



CC114 – Data Structure and Algorithm

Final Examination

1st Semester

December 11-13, 2024

Name: _____

Year /Section: _____ Score: _____

General Instructions:

1. Write all your answers in the space provided.
2. Write neatly and legibly.
3. Erasure or change of answer in any way is strictly not allowed

Test 1: Multiple Choice: (points)

Direction: Read each question carefully, and write the letter of your answer in the space provided

_____ 1. What does LIFO stand for in the context of stacks?

- a) Last-In-First-Out b) First-In-First-Out
c) Last-In-Last-Out d) First-In-Last-Out

_____ 2. What is the primary characteristic of the Bubble Sort algorithm?

- a) Divides the array into halves and sorts each half recursively.
b) Compares adjacent elements and swaps them if they are in the wrong order.
c) Selects the smallest element and places it at the beginning.
d) Uses a pivot to divide the list into two parts.

_____ 3. What is a common application of queues in operating systems?

- a) Data storage b) Job scheduling
c) Encryption d) File compression

_____ 4. What is the topmost node in a tree called?

- a) Leaf node b) Parent node
c) Root node d) Internal node

_____ 5. After the first pass of Bubble Sort on the array [5, 3, 8, 4, 2], what will the array look like?

- a.) [3, 5, 8, 4, 2] b.) [3, 5, 4, 8, 2]
c.) [2, 3, 4, 5, 8] d.) [5, 8, 3, 4, 2]

_____ 6. Which of the following represents a terminal node in a tree?

- a) Root b) Internal node c) Leaf node d) Sibling

_____ 7. What is the key property of a binary search tree (BST)?

- a) Each node has at most three children.
b) Left child values are smaller, and right child values are larger than the parent node.
c) It allows duplicate values in any subtree.
d) Nodes are arranged in a circular hierarchy.

_____ 8. Which algorithm uses queues for graph traversal?

- a) Depth-First Search (DFS) b) Breadth-First Search (BFS)
c) Dijkstra's Algorithm d) Bellman-Ford Algorithm

_____ 9. What is the primary purpose of a queue in a job scheduling system?

- a) To store completed jobs.
b) To prioritize jobs based on their importance.
c) To execute jobs in a random order.
d) To store waiting jobs in a first-come-first-served (FCFS) manner

10. What are the advantages and disadvantages of using a queue for job scheduling?

- a) Advantages: Fair scheduling, easy implementation; Disadvantages: Potential for starvation, long wait times.
- b) Advantages: Fast processing, low overhead; Disadvantages: Unfair scheduling, unpredictable performance.
- c) Advantages: High throughput, efficient resource utilization; Disadvantages: Complex implementation, high memory overhead.
- d) Advantages: Flexible scheduling, dynamic priority adjustment; Disadvantages: Inefficient resource utilization, unpredictable performance

11. Which of the following best describes "siblings" in a tree?

- a) Nodes that share the same parent
- b) Nodes with no children
- c) Nodes at the same height as the root
- d) Nodes connected by an edge

12. Given the array [5, 2, 4, 6, 1, 3], what will the array look like after the first pass of Insertion Sort?

- a)[2, 5, 4, 6, 1, 3]
- b) [5, 4, 2, 6, 1, 3]
- c)[2, 4, 5, 6, 1, 3]
- d) [5, 2, 6, 4, 1, 3]

13.What is the primary approach used by Quick Sort to sort elements?

- a). Divide-and-Conquer
- b) Brute Force
- c)Dynamic Programming
- d) Linear Scanning

14. What is the initial condition of a stack called?

- a) Full stack
- b) Null stack
- c) Empty stack
- d) Overflow

15. What is the primary difference between stack and queue?

- a) Stacks follow FIFO, queues follow LIFO
- b) Stacks follow LIFO, queues follow FIFO
- c) Both follow LIFO
- d) Both follow FIFO

16. Given a stack with elements [2, 4, 6, 8], what is the result after a pop operation?

- a) [2, 4, 6]
- b) [4, 6, 8]
- c) [2, 4, 8]
- d) [2, 6, 8]

17. Which stack application is most relevant for function call management in programming?

- a) Backtracking
- b) Undo operations
- c) Function call stack
- d) Expression evaluation

18. Which of the following is a correct prefix expression for $(A + B) * C$?

- a) A B + C *
- b) * + A B C
- c) + A B * C
- d) * C + A B

19. Given the infix expression $5 * (3 + 2)$, create its binary tree representation in terms of operators and operands. What is the root of the tree?

- a) *
- b) +
- c) 5
- d) (3 + 2)

20. Convert the infix expression $A + B * C$ to postfix.

- a) A B C * +
- b) A + B * C
- c) A B + C *
- d) A + C B *

_____ 21. Identify the error in the postfix expression A B + * C.

- a) Misplaced operator b) Missing operand
- c) Too many operators d) Correct expression

_____ 22. Which of the following postfix expressions produces the result 20 when evaluated?

- a) 4 5 + 2 * b) 5 4 2 * + c) 5 4 + 2 * d) 5 2 * 4 +

_____ 23. In a web server, how can a queue be used to handle incoming requests?

- a) By immediately processing each request.
- b) By discarding requests if the server is overloaded.
- c) By storing requests in a queue and processing them one by one.
- d) By prioritizing requests based on their source IP address.

_____ 24. If a stack overflows, what does this indicate?

- a) Memory leak b) Stack is empty
- c) Stack is full d) Unused memory

_____ 25. Which of the following scenarios is best suited for applying Counting Sort?

- a. Sorting a large dataset of floating-point numbers.
- b. Sorting non-negative integers with a known small range (e.g., 0 to 100).
- c. Sorting a dataset where elements are strings with varying lengths.
- d. Sorting negative integers without a specified range

_____ 26. In a postfix expression evaluation using stacks, what is the first operation performed?

- a) Push operands into the stack b) Push operators into the stack
- c) Evaluate operators d) Reverse the expression stack

_____ 27. What is another name for postfix notation?

- a) Reverse Polish Notation c) Inorder Notation
- b) Polish Notation d) Postorder Notation

_____ 28. Determine the equivalent infix expression for the prefix expression + A * B C.

- a) A + B * C b) (A + B) * C
- c) A * (B + C) d) (A * B) + C

_____ 29. Consider the following BST:

10

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5 20

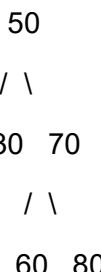
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2 7

What is the result of searching for the value 7?

- a) Found in the left subtree of 10 b) Found in the right subtree of 10
- c) Not found in the BST d) Found at the root

30. Evaluate the height of the following tree:



- a) 2 b) 3 c) 4 d) 1

31. Which of these is a practical disadvantage of stack implementation?

- a) Limited memory b) Difficult to debug
c) Non-intuitive operations d) Overflow and underflow issues

32. What does infix notation mean?

- a) Operators appear after operands b) Operators appear before operands
c) Operators appear between operands d) None of the above

33. What is the main advantage of postfix over infix notation in computation?

- a) No need for parentheses b) Easier to read
c) Reduced memory usage d) None of the above

34. Which of the following cannot be implemented using a stack?

- a) Balancing symbols b) Recursive function call management
c) Binary tree traversal d) Breadth-first search

35. How can a queue be used to implement a print spooler?

- a) By storing print jobs in a queue and processing them one by one.
b) By discarding print jobs if the printer is busy.
c) By prioritizing print jobs based on their size.
d) By printing all jobs simultaneously

Test II: Implementation (10 points)

Given the array [45, 23, 78, 12, 56], apply the selection sort algorithm and show the array after the second pass of the algorithm.

Answer:

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