



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester - Master of Computer Applications (MCA)

Semester End Examination; Dec. - 2015

Analysis and Design of Algorithms

Time: 3 hrs

Max. Marks: 100

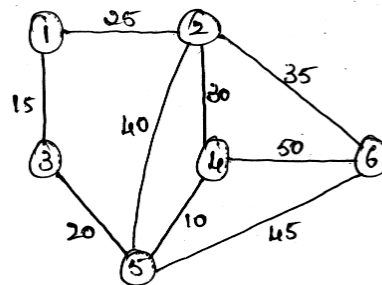
Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. Give the general plan for analyzing time efficiency of recursive algorithms with an example. 10
- b. Write the formal definitions of Asymptotic Notations. 6
- c. Arrange the following functions according to their order of decay, 4
 $\log_2 n, n, n \log_2 n, n^2, n^3, 2^n, n!$
- 2 a. Write an algorithm to find largest of N numbers and obtain the time efficiency. 10
- b. Write an algorithm for Brute force string matching and also analyze its time complexity. 10

UNIT - II

- 3 a. Explain Defective chess Board problem with $K = 2$. 8
- b. Write the merge sort algorithm and find the time complexity. 12
- 4 a. Define fractional knapsack problem. Obtain the optimal solution for the knapsack problem using greedy method given the following : 10
 $m = 40$ (capacity of the knapsack)
 $n = 3$ (number of elements)
 $(W_1, W_2, W_3) = (20, 25, 10)$ (represents weights)
 $(P_1, P_2, P_3) = (30, 40, 35)$ (represents profits).
- b. Define minimum spanning tree. Solve the following graph for its MST using Kruskal's algorithm. 10



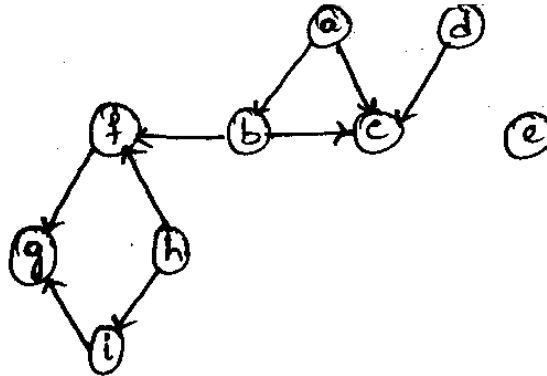
UNIT - III

- 5 a. Explain the concept of decrease and conquer methodology, indicating the three major variations of the same. 12

- b. Write an algorithm for sorting by counting. Trace the algorithm over the list :
6, 3, 8, 9, 1, 4, 5.

8

- 6 a. What is topological sorting? Topologically sort the following graph using source removal method.



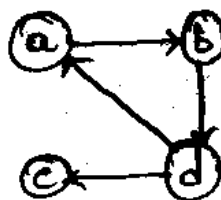
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- b. Write an algorithm to sort N numbers using comparison counting method and trace the algorithm over the list: 25 45 10 20 50 15.

10

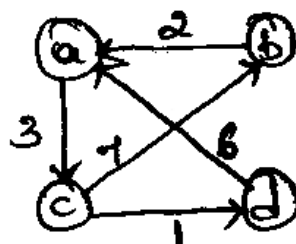
UNIT - IV

- 7 a. Write an algorithm to compute transitive closure using Warshall's method. Apply the same for the graph given.



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- b. With the help of an algorithm, explain the Floyd's algorithm for all-pairs shortest path problem. Apply it to the following graph.



10

- 8 a. Write a note on:

- i) P - class
- ii) NP - class
- iii) NP - complete problems
- iv) NP - hard problems

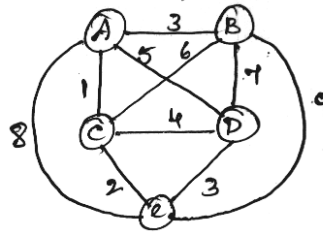
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- b. Write a decision tree to sort the elements using selection sort and show that the lower bound is $\log_2 n!$. Also show that the asymptotic behaviour is $n \cdot \log_2 n$.

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UNIT - V

9 a. Apply the branch and bound algorithm to solve the TSP for the following graph.



10

b. Apply backtracking to solve the following instance of sum of subset problem. $S = \{1, 5, 2, 7\}$ with $d = 8$.

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10 a. Let the input to the prefix computation problem is $\{12, 3, 6, 8, 11, 4, 5, 7\}$ and let \oplus be addition. Obtain prefix's using divide and conquer with $n = 8$ and $p = 8$.

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b. Define the terms :

i) Speedup

ii) Asymptotic speedup

iii) Linear speedup

iv) Total work done by algorithm

v) Efficiency of the algorithm.

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