[35103]
M.C.A DEGREE EXAMINATIONS
THIRD SEMESTER
Paper - III : DESIGN AND ANALYSIS OF ALGORITHMS
(2016-17, 2017-18, 2018-19, and 2019-20 Admitted Batches)

Time : 3 Hours **Maximum : 75 Marks**

SECTION - A

Answer ALL questions. **(4×15=60)**

1. a) Explain recursion tree method for solving recursive algorithms with suitable example.

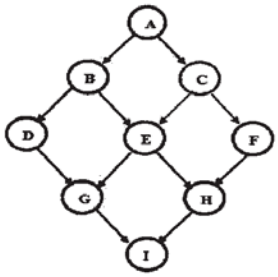
b) Write about asymptotic notations used to measure the running time of algorithm.

(OR)

c) State Master's theorem and find the time complexity for the following recurrence relations $T(n) = \begin{cases} 1 & if\ n = 1 \\ T(n-1) + n(n-1) & if\ n \geq 2 \end{cases}$

d) Illustrate selection sort algorithm with suitable example.

2. a) Find the BFS result on the following graph with A as starting vertex:



b) Write an algorithm for quick sort to sort A, L, G, O, R, I, T, H, M in alphabetical order

(OR)

c) Illustrate balanced search trees with suitable example.

d) Explain about topological sorting technique with example.

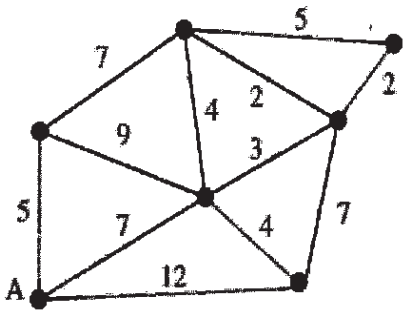
3. a) Given weight vector $(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$ and profit vector $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and Knapsack of capacity 15. Find Optimal solution for 0/1 knapsack problem

b) What is an optimal Huffman code for the following set of frequencies based on first 8 Fibonacci numbers: 1,1,2,3,5,8,13,21.

(OR)

c) With suitable example, describe Floyd's algorithm to solve the all - pair shortest path Problem.

d) Write the pseudo code for Kruskal algorithm. Construct Minimum spanning tree for the following graph using Kruskals algorithm.

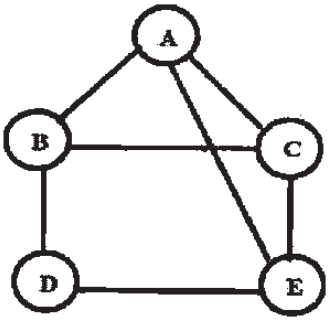


4. a) Find the subset from the given sum using back tracking: S = {1, 2, 5, 7} and d = 8.

b) Briefly explain about NP- completeness problems.

(OR)

c) Apply back tracking technique to solve the 3 - coloring problem for following graph



d) Describe branch and bound algorithm to solve the Travelling salesmen problem.

SECTION - B

Answer any five questions. **(5×3=15)**

5. a) Prove that $\sum_{k=0}^{n} k^3 = \Theta\left(n^4\right)$

b) What is the best and worst case complexities of merge sort?

c) Compare and contrast DFS and BFS.

d) What is meant by Heap condition?

e) State 4- queen problem.

f) Write short notes on B - trees.

g) What is meant by optimal binary search tree?

h) Define the classes of P and NP.
