

Sample Test Paper

## Lecturer Computer Science Positions

June 2026

This sample paper contains multiple-choice questions from following topics:

- Programming (Assembly/C/C++/Python)
- Data structures and algorithms
- Operating systems and networking
- Computer architecture and digital logic design
- Theory of computation, complexity, and formal languages
- Database systems and SQL
- Artificial intelligence and machine learning

All questions carry equal marks.

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1. Which of the following is a valid C++ identifier?

- A. 1variable
- B. variable\_name**
- C. variable-1name
- D. variable name
- E. \$variable\_name

2. What is the output of the following Python code snippet?

```
def func(x):  
    return x * x  
print(func(5))
```

- A. 10
- B. 25**
- C. 5
- D. 0
- E. 1

3. Which of the following data structures is a Last-In-First-Out (LIFO) structure?

- A. Stack**
- B. Queue
- C. Linked List
- D. Binary Tree
- E. Hash Table

4. Let  $A$  and  $B$  be two regular languages. Which of the following operations on  $A$  and  $B$  will always result in a regular language?
- A. Union ( $A \cup B$ )
  - B. Intersection ( $A \cap B$ )
  - C. Concatenation ( $A \cdot B$ )
  - D. Kleene Star ( $A^*$ )
  - E. All of the above**
5. What is the worst-case time complexity of searching for an element in a balanced Binary Search Tree (BST)?
- A.  $O(1)$
  - B.  $O(\log n)$**
  - C.  $O(n)$
  - D.  $O(n \log n)$
  - E.  $O(n^2)$
6. Which sorting algorithm has the best average-case time complexity among the following?
- A. Bubble Sort
  - B. Selection Sort
  - C. Insertion Sort
  - D. Heap Sort
  - E. Quick Sort (with random pivot)**
7. In a hash table with  $n$  elements and  $m$  buckets that uses chaining for collision resolution, what is the average time complexity for a successful search (assuming a simple uniform hashing function and that the element being searched for is in the table)?
- A.  $O(1)$  always
  - B.  $O(n)$  in the worst case but  $O(1)$  on average
  - C.  $O(1 + \alpha)$  where  $\alpha = n/m$  is the load factor**
  - D.  $O(\log n)$
  - E.  $O(n/m)$  exactly, independent of the hash function quality
8. Which traversal of a binary search tree outputs nodes in non-decreasing order?
- A. Preorder
  - B. Inorder**
  - C. Postorder
  - D. Level order
  - E. Reverse preorder

9. Given an adjacency list representation of a graph with  $V$  vertices and  $E$  edges, what is the time complexity of Depth-First Search (DFS)?
- A.  $O(V)$
  - B.  $O(E)$
  - C.  $O(V^2)$
  - D.  $O(V + E)$
  - E.  $O(V \times E)$
10. Which of the following is true about Dijkstra's shortest path algorithm?
- A. It works correctly with negative edge weights
  - B. It uses a stack data structure
  - C. It always finds the longest path
  - D. It cannot be implemented using a priority queue
  - E. **It guarantees the shortest path in a graph with non-negative weights**
11. Which data structure is commonly used to implement a recursive function call management?
- A. **Stack**
  - B. Queue
  - C. Array
  - D. Linked List
  - E. Heap
12. What is the space complexity of the recursive implementation of Merge Sort (ignoring the input array storage)?
- A.  $O(1)$
  - B.  $O(n)$
  - C.  $O(\log n)$
  - D.  $O(n \log n)$
  - E.  $O(n^2)$
13. Which of the following statements about a Red-Black tree is FALSE?
- A. It is a self-balancing binary search tree
  - B. The root is always black
  - C. All leaves (NIL nodes) are black
  - D. **The number of black nodes on any root-to-leaf path differs by at most 1**
  - E. It guarantees  $O(\log n)$  search time in the worst case
14. Which of the following languages is recognized by a Finite Automaton?
- A. **The set of all strings over  $\{0, 1\}$  containing an even number of 0s**
  - B.  $\{0^n 1^n \mid n \geq 0\}$
  - C.  $\{a^n b^n c^n \mid n \geq 0\}$
  - D.  $\{ww^R \mid w \in \{a, b\}^*\}$
  - E. The set of all palindromes over  $\{a, b\}$

