



# IS46

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**M S RAMAIAH INSTITUTE OF TECHNOLOGY**  
(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)  
BANGALORE – 560 054

**SEMESTER END EXAMINATIONS - JUNE 2010**

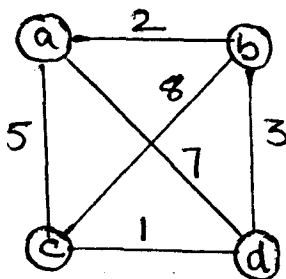
Course & Branch	: B.E (Information Science and Engg)	Semester	: IV
Subject	: Analysis and Design of Algorithm	Max. Marks	: 100
Subject Code	: IS46	Duration	: 3 Hrs

**Instructions to the Candidates:**

Answer one full question from each unit.

**UNIT – I**

1. a) Define an algorithm. Describe the sequence of steps used in designing and analyzing an algorithm. (10)  
b) Explain the process of comparing orders of growth of two functions using limits. Using the same, compare the orders of growth of the following functions.  
i.  $\frac{1}{2}n(n-1)$  and  $n^2$  ii.  $\log_2 n$  and  $\sqrt{n}$   
c) Suggest a general plan for analyzing the efficiency of non-recursive algorithms. (04)
2. a) Why are asymptotic notations used in algorithm analysis? Explain the various notations used with an example for each. (10)  
b) Write a brute force string matching algorithm and analyze its worst case time efficiency. (05)  
c) Define exhaustive search. Solve the following Travelling salesman problem using exhaustive search. (05)



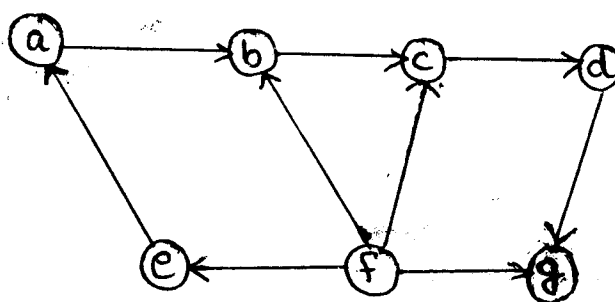
**UNIT – II**

3. a) Write the merge-sort algorithm and sort the list, 'C', 'O', 'M', 'P', 'U', 'T', 'E', 'R' using merge sort. (10)



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- b) Using decrease and conquer technique, mention the various methods (10) of generating permutations. Generate all permutations of  $\{1,2,3,4\}$  using any two of the mentioned methods.
4. a) Write the procedure of multiplying two large integers using divide (10) and conquer technique. Apply this method to multiply 23 and 14.
- b) Write an algorithm to perform topological sorting based on depth (10) first search. Apply the same to topologically sort the following graph.

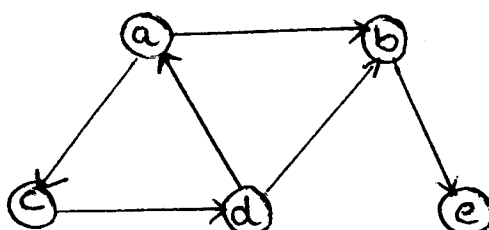


### UNIT - III

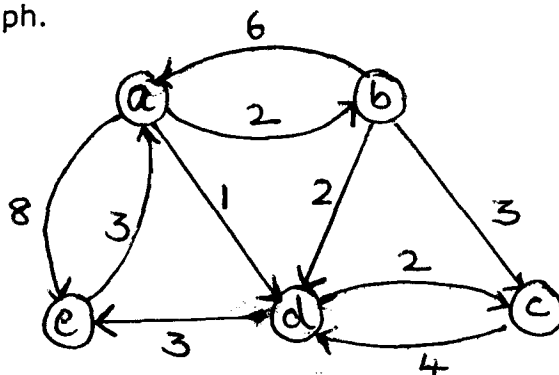
5. a) Define AVL Trees. Construct an AVL Tree by successive insertions of (10) the elements, 5,6,8,3,2,4,7.
- b) What are the structural properties of a B-tree? Construct a B-tree of (10) order 4 using the following numbers.  
17,31,7,13,83,64,1,9,26,54,71,43,12,30
6. a) What is a heap? Sort the following set of elements in ascending order (10) using heap sort 2,9,7,6,5,8
- b) Apply Boyer Moore algorithm to search for the pattern TCCTATTCTT (10) in the sequence TTATAGATCTCGTATTCTTCCTATTCTT.

### UNIT - IV

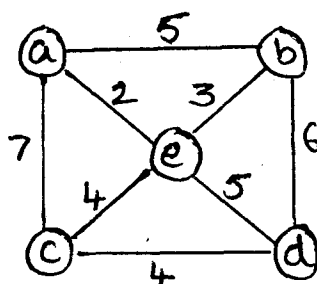
7. a) Apply Warshall's algorithm to find the transitive closure of the (05) digraph given below.



- b) Apply Floyd's algorithm to compute all pair shortest paths for the (05)  
following graph.



- c) Define minimum spanning tree. Write Prim's algorithm to construct a (10)  
minimum spanning tree. Apply the same for the following graph.

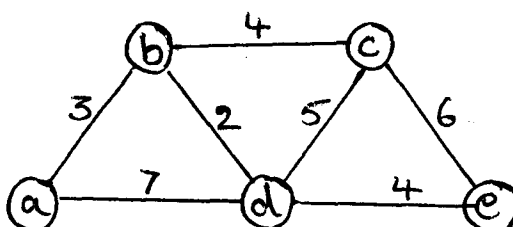


8. a) Write an algorithm to solve the Kanpsack problem using memory (10)  
function and solve the following problem

Item	Weight	Value
1	3	Rs.12
2	2	Rs.20
3	1	Rs.15
4	4	Rs.40
5	5	Rs.50

Capacity  $W=6$

- b) Write Dijkstra's algorithm to find single source shortest path. Apply (10)  
the same to find the shortest path from vertex 'a' in the following  
graph.





## UNIT – V

9. a) How are decision trees important in analyzing algorithms? Draw a binary decision tree for binary search in a four –element array. (10)
- b) Define (10)
- i. P Problem
  - ii. Non deterministic algorithm
  - iii. NP problem
  - iv. NP – complete problem
10. a) What is backtracking? Explain how backtracking can be used to solve n-queens problem and obtain one solution to 4-queens problem showing the state space tree. (10)
- b) Solve the following assignment problem using branch – and bound technique. (10)

$$c = \begin{array}{c} \begin{array}{cccc} \text{Job1} & \text{Job2} & \text{Job3} & \text{Job4} \end{array} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \begin{array}{l} \text{persona} \\ \text{personb} \\ \text{personc} \\ \text{persond} \end{array} \end{array}$$

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