Reg. No.														

B.Tech/ M.Tech (Integrated) DEGREE EXAMINATION, MAY 2024

Third Semester

21CSC201J – DATA STRUCTURES AND ALGORITHMS

(For the candidates admitted from the academic year 2022-2023 onwards)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours | Max. Marks: 75

PART – A (20 × 1 = 20Marks) | Marks | BL | CO | PO

Answer **ALL** Questions

1. Which of the following case does not exist in complexity theory? | 1 | 1 | 1 | 1

(A) Best case (B) Worst case
(C) Average case (D) Base case

2. How many times the following code prints the string "hello" | 1 | 2 | 1 | 2

```
for (i = 1; i<=50; i++)
    printf ("hello");
```

(A) 1 (B) 50
(C) Zero (D) 49

3. Elements in an array are accessed _____. | 1 | 1 | 1 | 1

(A) Randomly (B) Sequentially
(C) Exponentially (D) Logarithmically

4. Which loop is guaranteed to execute at least one time | 1 | 1 | 1 | 1

(A) For (B) While
(C) Do while (D) Both for and while

5. Linked list data structure offers considerable saving in | 1 | 1 | 2 | 1

(A) Computational time (B) Space utilization
(C) Space utilization and computational time (D) Speed utilization

6. Which of the following is false about a double linked list? | 1 | 1 | 2 | 1

(A) Navigate in both the directions (B) It requires more space than a singly linked list
(C) The insertion and deletion of a node take a bit longer (D) Implementing a double LL is easier than SLL

7. Which of the following application makes use of a circular linked list? | 1 | 1 | 2 | 1

(A) Undo operation in a text editor (B) Recursive function calls
(C) Allocating CPU to resources (D) Implement hash tables

8. What is the functionality of the below code: | 1 | 2 | 2 | 1

```
public void function (Node node)
  {
   if (size = = 0)
      head = node;
```

```
    else
       Node temp, cur;
       for cur = head; (temp = cur.getNext( )! = null; cur = temp)        cur.setNext
(node);
            }
             size + +;
    }
```

(A) Inserting a node at the beginning of the list
(B) Deleting a node at the beginning of the list
(C) Inserting a node at the end of the list
(D) Deleting a node at the end of the list

9. What does the following function check for? 1 3 3 2

```
#define max 10
 typedef struct stack
 {
  int top;
  int item [max];
 } stack;
int function (stack *s)
{
 if (s→top = = -1)
    return 1;
 else
    return 0;
}
```

(A) Full stack
(B) Invalid stack
(C) Empty stack
(D) Infinite stack

10. The postfix form of the expression $(A+B)*(C*D-E)*F/G$ 1 2 3 2

(A) $AB+CD*E-FG/**$
(B) $AB+CD*E-F**G/$
(C) $AB+CD*E-*F*G/$
(D) $AB+CDE*-*F*G/$

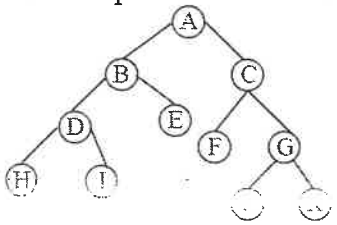
11. A linear list of elements in which deletion can be done from one end and insertion can take in place only at the other end is known as 1 1 3 1

(A) Queue
(B) Stack
(C) Tree
(D) Linked list

12. A data structure in which elements can be inserted or deleted at / from both ends but not in the middle is? 1 1 3 1

(A) Queue
(B) Circular queue
(C) Dequeue
(D) Priority queue

13. Find the pre-order traversal sequence. 1 2 4 2



(A) HIDEGFJKGCA
(B) HDIBEAFCJGK
(C) ABDHIECFGJK
(D) ABCDEFGHIJK

14. What is direct addressing? 1 2 4 1

(A) Distinct array position for every possible key
(B) Fewer array positions than keys
(C) Fewer keys than array positions
(D) Same array position for all keys

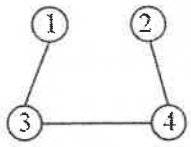
15. A binary search tree contains values 7, 8, 13, 26, 35, 40, 70. 75. Which one of the following is a valid post order sequence of the tree provided the pre-order sequence as 35, 13, 7, 8, 26, 70, 40 and 75? 1 1 4 2

