

Fourth Semester B.E. Degree Examination, June/July 2013
Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1
 - a. What is an algorithm? What are the properties of an algorithm? Explain with an example. (08 Marks)
 - b. Explain brute force method for algorithm design and analysis. Explain the brute force string matching algorithm with its efficiency. (08 Marks)
 - c. Express using asymptotic notation i) $n!$ ii) $6 * 2^n + n^2$. (04 Marks)
- 2
 - a. Explain divide and conquer technique. Write the algorithm for binary search and find average case efficiency. (10 Marks)
 - b. What is stable algorithm? Is quick sort stable? Explain with example. (06 Marks)
 - c. Give an algorithm for merge sort. (04 Marks)
- 3
 - a. Explain the concept of greedy technique for Prim's algorithm. Obtain minimum cost spanning tree for the graph below Prim's algorithm. (09 Marks)

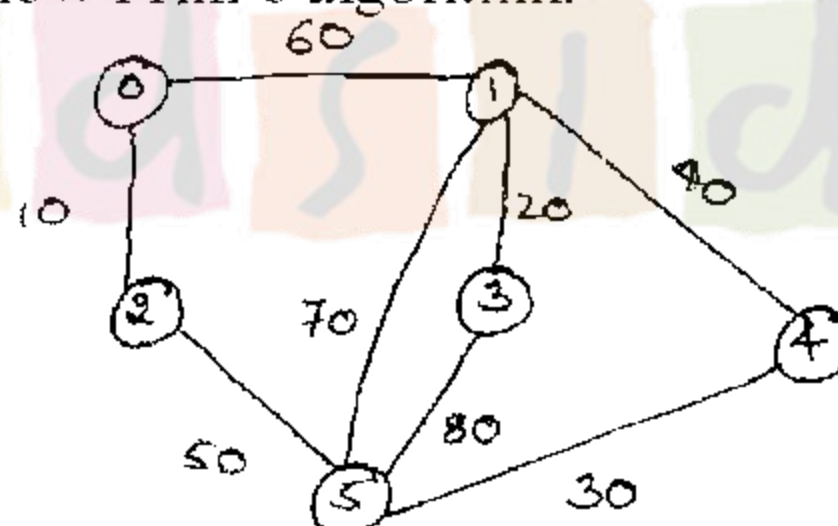


Fig.Q.3(a)

- b. Solve the following single source shortest path problem assuming vertex 5 as the source. (09 Marks)

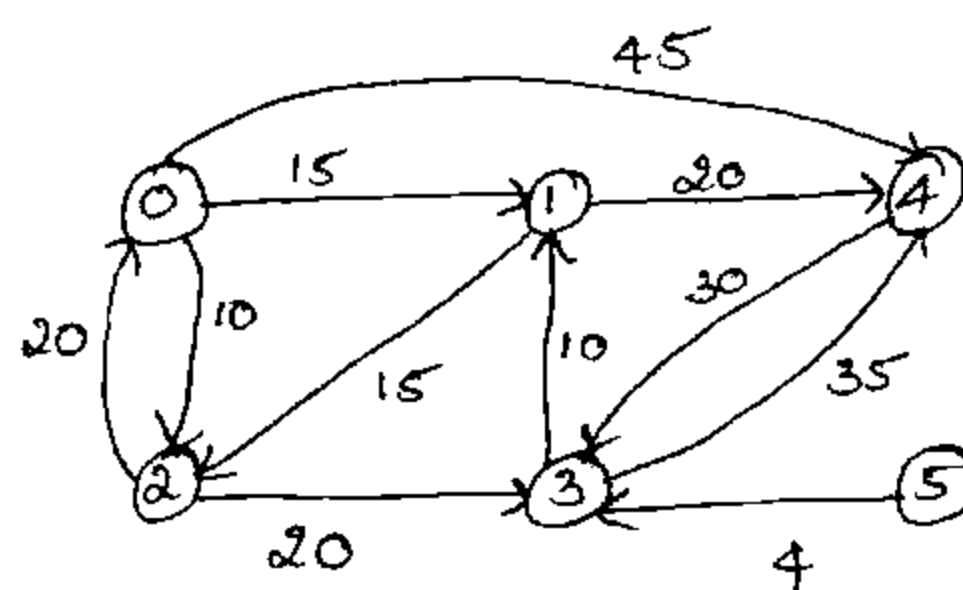


Fig.Q.3(b)

