B.Tech VIth Semester (Main/Back) Examination, June-2010

Computer & IT

DESIGN & ANALYSIS OF ALGORITHMS

(Common for 6CS3 and 6IT3)

6E3016

Time: 3 Hr. **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

Attempt any ***five Questions*** selecting ***one question*** from ***each unit***. All questions carry ***equal marks***. (Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.)

Unit-I

Q.1 (a) Write a recursive algorithm for Binary Search. What is the time complexity of the algorithm? **[5]**

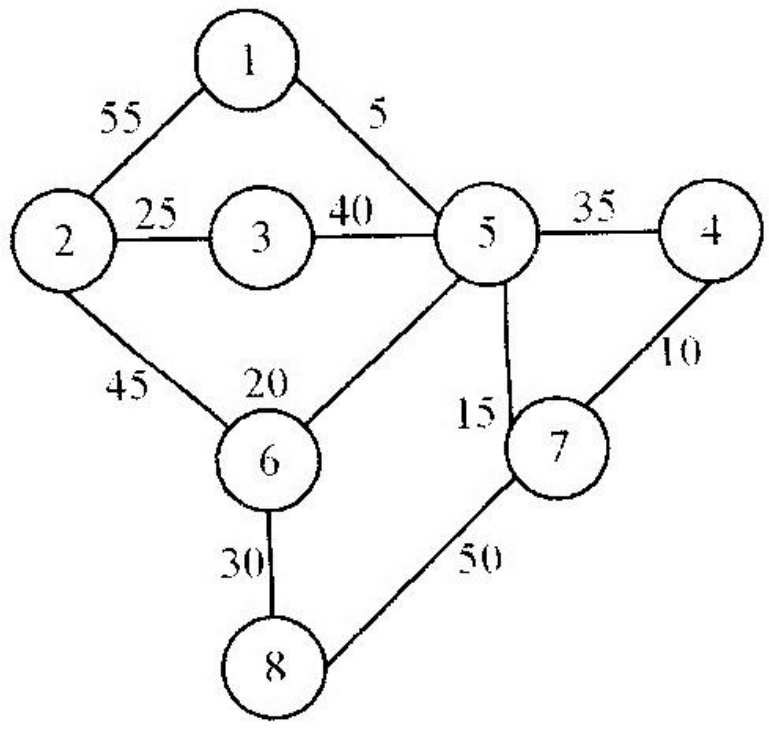
(b) Explain Strassen's matrix multiplication. Derive its time complexity. Why this is better than ordinary matrix multiplication? **[5]**

(c) What is the Greedy approach? Does it always give Optimal Solution? Give two examples in which Greedy algorithm gives optimal solution. **[6]**

OR

Q.1 (a) Write an efficient algorithm to determine the second largest element of n numbers Determine the number of comparisons needed to find it. **[4]**

(b) Trace the Kruskal's algorithm to obtain the minimum spanning tree from the following graph.



(c) On what kind of input does the Quick sort algorithm exhibit its worst-case behaviour? Why? **[4]**

Unit-II

Q.2 (a) Write mathematical formulation of 0-1 knapsack problem. Use dynamic programming approach to solve the following instance of the problem

Maximum capacity	: 11 units
No of items	: 5
Weights	: 1, 2, 5, 6, 7
Profits	: 1, 6, 18, 22, 28

[10]

(b) Prove that the lower bound of sorting a sequence of n elements using comparisons based sorting algorithm is n logn. **[6]**

OR

(a) Give an 8 × 8 chessboard. A 'q' is placed on the one square of the chessboard. You have to place only one 'q' in each row and column and no two 'q' can be placed diagonally. Write the algorithm for the above problem using backtracking method. **[8]**

(b) Write the short note on the following: **[4+4]**

(i) Longest common subsequence

(ii) Backtracking Algorithms.

Unit-III

Q.3 (a) Write the Knuth-Morris-Pratt String Matching algorithm. What is its time complexity? Mention the situations when one should use the naive algorithm, Boyer-Moore algorithm and Knuth-Morris-Pratt algorithm. **[10]**

(b) Explain Rabin Karp method with suitable example. Also give the algorithm for the same. **[6]**