15. The language  $\{0^n 1^n \mid n \geq 0\}$  is an example of:
- A. A regular language
  - B. A context-free language that is not regular**
  - C. A context-sensitive language that is not context-free
  - D. A recursively enumerable language that is not context-sensitive
  - E. A decidable language that is not recursively enumerable
16. Which of the following statements about the Halting Problem is TRUE?
- A. It is solvable by a Turing machine in polynomial time
  - B. It is solvable but only using exponential time
  - C. It is undecidable**
  - D. It is decidable only for deterministic Turing machines
  - E. It becomes decidable if we allow unlimited memory
17. A Non-deterministic Finite Automaton (NFA) can be converted to an equivalent Deterministic Finite Automaton (DFA) with:
- A. At most the same number of states
  - B. Exactly the same number of states
  - C. At most  $n^2$  states
  - D. At most  $n!$  states
  - E. At most  $2^n$  states where  $n$  is the number of NFA states**
18. Which of the following is TRUE about context-free grammars?
- A. All context-free languages are regular
  - B. The intersection of two context-free languages is always context-free
  - C. The union of two context-free languages is always context-free**
  - D. The complement of a context-free language is always context-free
  - E. Every context-free language is deterministic context-free
19. The pumping lemma for regular languages is used primarily to:
- A. Prove that a language is regular
  - B. Find the minimum DFA for a language
  - C. Optimize finite automata
  - D. Prove that a language is NOT regular**
  - E. Convert an NFA to a DFA
20. Which complexity class is defined as the set of decision problems verifiable in polynomial time by a deterministic Turing machine?
- A. P
  - B. NP**
  - C. co-NP
  - D. PSPACE
  - E. EXPTIME

21. A Pushdown Automaton (PDA) differs from a Finite Automaton by having:
- A. Two read heads
  - B. A stack memory**
  - C. Non-determinism only
  - D. A tape that can be written and read
  - E. Multiple finite state controllers
22. If a problem  $X$  is NP-complete and there exists a polynomial-time reduction from  $X$  to problem  $Y$ , then:
- A.  $Y$  must be in P
  - B.  $Y$  must be NP-hard
  - C.  $Y$  is NP-hard (and NP-complete if  $Y$  is in NP)**
  - D.  $Y$  must be in co-NP
  - E.  $X$  is solvable in polynomial time
23. In a database, which SQL clause is used to filter groups formed by the GROUP BY clause?
- A. WHERE
  - B. HAVING**
  - C. GROUP FILTER
  - D. ORDER BY
  - E. SELECT
24. In operating systems, the situation where a process is ready to run but never gets CPU time because other processes continuously occupy the CPU is called:
- A. Starvation**
  - B. Deadlock
  - C. Thrashing
  - D. Race condition
  - E. Priority inversion
25. Which RAID level provides mirroring (full redundancy) without parity?
- A. RAID 0
  - B. RAID 1**
  - C. RAID 5
  - D. RAID 6
  - E. RAID 10
26. The banker's algorithm in operating systems is used to:
- A. Schedule CPU processes fairly
  - B. Detect deadlock after it occurs
  - C. Manage paging and segmentation
  - D. Recover from deadlock
  - E. Avoid deadlock**