- c. Define the following: i) Optimal solution; ii) Feasible solution. (02 Marks)
- 4
 - a. Using Floyd's algorithm solve the all pair shortest problem for the graph whose weight matrix is given below:

$$\begin{bmatrix}
 0 & \infty & 3 & \infty \\
 2 & 0 & \infty & \infty \\
 \infty & 7 & 0 & 1 \\
 6 & \infty & \infty & 0
 \end{bmatrix}$$

(07 Marks)

- b. Using dynamic programming, solve the following knapsack instance.
 $N = 4$ $M = 5$
 $(W_1, W_2, W_3, W_4) = (2, 1, 3, 2)$
 $(P_1, P_2, P_3, P_4) = (12, 10, 20, 15).$ (05 Marks)
- c. Outline an exhaustive search algorithm to solve traveling salesman problem. (08 Marks)

PART – B

- 5 a. Write and explain DFS and BFS algorithm with example. (08 Marks)
- b. Obtain topologies sorting for the given diagram using source removal method. (05 Marks)

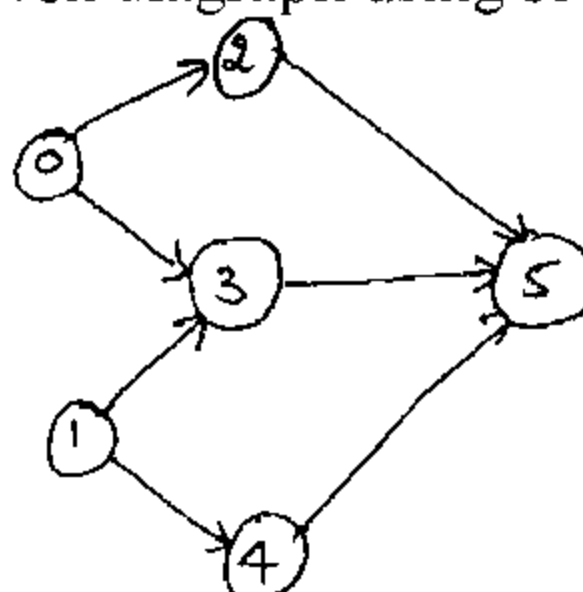


Fig.Q.5(b)

- c. Explain Horspool's string matching algorithm for a text that comprises letters and space (denoted by hyphen) i.e "JIM-SAW-ME-IN-BARBER-SHOP" with pattern "BARBER". Explain its working along with a neat table and algorithm to find shift table. (07 Marks)
- 6 a. Define the following:
 i) Class P
 ii) Class NP
 iii) NP complete problem
 iv) NP hard problem. (08 Marks)
- b. Write the decision tree to sort the elements using selection sort and find the lower bound. (08 Marks)
- c. What is numeric analysis? (02 Marks)
- d. Brief overflow and underflow in numeric analysis algorithms. (02 Marks)
- 7 a. What is back tracking? Apply back tracking problem to solve the instance of the sum of subset problem: $S = \{3, 5, 6, 7\}$ and $d = 15$. (07 Marks)
- b. With the help of a state space tree, solve the following instance of the knapsack problem by the branch-and-bound algorithm. (06 Marks)

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12
Knapsack	Capacity	$W = 10$

- c. Explain how backtracking is used for solving 4-queen's problem. Show the state space table. (07 Marks)
- 8 a. What is prefix computation problem? Give the algorithms for prefix computation which uses: i) n processors; ii) $n/\log n$ processors. Obtain the time complexities of these algorithms. (10 Marks)
- b. What is super linear speed up? Obtain the maximum speed up when $P = 10$ and various values of $f = 0.5, 0.1, 0.01$. (05 Marks)
- c. What are the different ways of resolving read and write conflicts? (05 Marks)
