



POORNIMA UNIVERSITY, JAIPUR
END SEMESTER EXAMINATION, 2023-2024 EVEN SEMESTER

Write Roll No Below: _____

MCA (ALL) I () - II sem (Main/Back) End Semester Examination,
MCACCA2101: Design & Analysis of Algorithms

Time: 3 Hours

Total Marks: 60

Min. Passing Marks: 21/24/27

Question Paper ID: 001349

Instructions: Attempt all five questions. There is an internal choice either (a or b) in Q1 to Q5. Marks of each question or its parts are indicated against each question/part. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Bloom Level(BL): 1-Remembering, 2-Understanding, 3-Applying, 4-Analysing, 5-Evaluating, 6-Creating

Use of following supporting material is permitted during examination for this subject: Nil

- Q1. (a)** (i) What is Time Complexity? Explain Asymptotic notation with suitable diagram. **(Marks 6)**
(ii) Solve the following recurrence relation: - **(Marks 6)**

Marks BL CO
12 1 1

- a. $T(n) = T(n-1) + n$
b. $T(n) = 2T(n/2) + kn$

(OR)

- (b)** (i) Write recursive algo for calculating factorial of any number. Compute recurrence relation and calculate the time complexity of the same. **(Marks 8)**
(ii) Explain any two applications of Stack. **(Marks 4)**

- Q2. (a)** (i) What is the recurrence relation of recursive Quick sort? Write the Algorithm of Quick Sort, and sort the following sequence using Quick Sort. **(Marks 6)**

Marks BL CO
12 1 2

44 33 11 55 77 90 40 60 99 22 88

- (ii) Write the algorithm of Fractional Knapsack and find the total profit by greedy approach of the following instance of Knapsack Problem. **(Marks 6)**

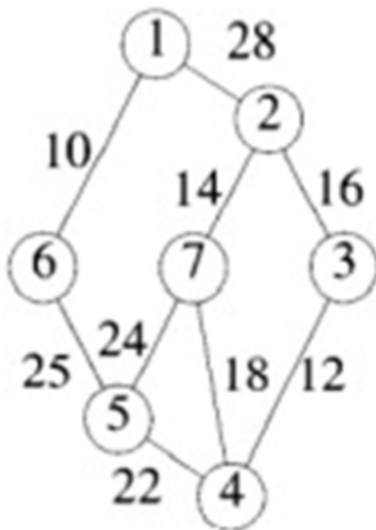
$W = \{4, 10, 5, 6, 8, 3\}$

$V = \{20, 15, 30, 18, 16, 21\}$

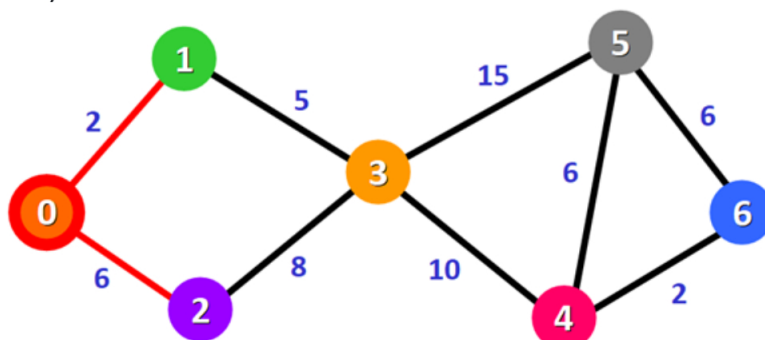
Capacity of Knapsack is 20.

(OR)

- (b)** (i) Given a weighted undirected graph. Find the sum of weights of edges of a Minimum Spanning Tree. Show the steps to find minimum spanning tree. **(Marks 6)**



- (ii) Find the single-source shortest path using the Dijkstra algorithm for the following graph- **(Marks 6)**



Q3. (a)

(i) Solve the travelling salesman problem having the following cost matrix, using branch and bound techniques. (Marks 12)

Marks BL CO
12 1 3

∞	2	3	4
4	∞	2	3
9	2	∞	5
6	5	1	∞

(OR)

(b)

Solve the resource allocation problem of multi stage graph. Using Dynamic programming by taking sequence of decision and follow principle of optimality. (Marks 12)

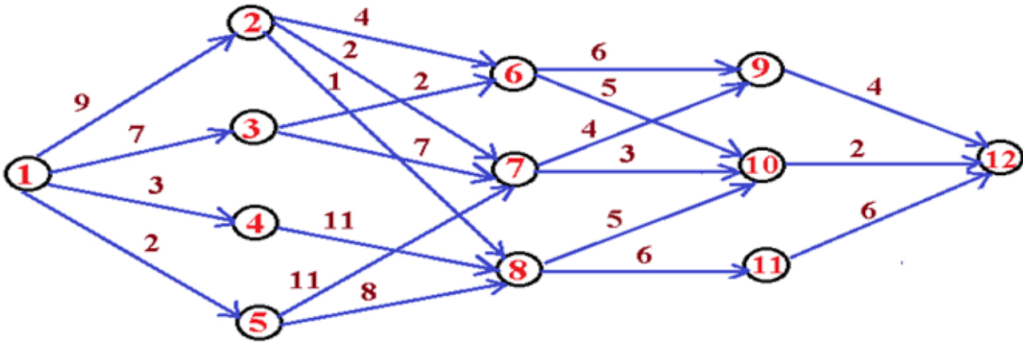


Fig-1

Q4. (a)

(i) Differentiate between Las Vegas and Monte Carlo algorithm. (Marks 6)

Marks BL CO
12 1 4

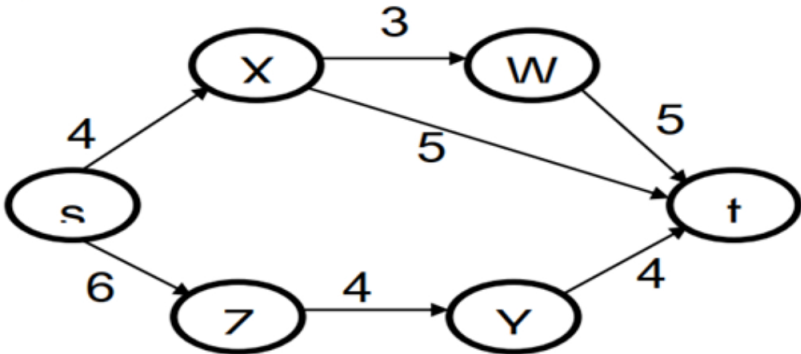
(ii) How randomize quick sort improve the worst case time complexity of deterministic quick sort? What will be the running time randomize quick sort. (In worst case scenario) (Marks 6)

(OR)

(b)

(i) What is min-cut problem? How can we solve it using a randomized method? Illustrate with an example. (Marks 6)

(ii) What are Flow networks? Implement the Ford Fulkerson Method on the below given graph: (Marks 6)



Q5. (a)

Explain the following with an example: - (Marks 12)

Marks BL CO
12 1 5

- a)

Parallel Multiplication
- b)

Parallel Division
- c)

Parallel evaluation of general arithmetic expression
- First -order linear recurrence

(OR)

(b)

Solve the following multiplication using a parallel algorithm: - (Marks 12)

2	3	4	5
9	8	7	6
5	4	2	3
8	7	3	4

Matrix A

3	5	7	6
2	7	6	3
7	5	3	2
4	3	2	5

Matrix B

*****End of Question Paper*****