(A) 7, 8, 26, 13, 75, 40, 70, 35 (B) 26, 13, 7, 8, 70, 75, 40, 35
(C) 7, 8, 13, 26, 35, 40, 70, 75 (D) 8, 7, 26, 13, 40, 75, 70, 35

16. What data organization method is used in hash tables? 1 1 4 1

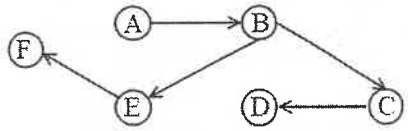
(A) Stack (B) Array
(C) Linked list (D) Queue

17. What would be the number of zero in the adjacency matrix of the given graph? 1 1 5 1



(A) 10 (B) 6
(C) 16 (D) 0

18. Which of the following is not a topological sorting of the given graph? 1 1 5 1

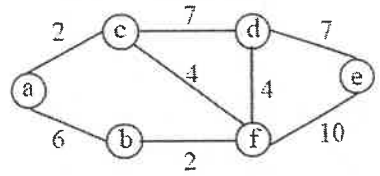


(A) ABCDEF (B) ABFEDC
(C) ABECFD (D) ABCDFE

19. The travelling salesman problem can be solved using. 1 1 5 1

(A) Spanning tree (B) A minimum spanning tree
(C) Bellman-Ford algorithm (D) DFS traversal

20. Consider the graph 1 1 5 1



What is the total cost of minimum spanning tree using Kruskals algorithm?

(A) 24 (B) 23
(C) 15 (D) 19

PART – B (5 × 8 = 40 Marks) Marks BL CO PO

Answer **ALL** Questions

21. a. How arrays can be created dynamically? Prove how it improves the performance of a program. 8 4 1 1

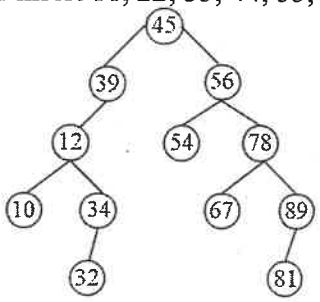
(OR)

b. Write a 'C' program to store students information using structures. How effectively improved using pointers? 8 4 1 1

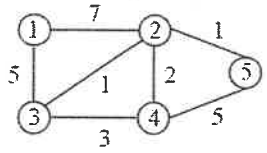
22. a. Consider an array A[1:n]. Given a position, write an algorithm to insert an element in the array. If the position is empty, the element is inserted easily. If the position is already occupied the element should be inserted with the minimum number of shifts. 8 4 2 2

(OR)

b.	Describe the following (i) Applications of list (ii) Polynomial manipulation	8	3	2	2
23. a.	Develop and show the simulation using stack for evaluation of the following expression: $12+3*14-(5*16)+7$.	8	4	3	2
	(OR)				
b.	Illustrate the steps to insert the following elements step by step in sequence into an empty AVL tree 15, 18, 20, 21, 28, 23, 30, 26.	8	4	3	2
24. a.	Consider the binary search tree given below: Show the result of in-order, pre-order and post-order traversal. Show the deletion of the root node and insert 11, 22, 33, 44, 55, 66 and 77 in the tree.	8	3	4	2

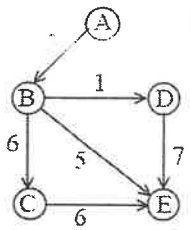


	(OR)				
b.	Illustrate how different notations performed on a AVL tree with suitable example and routines.	8	3	4	2
25. a.	Illustrate the algorithm to compute the shortest path using Dijkstra's algorithm. Validate the algorithm with suitable example.	8	4	5	2
	(OR)				
b.	Illustrate Kruskal's algorithm to find the minimum spanning tree of a graph. Trace the algorithm for the following graph.	8	4	5	2



PART – C (1 × 15 = 15 Marks)
Answer **ANY ONE** Question

		Marks	BL	CO	PO
26.	Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \bmod 10$, show the resulting (i) Open hash table (ii) Closed hash table using linear probing (iii) Closed hash table using quadratic probing	15	4	5	2
27.	Apply an appropriate algorithm to find the shortest path from 'A' to every other node of A. For the given graph	15	4	5	2



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