en Memory reference,
d I/O instructions.

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g Priority Interrupt.

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TCS–404/TIT–404

B. Tech. (CS/IT) (Fourth Semester)
End Semester EXAMINATION, 2014

DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three Hours] [*Maximum Marks : 100*

Note : (i) This question paper contains two Sections : Section A (Part I and II) and Section B.

(ii) Answer all questions in Section A (Part I) briefly in not more than 50 words. Each question carries 2 marks.

(iii) Answer any *four* questions from Section A (Part II). Each question carries 6 marks.

(iv) Answer any *four* questions from Section B. Each question carries 14 marks.

Section—A

Part—I

2 each

1. Attempt all questions briefly in not more than 50 words :

(i) What will be the number of edges in terms of number of vertex in any Complete Graph ?

(ii) Calculate time complexity of Merge Sort.

(iii) Define O and Ω notation.

(iv) Compare between Dynamic Programming and Greedy Method.

(v) Differentiate between Dijkstra and Bellman-Ford algorithm.

(vi) Relate among P, NP, NP-hard and NP-complete.

(vii) Write down at least *two* designing techniques for solving the Travelling-Salesperson problem.

(viii) Give the time complexity of Insertion sort in all cases.

(ix) Represent the expression $2^{\lg(!n)} + n^{102} + n^* \lg(n^n)$ by O, Ω and Θ.

(x) Solve recurrence T(n) = 2 T (n − 1) + 1 if T (1) = 1.

Part—II 6 each

2. Write short notes on any *four* of the following :

(a) Backward Substitution method

(b) Masters method

(c) Graph representation.

(d) 0-1 Knapsack

(e) String Matching

(f) Reduction of NP-complete problems.

Section—B 14 (7+7) each

Note : Attempt any *four* questions.

3. (a) Arrange the function f (n), g (n) and h (n) in non-decreasing order of their asymptotic growth :

$f(n) = 2^n + n^2 + 6$, $g(n) = n^{1000} + \lg(n!) + n$

$h(n) = \lg(n^n) + 2^{\lg(n!)} + n$

(b) Apply Quick Sort on the following sequence to sort in non-decreasing order :

7 4 6 8 2 3 5

4. (a) Design the algorithm of Insertion Sort for sorting numbers in the decreasing order and derive the Time Complexity for BEST and WORST case.

(b) Apply Bellman-Ford algorithm on the following graph consider 'S' as source node.

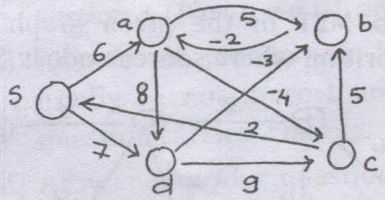

Fig. 1

5. (a) Solve $T(n) = T(n/3) + T(2n/3) + n$ using Recursive Tree method and give upper bound and lower bound.

(b) Design and analyze the Floyd-Warshall's algorithm for finding All-Pair shortest path.

6. (a) Write the time complexities of the following in terms of asymptotic notation :

(i) Kruskal's algorithm and Bellman-Ford algorithm

(ii) Reading two square matrix of order 'm' and compute product of two matrices.

(iii)
```
for (i = 1; i < n; i++)
{for (j=n;j>1;j--)
 {t = a;
  a=b
  b=t;
 }
}
```

(b) Design and analyze algorithm for Vertex cover problem using approximation algorithm.

7. (a) What are the different data structure used in DFS and BFS ? Explain with the help of example.

(b) Find MST of the given graph using Prim's algorithm where source node is 'S' :

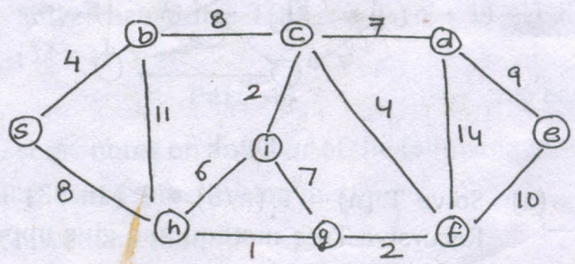

Fig. 2

8. (a) Explain the Subset-Sum problem with the help of example. How is it solved using backtracking ?

(b) Describe the working of Branch and Bound technique. How is Assignment Problem solved using this technique with the help of example ?