

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIRST SEMESTER M.C.A DEGREE EXAMINATION (Regular), DECEMBER 2022  
(2021 SCHEME)****Course Code: 21CA102****Course Name: Advanced Data Structures****Max. Marks: 60****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Explain the implementation of sets using bit string.
2. Differentiate linked list and array.
3. Define splaying with an example.
4. Write an algorithm to perform inorder and preorder traversal with an example.
5. Create a max heap tree using the following data 32, 15, 20, 30, 12, 25, 16.
6. Differentiate binomial heap and fibonacci heap.
7. Define strongly connected components of a graph.
8. In a weighted graph, assume that the shortest path from a source 's' to a destination 't' is correctly calculated using a shortest path algorithm. If we increase weight of every edge by 1, the shortest path always remains same. Is the following statement true?
9. What are the characteristics of a good hash function?
10. Explain quadratic probing with an example.

**PART B*****(Answer one full question from each module, each question carries 6 marks)*****MODULE I**

11. Write an algorithm to delete a node of a singly linked list by taking the position from user. The position can be first, last or any position. (6)  
Explain with an example.

**OR**

12. Write an algorithm to insert an element in a circular linked list. (6)

**MODULE II**

13. a) Write an algorithm to delete a node from a B-Tree. Explain with an example. (3)
- b) Construct a B-Tree of order five from the following data items: (3)  
16,20,22,42,12,30

**OR**

14. a) Construct a red black tree by inserting the keys 41,38,31,12,19,8 into an empty red-black tree. (3)  
 b) Write an algorithm to insert an element in a red black tree. (3)

**MODULE III**

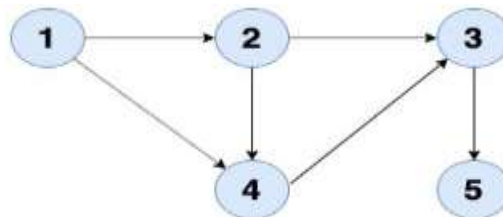
15. a) Explain the procedure to decrease a key in a binomial heap with an example. (3)  
 b) Explain the procedure to extract the node with minimum key from a binomial heap with an example. (3)

**OR**

16. Write an algorithm to extract the minimum key in a fibonacci Heap. (6)

**MODULE IV**

17. a) Write the algorithm for DFS and analyse its complexity. (4)  
 b) Write the topological sorting for the graph given below:



(2)

**OR**

18. Explain Kruskal's algorithm.  
 Find the minimum cost spanning tree of the graph whose vertices are  $v_1, v_2, v_3, v_4, v_5, v_6$ , and  $v_7$ . The cost of the graph's edges are  $(v_1, v_2)=28$ ,  $(v_1, v_6)=10$ ,  $(v_6, v_5)=25$ ,  $(v_5, v_4)=22$ ,  $(v_5, v_7)=24$ ,  $(v_7, v_2)=14$ ,  $(v_2, v_3)=16$ ,  $(v_3, v_4)=12$  and  $(v_4, v_7)=18$ . (6)

**MODULE V**

19. Given the values {2341, 4234, 2839, 430, 22, 397, 3920} in a hash table of size 7 and a hash function,  $h(x) = x \bmod 7$ . Show the resulting table after inserting the values in the given order with each of the following collision strategies. (6)  
 (i) Separate chaining  
 (ii) Linear probing .

**OR**

20. Describe block chain architecture in detail. (6)

\*\*\*\*\*