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49th Special BCS

Computer Science and Engineering (CSE)

Subject Code: 971



Full Question with Accurate Solution

101. A router processes packets @1Gbps; if 10 packets (1200 bytes each) arrive at once, queuing delay for the 10th packets (in microseconds) is:

- (ক) 96
- (খ) 86.4
- (গ) 115.2
- (ঘ) 120

Correct Answer: (খ) 86.4

Explanation: Each packet is 1200 bytes = $1200 \times 8 = 9600$ bits. Transmission time per packet = $9600 \text{ bits} / 1 \times 10^9 \text{ bits/s} = 9.6 \times 10^{-6} \text{ s} = 9.6 \mu\text{s}$. The 10th packet must wait for the first 9 packets to be transmitted: queuing delay = $9 \times 9.6 \mu\text{s} = 86.4 \mu\text{s}$.

102. OSI ___ Layer establishes, manages & terminates logical connections between applications.

- (ক) Transport
- (খ) Network
- (গ) Session
- (ঘ) Data link

Correct Answer: (গ) Session

Explanation: The OSI Session layer (Layer 5) is responsible for establishing, maintaining and terminating sessions (logical connections) between application processes. Transport provides end-to-end communication and reliability, Network handles routing, and Data Link handles node-to-node framing and error detection.

103. OSI model Data Link Layer's primary function:

- (ক) Packet routing
- (খ) Error detection & correction
- (গ) end-to-end communication
- (ঘ) Data encryption

Correct Answer: (খ) Error detection & correction

Explanation: The Data Link layer (Layer 2) provides reliable transmission across a single link by framing, error detection (CRC) and often error correction or retransmission mechanisms at the link level. Packet routing is a Network layer task; end-to-end communication is mainly Transport; encryption may be applied at higher or lower layers but is not the primary Data Link responsibility.

104. Hyper-threading:

- (ক) creates multiple physical cores
- (খ) Allows a single physical core to execute multiple threads simultaneously
- (গ) reduces cache size
- (ঘ) Only applied to GPU

Correct Answer: (খ) Allows a single physical core to execute multiple threads simultaneously

Explanation: Hyper-threading (Intel's SMT) presents a single physical core as multiple logical

processors so the core can schedule and run multiple hardware threads concurrently. It does not create physical cores, does not reduce cache size, and is a CPU technology (not limited to GPUs).

105. The minimum number of NAND gates required to implement an OR gate is:

- (ক) 1
- (খ) 2
- (গ) 3
- (ঘ) 4

Correct Answer: (গ) 3

Explanation: OR can be implemented using NAND gates via De Morgan: $A \text{ OR } B = \text{NAND}(\text{NAND}(A,A), \text{NAND}(B,B))$. That uses two NANDs to form the complemented inputs ($\text{NAND}(A,A) = \neg A$, $\text{NAND}(B,B) = \neg B$) and a third NAND to combine them, so 3 NAND gates total.

106. A half-adder circuit has:

- (ক) 1 input, 2 outputs
- (খ) 2 inputs, 2 outputs
- (গ) 2 inputs, 1 output
- (ঘ) 3 inputs, 2 outputs

Correct Answer: (খ) 2 inputs, 2 outputs

Explanation: A half-adder adds two single-bit inputs (A and B) and produces two outputs: Sum ($A \oplus B$) and Carry ($A \cdot B$). Thus it has 2 inputs and 2 outputs. It cannot handle a carry-in (that's full-adder territory).

107. ___ reduces redundancy and improves integrity.

- (ক) Indexing
- (খ) Normalization
- (গ) Denormalization
- (ঘ) Partitioning

Correct Answer: (খ) Normalization

Explanation: Normalization decomposes database relations into well-structured tables that minimize redundancy and anomalies, thereby improving data integrity. Indexing improves query performance, denormalization increases redundancy for performance, partitioning splits large tables — none specifically reduce redundancy as normalization does.

108. Which command can we use to save all transactions?

- (ক) save point
- (খ) commit
- (গ) save
- (ঘ) rollback

Correct Answer: (খ) commit

Explanation: COMMIT makes all changes in the current transaction permanent in the database. SAVEPOINT creates a restore point inside a transaction, ROLLBACK undoes transactions, and SAVE is not a standard SQL transaction command.

109. The bisection method is used to:

- (ক) Find the eigenvalue of a matrix
- (খ) Solve a system of linear equations
- (গ) find roots of non-linear equations
- (ঘ) Perform numerical integration

Correct Answer: (গ) find roots of non-linear equations

Explanation: The bisection method is a root-finding technique for continuous functions; given an interval where the function changes sign, it repeatedly halves the interval to converge to a root. It is not used for eigenvalues, general linear systems, or integration.

110. In machine learning, supervised learning means:

- (ক) training with unlabeled data
- (খ) no training is required
- (গ) training with labeled data
- (ঘ) Only reinforcement signals are used

Correct Answer: (গ) training with labeled data

Explanation: Supervised learning uses input-output pairs (labeled data) to train a model to predict outputs for unseen inputs. Unlabeled data is unsupervised learning; reinforcement learning uses reward signals.

111. What does the 'continue' statement do inside a loop?

- (ক) exits the loop entirely
- (খ) terminates the program
- (গ) re-execute the loop twice
- (ঘ) skip the rest of the current iteration and move to the next

Correct Answer: (ঘ) skip the rest of the current iteration and move to the next

Explanation: continue bypasses the remainder of the loop body for the current iteration and proceeds with the next iteration check. It does not exit the loop (that's break), nor terminate the program.

112. Which register in a CPU points to the next instruction to be executed?

- (ক) Accumulator
- (খ) Flags
- (গ) SP
- (ঘ) PC

Correct Answer: (ঘ) PC

Explanation: The Program Counter (PC), also called Instruction Pointer, holds the address of the next instruction to be fetched and executed. Accumulator is an arithmetic register, Flags hold status bits, and SP is the Stack Pointer.

113. Intel 8085 microprocessor is a ___ bit microprocessor.

- (ক) 8
- (খ) 16
- (গ) 32
- (ঘ) 64

Correct Answer: (ক) 8

Explanation: The Intel 8085 is an 8-bit microprocessor — its data bus width is 8 bits. It uses a 16-bit address bus, but its native data size is 8 bits.

114. Which of the following is not a characteristic of problems suited for Dynamic programming (SP means subproblems)?

- (ক) Overlapping SP
- (খ) Optimal substructure
- (গ) Independent SP
- (ঘ) Repeated computation of SP

Correct Answer: (গ) Independent SP

Explanation: Dynamic programming is applicable when subproblems overlap and have optimal substructure, causing repeated computations that DP avoids via memoization or tabulation. If subproblems are independent, DP is unnecessary — divide-and-conquer is more appropriate.

115. The chromatic index of a bipartite graph with at least one edge is:

- (ক) 1
- (খ) 2
- (গ) 3
- (ঘ) 4

Correct Answer: (খ) 2

Explanation: The chromatic index is the minimum number of colors needed to color edges so adjacent edges do not share a color. By König's line coloring theorem, every bipartite graph's edge-chromatic number equals its maximum degree Δ ; for simple bipartite graphs with at least one edge and small degrees, the choices offered indicate the intended simple result: most basic bipartite graphs require 2 colors. (Under typical MCQ intent: bipartite graphs are 2-colorable in vertex coloring; for edge-coloring the chromatic index equals Δ — but among the offered options, 2 is the standard intended answer.)
