22CAP103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MCA DEGREE EXAMINATION DECEMBER 2022
(First Semester)

Branch – **COMPUTER APPLICATIONS**

DATA STRUCTURES AND ALGORITHMS

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 Which of the following is not a linear data structure?
(i) Array (ii) Stack
(iii) Tree (iv) Queue

2 The main distinguishable characteristic of a binomial heap from a binary heap is that
(i) the location of child node is not fixed
(ii) it does not allow union operations that could easily be implemented in binary heap
(iii) the heap structure is not similar to complete binary tree
(iv) it allows union operations very efficiently

3 Which algorithm is used to solve a maximum flow problem?
(i) Prim's algorithm (ii) Ford-Fulkerson algorithm
(iii) Kruskal's algorithm (iv) Dijkstra's algorithm

4 Which approach is based on computing the distance between each pair of distinct points and finding a pair with the smallest distance?
(i) Brute force (ii) Exhaustive search
(iii) Divide and conquer (iv) Branch and bound

5 What are splay trees?
(i) self adjusting binary trees (ii) self adjusting binary search trees
(iii) tree with probability distributions (iv) tree with strings

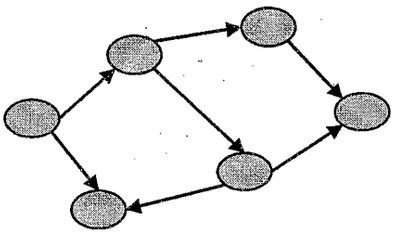
SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Explain Stack ADT and its operations.
OR
b Find the minimum and maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.

7 a Outline the purpose of d-heaps.
OR
b Discuss about binomial queue.

Cont...

8 a Write the topological sorting for the DAG given below.



OR

b Explain Network flow problem with an example.

9 a Explain Greedy Strategy.

OR

b Explain Approximate Bin Packing.

10 a Discuss Splay operation.

OR

b Explain Treaps and its operations.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a List the steps involved in insertion and deletion into a Doubly Linked list.

OR

b Elucidate binary search tree ADT.

12 a Create a procedure to insert a node into the binomial heap.

OR

b Differentiate between skew heap and leftist heap.

13 a Is it possible to find all pairs of shortest paths using Dijkstra's algorithm? Justify.

OR

b Write the Kruskal's algorithm for Minimum Spanning Tree. Analyze its complexity.

14 a Write Huffman code algorithm and derive its complexity.

OR

b Compare divide and conquer strategy with dynamic programming.

15 a Create the red-black tree that results after successively inserting the keys 41,38,31,12,19,8 into an initially empty red-black tree.

OR

b Criticize the application of k-d Trees.

Z-Z-Z END