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

21ECC212T – 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)

Answer **ALL** Questions

Marks BL CO PO

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|--|---|---|---|---|
| 1. In C, which of the following is the correct way to declare a two-dimensional array? | 1 | 1 | 1 | 1 |
| (A) int[3][3] matrix; | | | | |
| (B) matrix int[3][3]; | | | | |
| (C) int matrix [3][3]; | | | | |
| (D) Array matrix [3][3]; | | | | |
| 2. Which function is used to find the length of the array in C? | 1 | 1 | 1 | 1 |
| (A) Size () | | | | |
| (B) Size of () | | | | |
| (C) Length () | | | | |
| (D) Length of () | | | | |
| 3. What is the time complexity for inserting a node at the beginning of a linked list? | 1 | 1 | 1 | 1 |
| (A) O(1) | | | | |
| (B) O(n) | | | | |
| (C) O(n ²) | | | | |
| (D) O(2) | | | | |
| 4. What is the main disadvantage of a singly linked list compared to an array? | 1 | 2 | 1 | 1 |
| (A) Faster element access | | | | |
| (B) Dynamic size | | | | |
| (C) Inefficient memory usage | | | | |
| (D) Easier to implement | | | | |
| 5. Which of the following is an application of stack data structure? | 1 | 1 | 2 | 1 |
| (A) Representing a hierarchical structure | | | | |
| (B) Implementing breadth-first search | | | | |
| (C) Function call management | | | | |
| (D) Storing sorted elements | | | | |
| 6. Which of the following is the correct sequence of operations to convert an infix to postfix using an stack? | 1 | 1 | 2 | 1 |
| (A) Push, Pop | | | | |
| (B) Peek, Push | | | | |
| (C) Pop, Push | | | | |
| (D) Push, Peek | | | | |
| 7. What is a queue in data structure? | 1 | 1 | 2 | 1 |
| (A) Linear data structure | | | | |
| (B) Non-linear data structure | | | | |
| (C) Hierarchical data structure | | | | |
| (D) Network data structure | | | | |
| 8. Which of the following operations not typically associated with queues? | 1 | 1 | 2 | 1 |
| (A) Enqueue | | | | |
| (B) Dequeue | | | | |
| (C) Push | | | | |
| (D) Peek | | | | |

9. How many children can a node have in a general tree?
 (A) 0 (B) 1
 (C) Multiple (D) Exactly 2 1 1 3 1
10. What is a forest in the context of trees?
 (A) Large tree in a forest (B) Collection of multiple trees
 (C) Specific type of binary tree (D) Tree without nodes 1 1 3 2
11. Which traversal visits the left subtree, then the root and finally the right subtree in a binary tree?
 (A) Preorder (B) Inorder
 (C) Post order (D) Level order 1 1 3 1
12. What is the primary purpose of a AVL tree?
 (A) To represent hierarchical structures (B) To efficiently search for an element
 (C) To maintain a balanced binary search tree (D) To visualize binary data 1 1 3 1
13. What is a directed graph?
 (A) A graph with only one vertex (B) A graph with edges having a specific direction
 (C) A graph with weighted edge (D) A graph with no cycles 1 2 4 2
14. What is the primary application of Dijkstra's algorithm in transportation networks?
 (A) Shortest path calculation (B) Cycle detection
 (C) Maximum flow determination (D) Topological sorting 1 2 4 2
15. Which traversal algorithm explores as far as possible along each branch before backtracking in a graph?
 (A) Breadth-first search (B) Depth first search
 (C) Dijkstra's algorithm (D) Prim's algorithm 1 2 4 2
16. What is the purpose of kruskal's algorithm?
 (A) To find the shortest path in the graph (B) To identify strongly connected components in a graph
 (C) To find the minimum spanning tree in a graph (D) To traverse all vertices or edges of a graph 1 2 4 2
17. When is linear search most suitable?
 (A) Small sorted datasets (B) Large unsorted datasets
 (C) Databases with indexing (D) Always efficient 1 2 5 2
18. In binary search, on which type of data structure does it operate efficiently?
 (A) Unsorted array (B) Linked list
 (C) Sorted array (D) Stack 1 1 5 2
19. What is the best case time complexity of bubble sort?
 (A) $O(n)$ (B) $O(1)$
 (C) $O(\log n)$ (D) $O(2n)$ 1 2 5 2

20. What is the worst case time complexity of insertion sort?

(A) $O(n^2)$

(B) $O(1)$

(C) $O(n)$

(D) $O(2n)$

1 2 5 2

PART – B ($5 \times 8 = 40$ Marks)

Answer ALL Questions

Marks BL CO PO

21. a. Write the application of linked list and explain the addition of polynomial addition using an linked list.

8 2 1 2

(OR)

b. Write the pseudocode for creating a 4×4 matrix.

8 2 1 3

22. a. Convert infix to post fix for given expression
 $a+b*c/d+e/f$

8 3 2 3

(OR)

b. Write algorithm for enqueue and dequeue on queue using an linked list with suitable factorial representation.

8 3 2 3

23. a. Explain the AVL tree rotations and insertion operations with an example.

8 3 3 3

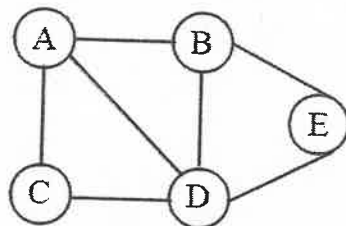
(OR)

b. Construct an binary search tree using the following elements 47 41 58 14 37 80 34 12 91 84 after creation, insert 51 data.

8 3 3 3

24. a. For the following graph, write an adjacency matrix and adjacency list in the memory.

8 3 4 3



(OR)

b. Define heaps. With example, explain about binomial heaps.

8 3 4 2

25. a. Consider the following data:

-2, 45, 0, 11, -9. Use bubble sort to arrange in increasing order.

8 3 5 2

(OR)

b. Explain the binary search algorithm with an example. Write pseudocode for the same.

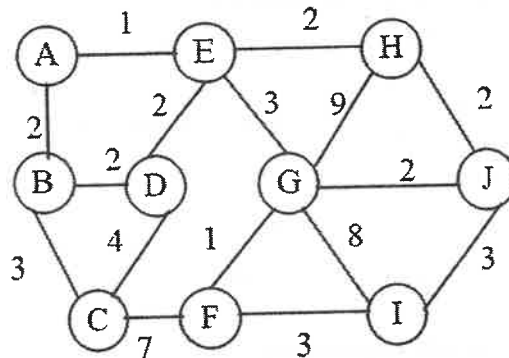
8 3 5 3

PART – C (1 × 15 = 15 Marks)

Marks BL CO PO

Answer ANY ONE Question

26. Find the minimum spanning tree for the graph given below using Prim's algorithm. 15 4 1 3



27. Consider a scenario where you are tasked to develop a C program that manage a student database using arrays. Each student records consist of the following information. 15 4 1 3

- (i) Student ID
- (ii) Name
- (iii) Marks in Maths (int)
- (iv) Marks in English (int)
- (v) Marks in Science (int)

Implement the following functions

- (1) Create an function to input data for given number of students (50)
- (2) Display student data
- (3) Average marks (calculate and display the average in Maths, English, Science for all students)

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