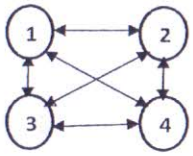
6. (a) Schedule the set of jobs in the following to obtain maximum profit and find out the total profit. Assume each job takes 2 Hrs. [4

Job No.	1	2	3	4	5	6	7	8
Profit	15	18	4	25	3	4	10	6
Dead line	7	5	6	2	4	2	3	4

(b) Define dis-joint set data structure. Discuss the tree based algorithms FIND-SET(x) and UNION(x,y). [4

7. (a) Consider the following instance of travelling salesperson problem. [4



	1	2	3	4
1	0	5	10	15
2	4	0	5	6
3	2	8	0	7
4	10	4	5	0

Find the tour of the travelling salesperson and minimum cost of the tour with starting vertex 1.

b) Write the algorithm for n-queens problem. Explain it for 4 queens. [4

8. a) Write an algorithm to merge two sorted array A (increasing order) and B (decreasing order) to a single sorted array C in decreasing order. [4

b) Write prim's algorithm to find out minimum cost spanning tree. Explain its time complexity. [4

x x x x x

AUTUMN END SEMESTER EXAMINATION-2015

5th Semester B.Tech & B.Tech Dual Degree

DESIGN & ANALYSIS OF ALGORITHM (CS-3001/CS-502)

(Regular-2013 & Back of Previous Admitted Batches)

Full Marks: 60 **Time: 3 Hours**

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer the following questions: [2 × 10

(a) What is the time complexity of the following recursive algorithm?

```
rec (n)
{
        if n=1  return 1
        else
                return rec(n-1) + n
}
```

(b) Justify the following whether true or false.

I. $n! = O(n^n)$

II. $2^{2n} = O(2^n)$

(c) The solution to the recurrence relation: $T(n)=7T(n/2)+ n^2$ is

i) $\theta(n^2)$ ii) $\theta(n^{\log 7})$ iii) $\theta(n \log n)$ iv) $\theta(n^2 \log n)$

(d) Write down the nature of dataset such that insertion sort and quick sort will have same run time behavior.

(e) Show that an n-element heap has height $\lfloor \log n \rfloor$.

(f) What do you mean by principle of optimality? Discuss with a suitable example.

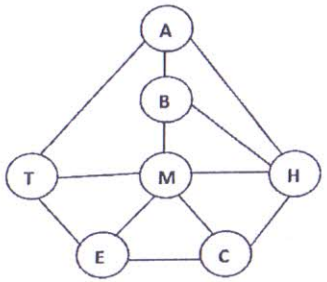
(g) Define Big-Oh Notation.

(h) Match the following pairs

A. Quick Sort Algorithm	P. GREDY
B. Bellmanford Algorithm	Q. Divide and Conquer
C. Floyd'-Warshall Algorithm	R. Dynamic Programming
D. N-Queer. Problem	S. Backtracking

(i) What is the difference between fractional knapsack and 0/1 knapsack problem? Which one gives more profit?

(j) Consider the following graph.



Among the following sequences, which are possible breadth first traversals of the above graph if the first symbol of each sequence is considered as start vertex.

i) MBTHAEC ii) HMBACET iii) HABMCET
iv) TAMEBHC

2. (a) Insertion sort can be expressed as a recursive procedure as follows. In order to sort A[1...n], we recursively sort A[1..n-1] and then insert A[n] into the sorted array A[1..n-1]. Write the procedure and a recurrence for the running time of this recursive version of insertion sort. [4

(b) Solve the following recurrence [4

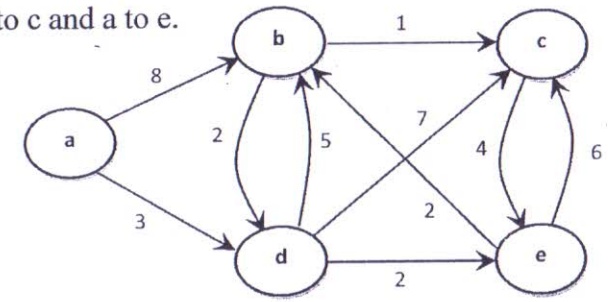
$$T(n) = \begin{cases} 2T\left(\frac{n}{4}\right) + \sqrt{n} & \text{if } n > 1 \\ 1 & \text{if } n = 1 \end{cases}$$

3. (a) Find an optimal parenthesization matrix-chain multiplication whose sequence of dimensions are 2 x 6, 6 x 5, 5 x 4 and 4 x 3. [4

(b) Find an optimal Huffman code for the following set of frequencies [4
a:40 b:20 c:15 d:30 e:75

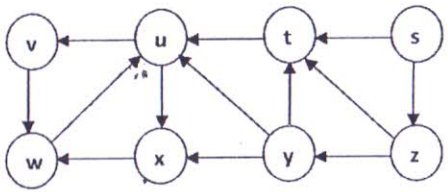
4. (a) Write master theorem. [4

(b) Use suitable shortest path algorithm to find out shortest path between a to c and a to e. [4



5. (a) Determine an LCS of <a, b, b, a, b, a, b, a> and <b, a, b, a, a, b, a, a, b> [4

(b) Traverse the following graph by DFS technique with 's' as start vertex. [4



i) Draw the DFS tree/forest.
ii) Find out the DFS sequence.