Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2017

Subject Code: 2150703 Date: 16/11/2017

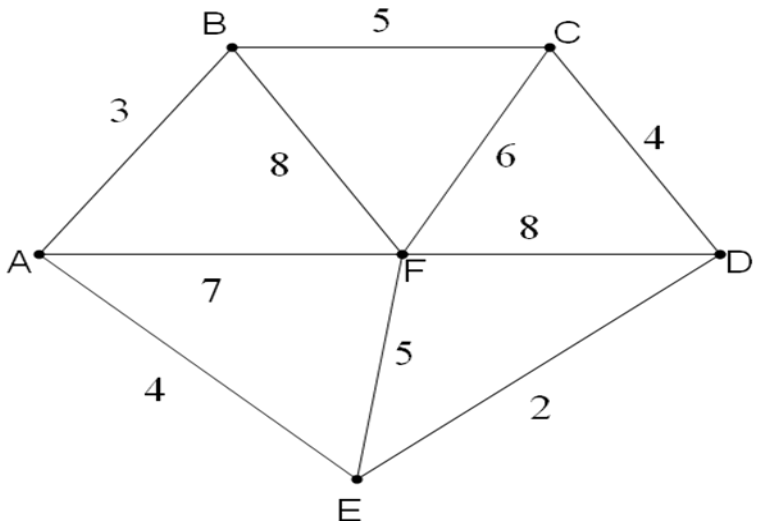
Subject Name: Analysis and Design of Algorithms

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

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

			MARKS
Q.1	**(a)**	Define an algorithm. List various criteria used for analyzing an algorithm.	**03**
	(b)	What is the smallest value of n such that an algorithm whose running time is $100n^2$ runs faster than an algorithm whose running time is 2^n on the same machine?	**04**
	(c)	What do you mean by asymptotic notation? Describe in brief any three asymptotic notations used for algorithm analysis.	**07**
Q.2	**(a)**	What do you mean by Divide & Conquer approach? List advantages and disadvantages of it.	**03**
	(b)	Let f(n) and g(n) be asymptotically nonnegative functions. Using the basic definition of Θ-notation, prove that max(f(n), g(n)) = Θ (f(n) + g(n)).	**04**
	(c)	Solve the following recurrence relation using iteration method. $T(n) = 8T(n/2) + n^2$. Here T(1) = 1.	**07**
		OR	
	(c)	Solve the following recurrence relation using substitution method. T(n) = 2T(n/2) + n. Here T(1) = 1.	**07**
Q.3	**(a)**	Differentiate between greedy method and dynamic programming.	**03**
	(b)	Prove that the fractional knapsack problem has the greedy-choice property.	**04**
	(c)	Find optimal sequence of multiplication using dynamic programming of following matrices: A1[10x100], A2[100x5], A3[5x50] and A4[50x1]. List optimal number of multiplication and parenthesization of matrices.	**07**
		OR	
Q.3	**(a)**	Briefly describe greedy choice property and optimal substructure.	**03**
	(b)	Suppose that we have a set of activities to schedule among a large number of lecture halls, where any activity can take place in any lecture hall. We wish to schedule all the activities using as few lecture halls as possible. Give an efficient greedy algorithm to determine which activity should use which lecture hall.	**04**
	(c)	Describe longest common subsequence problem. Find longest common subsequence of following two strings X and Y using dynamic programming. X=abbacdcba, Y=bcdbbcaac.	**07**
Q.4	**(a)**	Differentiate between depth first search and breadth first search.	**03**
	(b)	Discuss and derive an equation for solving the 0/1 Knapsack problem using dynamic programming method.	**04**
	(c)	List applications of a minimum spanning tree. Find minimum spanning tree using Krushkal's algorithm of the following graph.	**07**

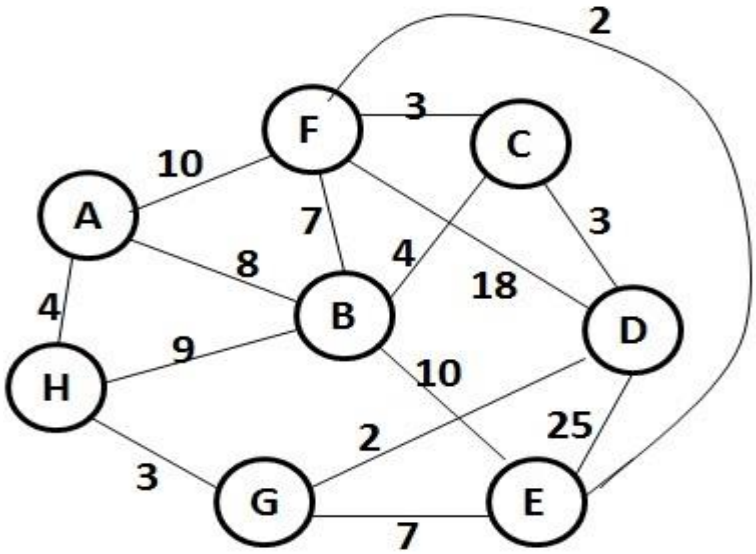


OR

Q.4 **(a)** Define graph. Describe strongly connected graph with example. **03**

(b) Given an adjacency-list representation of a directed graph, how long does it take to compute the out-degree of every vertex? How long does it take to compute the in-degrees? **04**

(c) Define minimum spanning tree. Find minimum spanning tree using Prim's algorithm of the following graph. **07**



Q.5 **(a)** Define amortized analysis. Briefly explain its two techniques. **03**

(b) Show the comparisons the naive string matcher makes for the pattern P=0001 in the text T=000010001010001. **04**

(c) State whether travelling salesman problem is a NP-Complete problem? Justify your answer. **07**

OR

Q.5 **(a)** Define backtracking. State types of constraints used in backtracking. **03**

(b) Working modulo q=11, how many spurious hits does the Rabin-Karp matcher encounter in the text T=3141592653589793 when looking for the pattern P=26? **04**

(c) Prove that if G is an undirected bipartite graph with an odd number of vertices, then G is nonhamiltonian. **07**

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