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Paper Code : ES-CS401/PCC-CS 404/PCC-CS404/PCC-CSD 402/PCCCS404 Design & Analysis of Algorithms

UPID : 004416

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[1 x 10 = 10]

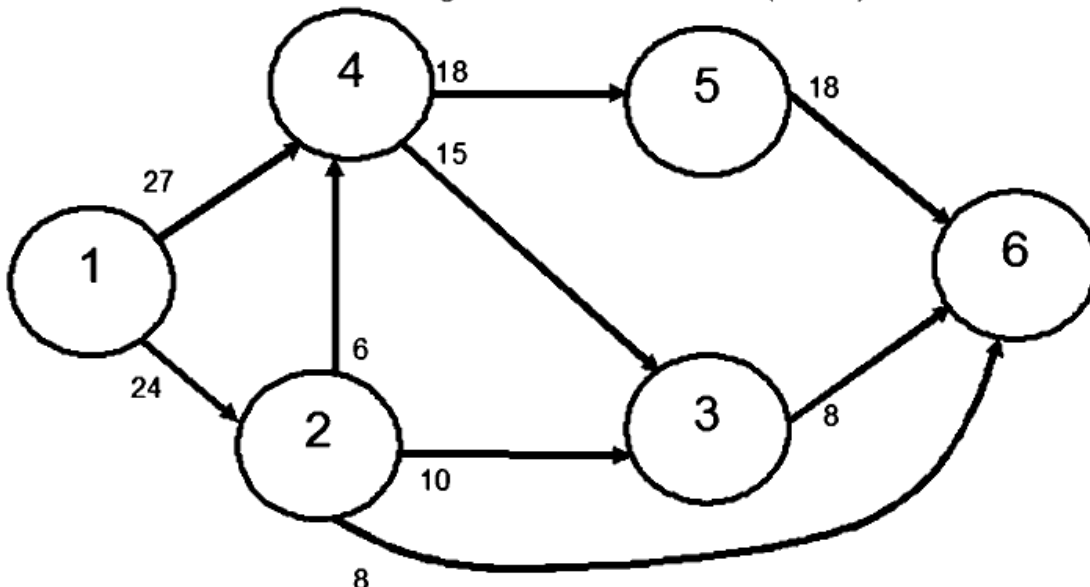
- (I) State True/False: Approximation algorithm guaranties the best quality of solution.
- (II) State True/False: $O(\log n) > O(n)$
- (III) What is the time complexity of Knapsack algorithm using Greedy method?
- (IV) State True/ False: Adjacency matrix and Path Matrix are same.
- (V) State True/ False: Ordered searching algorithm is a Polynomial Algorithm.
- (VI) State True/False: Brute Force method gives the best quality of solution.
- (VII) State True/ False: Travelling Salesman Problem is a Non-Polynomial problem.
- (VIII) Name one heuristic method of searching.
- (IX) Best case time complexity of Binary search algorithm is _____
- (X) The time complexity of Floyd's algorithm is _____
- (XI) Backtracking follows _____ traversal technique.
- (XII) What is spanning tree?

Group-B (Short Answer Type Question)

Answer any three of the following :

[5 x 3 = 15]

2. Write down an algorithm to solve the Job Sequencing with Deadline Problem using Greedy method. What is the time complexity of your algorithm? [5]
3. Find the maximum flow of the following network. Mention each step clearly. [5]