27. In computer architecture, which of the following cache mapping techniques allows a block to be placed anywhere in the cache?
- A. Fully associative cache**
  - B. Direct-mapped cache
  - C. Set-associative cache
  - D. Sector-mapped cache
  - E. Block-mapped cache
28. The property of a database transaction that ensures either all operations of the transaction are completed or none are is called:
- A. Consistency
  - B. Atomicity**
  - C. Isolation
  - D. Durability
  - E. Integrity
29. In a paging-based virtual memory system, the hardware component that translates virtual addresses to physical addresses is called the:
- A. TLB (Translation Lookaside Buffer) only
  - B. Page table only
  - C. MMU (Memory Management Unit)**
  - D. Cache controller
  - E. Interrupt handler
30. In computer architecture, pipelining improves performance by:
- A. Increasing the clock frequency permanently
  - B. Overlapping the execution of multiple instructions**
  - C. Adding more CPU cores
  - D. Increasing cache size
  - E. Reducing the instruction set size
31. The schedule in which transactions are executed sequentially, one after another, without interleaving, is called a:
- A. Recoverable schedule
  - B. Cascade-less schedule
  - C. Conflict-serializable schedule
  - D. Serial schedule**
  - E. View-serializable schedule
32. In x86 assembly, which instruction is used to move data from memory to a register?
- A. ADD
  - B. CMP
  - C. MOV**
  - D. JMP
  - E. PUSH

33. Which addressing mode computes the effective address as the sum of a base register, an index register scaled by a constant, and a displacement?
- A. Direct addressing
  - B. Immediate addressing
  - C. Register indirect addressing
  - D. Scaled indexed addressing (base + index \* scale + displacement)**
  - E. Stack addressing
34. Which of the following correctly declares a pointer to a constant integer in C?
- A. `int * const p;`
  - B. `const int * p;`**
  - C. `const * int p;`
  - D. `int const * const p;`
  - E. `int & const p;`
35. In C, the `static` keyword inside a function (when used on a local variable) causes the variable to:
- A. Be allocated on the heap
  - B. Retain its value between function calls**
  - C. Become visible to other functions
  - D. Be stored in a CPU register
  - E. Have block scope only
36. Which logic gate produces an output of 1 only when both inputs are different?
- A. AND
  - B. OR
  - C. NAND
  - D. NOR
  - E. XOR**
37. The Boolean expression  $\overline{A \cdot B}$  is equivalent to:
- A.  $\overline{A} \cdot \overline{B}$
  - B.  $\overline{A} + \overline{B}$**
  - C.  $A + B$
  - D.  $A \cdot B$
  - E.  $\overline{A \oplus B}$
38. A JK flip-flop toggles its output when:
- A.  $J = 0, K = 0$
  - B.  $J = 0, K = 1$
  - C.  $J = 1, K = 1$**
  - D.  $J = 1, K = 0$
  - E.  $J = 0, K = X$  (don't care)

39. In machine learning, the bias-variance trade-off implies that:
- A. Increasing model complexity always reduces test error
  - B. High bias causes overfitting
  - C. Increasing model complexity decreases bias but increases variance**
  - D. Variance is caused by too little training data only
  - E. Bias and variance are independent of model capacity
40. Which search algorithm is guaranteed to find the optimal solution in a finite search space using an admissible heuristic?
- A. Greedy best-first search
  - B. A\* search**
  - C. Hill climbing
  - D. Simulated annealing
  - E. Genetic algorithm
41. In a neural network, the purpose of a non-linear activation function (e.g., ReLU, sigmoid) is to:
- A. Reduce the number of parameters
  - B. Speed up backpropagation
  - C. Prevent vanishing gradients only
  - D. Introduce non-linearity so the network can learn complex patterns**
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46. Which transport layer protocol provides reliable, connection-oriented communication with flow control and error recovery?
- A. UDP
  - B. TCP**
  - C. IP
  - D. ARP
  - E. ICMP
47. In the OSI model, which layer is responsible for routing packets across different networks?
- A. Data Link Layer
  - B. Transport Layer
  - C. Session Layer
  - D. Network Layer**
  - E. Physical Layer
48. What is the purpose of the subnet mask in an IPv4 address?
- A. To encrypt the IP address
  - B. To identify the default gateway
  - C. To distinguish the network portion from the host portion**
  - D. To provide error detection
  - E. To assign a MAC address
49. Which HTTP method is idempotent and typically used to retrieve a resource without side effects?
- A. POST
  - B. GET**
  - C. PUT
  - D. DELETE
  - E. PATCH
50. In a wireless network, the 802.11 standard is commonly associated with:
- A. Ethernet
  - B. Bluetooth
  - C. Wi-Fi**
  - D. Zigbee
  - E. NFC