Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VIII • EXAMINATION – SUMMER • 2015**

**Subject code: 181604** **Date: 05/05/2015**

**Subject Name: Design and Analysis of Algorithm (Department Elective-II)**

**Time: 10.30AM-01.00PM** **Total Marks: 70**

## Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** Define terms: **07**

1. Polynomial time algorithm
2. Greedy Algorithm
3. Minimum Spanning Tree (MST)
4. NP-Complete

**(b)** Prove that travelling salesman problem is NP-complete. **07**

**Q.2** **(a)** Given a set of n items with each item I having $b_i \rightarrow$a positive benefit and $w_i \rightarrow$a positive weight. Choose items with maximum total benefits but with at most W=10ml. **07**

| Weight | 4 ml | 8 ml | 2 ml | 6 ml | 1 ml |
|---|---|---|---|---|---|
| Benefit per ml | 3 | 4 | 20 | 5 | 50 |

**(b)** Explain the accounting method of amortized analysis using stack operations. **07**

**OR**

**(b)** Explain potential method of amortized analysis. **07**

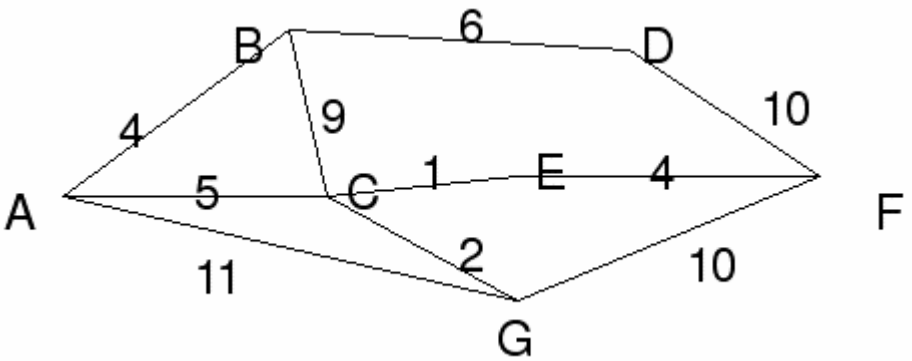
**Q.3** **(a)** Use master method to give tight asymptotic bounds for the following recurrence. **07**

$T(n) = 2^n T(n/2) + n^n$

$T(n) = 3T(n/2) + n^2$

$T(n) = 16T(n/4) + n$

**(b)** Write Prim's algorithm and apply it on following graph. And find running time of the algorithm. **07**



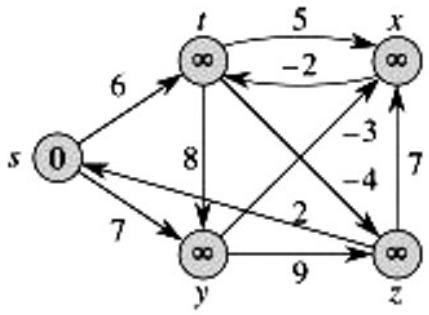

**OR**

**Q.3** **(a)**

1. Let f(n) = 4n + 3 and g(n) = n Is f(n) = Ω(g(n)) ? **07**
2. Let $f(n) = n^2$ and $g(n) = 4n^2 + 2$ Is f(n) = Ω (g(n)) ?

If yes, find $n_0$ and c

**(b)** What kind of problems is solved by Bellman Ford algorithm? **07**
Run the bellman Ford algorithm on following graph. Find the running time.




**Q.4** **(a)** Working modulo q=13, how many spurious hits does the Rabin Karp matcher encounter in text T=2359023141526739921 when looking for pattern P=31415 **07**

**(b)** Determine a Longest Common subsequence (LCS) of {1,0,0,1,0,1,01} and {0,1,0,1,1,0,1,1,0} with proper diagram. **07**

**OR**

**Q.4** **(a)** Write the case in which worst case behavior for quicksort occurs. Find out the worst case running time of quicksort. Write and explain randomized partition for QUICKSORT. **07**

**Q.4** **(b)** Describe Dijkstra's algorithm for single source shortest path problem. Give a simple example of a directed graph with negative-weight edges for which Dijkstra's algorithm produces incorrect answers. **07**

**Q.5** **(a)** Find the running time of breadth first search algorithm. **07**

**(b)** How MERGE-SORT can be done with Divide and Conquer strategy? Explain with example. **07**

**OR**

**Q.5** **(a)** Explain recursive algorithm of depth first search (DFS) for directed graph. **07**

**(b)** Explain assembly line scheduling and how it can be done by dynamic programming? Write the procedure for computing the fastest times to get the assembly out of factory. **07**

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