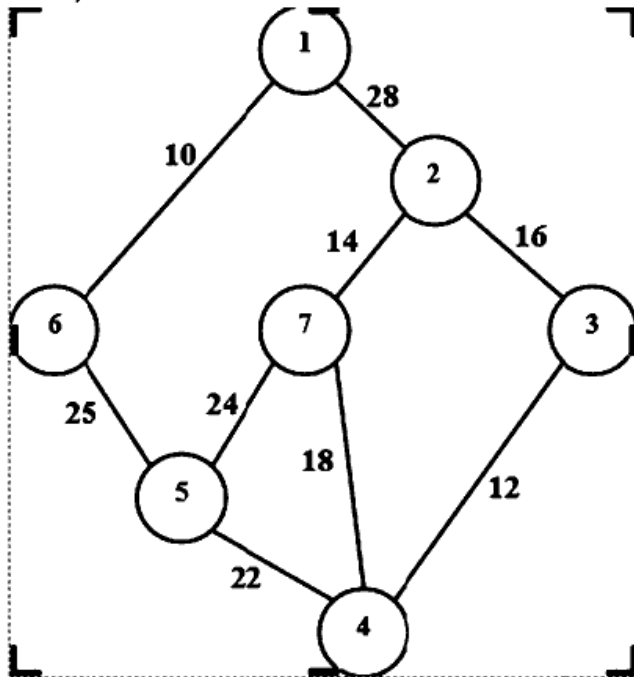
4. Write down an algorithm in Greedy method to find the minimum spanning tree by Prim's algorithm. What is the time complexity of your algorithm? [5]
5. (a) State Cook's Theorem. [5]
(b) Define Clique with example.
6. Define the following terms: [5]
(i) Brute Force Algorithm

Group-C (Long Answer Type Question)

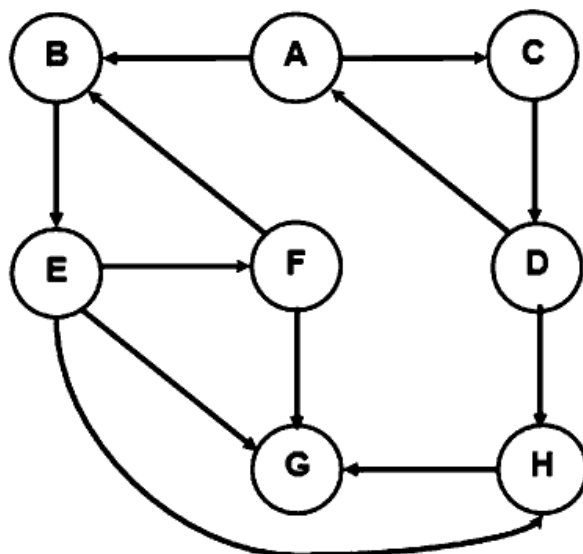
Answer any three of the following :

[15 x 3 = 45]

7. (a) Find the minimum spanning tree using Prim's method from the following graph. Mention each step clearly. [6]



- (b) Write an algorithm to find all solutions of N-Queens problem using backtracking. [4]
 (c) What is the time complexity of your algorithm? [1]
 (d) Write an algorithm to find all pairs shortest path using Floyd's method. [4]
8. (a) Write down an algorithm of Quick Sort. [5]
 (b) Derive the best, worst and average case time complexity of your algorithm. [2+3+5]
9. (a) Find the minimum number of scalar operation needed to multiply the matrices A1, A2, A3 and A4 having dimensions 30×35, 35×15, 15×5 and 5×10 respectively. [5]
 (b) Write down an algorithm using Greedy method to find minimum spanning tree by Krushkal's algorithm. [5]
 (c) Find the time complexity of your algorithm. [3]
 (d) Differentiate between Backtracking and Branch and Bound. [2]
10. (a) Find the transitive closure of vertex A from the following graph: [3]



- (b) Define the following terms: [12]
 (i) Directed graph
 (ii) Undirected graph

- (iii) In-Degree and Out-Degree
- (iv) Complete Graph
- (v) Articulation Point
- (vi) Bridge

11. (a) Differentiate between recursion and iteration. [3]

(b) Find the time complexity of the following recurrence relations using Master's Theorem. [4+4]

(i)

$$T(n) = 2T\left(\frac{n}{4}\right) + n^{0.51}$$

(ii)

$$T(n) = \sqrt{2}T\left(\frac{n}{2}\right) + \log n$$

(c) (c) Define little omega notation. Explain with an example. [2+2]

*** END OF PAPER ***