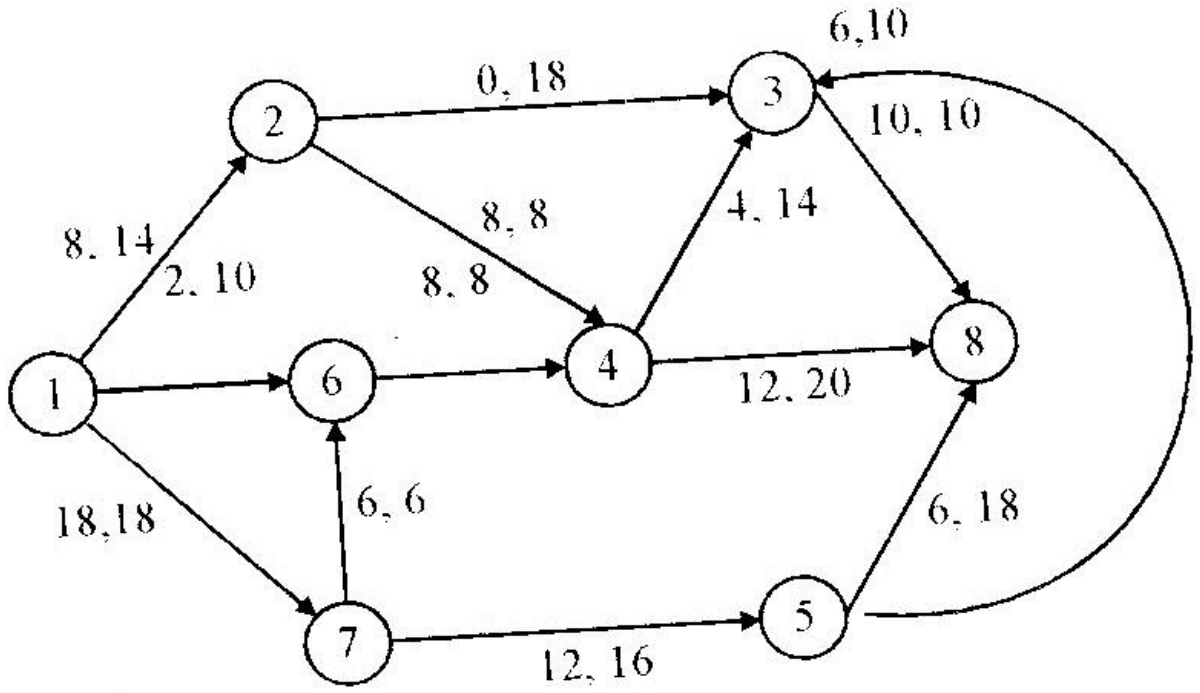
OR

Q.3 (a) Write Boyer-Moore Matcher algorithm for string matching. What is the use of prefix function in Knuth-Morris-Pratt String Matching Algorithm? **[10]**

(b) What is the basic idea behind String Matching? Explain with suitable example. **[6]**

Unit-IV

Q.4 (a) State and prove Ford Fulkerson'a theorem. Find out the maximum flow and minimum cut for the following network at a state, where first entry represents flow along that are and second entry represents the capacity of that arc. **[10]**

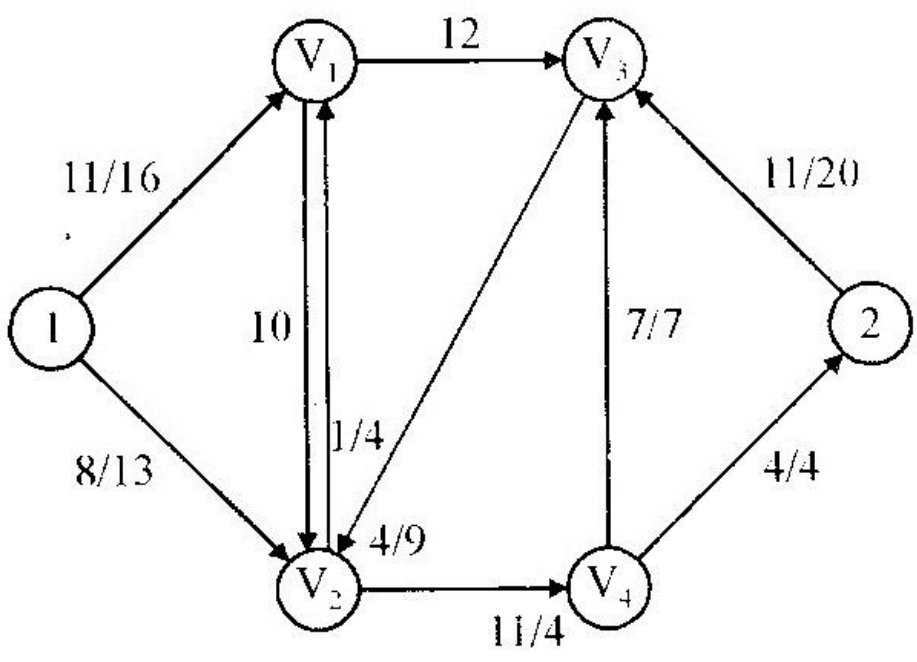


Figure

(b) Explain the terms flow and capacity in a network. What are meant by properly and improperly oriented edges? **[6]**

OR

Q.4 (a) Define a Flow Network. What is the goal of the Flow Network? What are the properties of a Flow Network? Prepare Residual Network for the following Flow Network. **[10]**



Figure

(b) Explain the randomized algorithm. Write the advantages of the randomized algorithm. **[6]**

Unit-V

Q.5 (a) Assuming 3-CNF satisfiability problem to be NP-Complete, prove clique problem is also NP-Complete. **[10]**

(b) Explain the Cook's theorem with suitable example. **[6]**

OR

(a) Show that traveling salesman problem is NP complete. **[10]**

(b) Explain Vertex and set cover problem. **[6]**