the appearance of the program and make its structure more obvious ?

(a) Pretty printer

(b) Format

(c) Top-down refinement

(d) Consistency

82. Which one of the following operators is used in C++ with an object type as its argument, and returns the address of a newly created dynamic object of the appropriate type ?

(a) new

(b) typedef

(c) heap

(d) pointer

83. If the last-executed statement of a function is a recursive call to the function itself, then this call can be eliminated by reassigning the calling parameters to the values specified in the recursive call, and then repeating the whole function. This statement refers to :

(a) Head recursion

(b) Tree recursion

(c) Tail recursion

(d) Nested recursion

84. Which one of the following searching algorithms requires that the keys in the list be of a scalar or other type that can be regarded as having an order and that the list is already completely in order ?

(a) Binary search

(b) Linear search

(c) Sequential search

(d) Hash search

85. How many comparisons of keys are required for verifying that a list of n entries is in the correct order ?

(a) $n + 1$

(b) $n * 2$

(c) $n - 1$

(d) n

86. How many comparisons of keys are required in the average case of an algorithm that sorts a list of n entries ?

(a) lg n!

(b) lg (n + 1)!

(c) lg (n – 1)!

(d) lg (n * 2)!

87. Which one of the following types of sorting algorithms is most suitable if you are working in a library and are given a thousand index cards to arrange in alphabetical order ?

(a) Divide-and-Conquer sorting

(b) Linear sort

(c) Heap sort

(d) Sequential sort

88. Which one of the following sorting techniques requires random access to all parts of the list ?

(a) Bucket sort

(b) Radix sort

(c) Heap sort

(d) Bubble sort

89. Which one of the following information retrieval methods is used to allow many of the different possible keys that might occur to be mapped to the same location in an array under the action of the index function ?

(a) Hash Tables

(b) Decision Tables

(c) Function Tables

(d) Index Tables

90. Which one of the following operations is used in a hash table when the individual records are small and there is no danger of overflowing the hash table ?

(a) Open addressing

(b) Chaining

(c) Linear probing

(d) Clustering

91. In the centre of a square room having a side of 15 m, there is a square carpet, and the rest of the floor is covered with oil cloth. The carpet and the oil cloth respectively cost ₹ 25 and ₹ 10 per square metre. If the total cost of the carpet and the oil cloth is ₹ 3,750, then what is the width of the oil cloth border ?

(a) 280 cm

(b) 220 cm

(c) 250 cm

(d) 210 cm

92. Three friends, Vishu, Pallavi, and Chaitra, are trying to recall Geeta's birthday, which falls in September. They encode the date as a two-digit number representing the day. Vishu says that the day is greater than 15 but less than 25. Pallavi adds that the sum of the digits of the day is a factor of the day. Chaitra further states that when the digits are reversed, the new number is less than the original, and the day is divisible by a prime number greater than 5. Based on this information, when is Geeta's birthday ?

(a) 17 September

(b) 20 September

(c) 21 September

(d) 22 September

93. Three interview panels A, B and C together interviewed an average of 24 candidates per panel per day over a week. The number of candidates interviewed daily by panel A was 4 more than twice the number interviewed by panel C, while panel B interviewed 6 fewer than panel A. How many candidates were interviewed daily by panel A ?

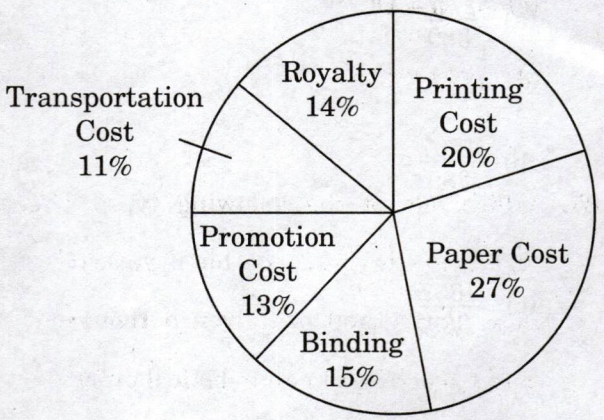
(a) 24

(b) 72

(c) 14

(d) 32

94. A publisher publishes 6000 copies of a book. The pie-chart shows the percentage distribution of the total expenditure incurred in publishing the books. If the combined expenditure on royalty and promotion is ₹ 2,02,500, and the publisher wants to earn a 20% profit on the selling price, then what should be the marked price of each book ?



(a) ₹ 125·45

(b) ₹ 156·25

(c) ₹ 184·65

(d) ₹ 168·35

95. The ratio of the ages of Yamika and Sudha is 5 : 7. Five years ago, the ratio of their ages was 3 : 5. After how many years from now will the ratio of their ages become 7 : 9 ?

(a) 3 years

(b) 5 years

(c) 8 years

(d) 4 years

96. If $5 = x + \cfrac{2}{1 + \cfrac{3}{2 + \cfrac{4}{3 + \cfrac{5}{4 + \cfrac{6}{5 + \frac{7}{2}}}}}}$, then what is the value of x ?

(a) $\frac{1775}{389}$

(b) $\frac{1567}{389}$

(c) $\frac{1657}{389}$

(d) $\frac{1557}{389}$

97. The difference between the banker's discount and the true discount on a bill due after 2 years at 12% per annum simple interest is 144. What is the amount of the bill due ?

(a) ₹ 2,400

(b) ₹ 2,900

(c) ₹ 3,100

(d) ₹ 3,600

98. When Sanju was born, her father was 28 years old. Her mother was 26 years old when Sanju's brother, who is 3 years younger than Sanju, was born. If Sanju's younger sister is 5 years younger than her brother and her mother is presently 45 years old, then what is the present age of Sanju's father ?

(a) 48 years

(b) 50 years

(c) 52 years

(d) 54 years

99. If $x_1, x_2, x_3, \ldots$ are in AP, and $x_1 + x_5 + x_{10} + x_{15} + x_{20} + x_{24} = 215$, then $x_1 + x_2 + x_3 + \ldots + x_{23} + x_{24}$ is equal to :

(a) 645

(b) 860

(c) 1075

(d) 1290

100. A train leaves Hyderabad at 6:00 AM and reaches Bengaluru at 12:00 PM. Another train leaves Bengaluru at 8:00 AM and reaches Hyderabad at 1:00 PM. At what time do the two trains cross each other ?

(a) 08:49 AM

(b) 09:19 AM

(c) 09:49 AM

(d) 11:29 AM

SPACE FOR ROUGH WORK

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