DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
SECOND SESSIONAL
SUBJECT: (IT 509) Design And Analysis of Algorithm

Examination	**: B.TECH Semester - V**	**Seat No.**	**:**
Date	**: 08/09/2018**	**Day**	**: Saturday**
Time	**: 11:45 – 01:00**	**Max. Marks**	**: 36**

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume any necessary data but giving proper justifications.
4. Be precise, clear and to the point in answering the questions. Unnecessary elaborations will not fetch more marks.

Q.1 Do as directed. **[12]**

(a) Compare greedy technique with dynamic programming. Give an example with brief justification where greedy paradigm is preferable compare to dynamic programming. **[2]**

(b) Compare dynamic programming with divide and conquer technique. In which cases we should prefer divide and conquer technique compare to dynamic programming? **[2]**

(c) Write the recurrence equation for Strassen's Matrix Multiplication algorithm and derive its complexity. **[2]**

(d) In a weighted undirected tree G = (V, E, w), breadth-first search from a vertex **S** finds single source shortest paths from ***S*** (via parent pointers) in O(V + E) time. State true or false with Justification. **[2]**

(e) Prove the optimal substructure property of shortest path problem using proof by contradiction Method. [Hint: Cut-Paste argument.] **[2]**

(f) State whether the following statement is True or False using brief justification or counterexample. **[2]**

1.) If all edges in a graph have distinct weight then the shortest path between two vertices is unique.

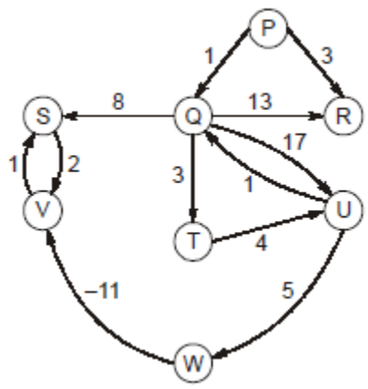
2.) Both in Dijkstra's and in Prim we have a set of nodes *S* (that initially contain only *s(source)*), and we add one by one additional node in each iteration then in both algorithms the nodes are added to *S* in the same order.

Q.2 Attempt ***Any TWO*** of the following questions. **[12]**

(a) Describe the fractional knapsack problem setup with different greedy strategy, write the algorithm for optimal greedy strategy and analyze its time complexity. **[6]**

(b) Discuss the convex hull problem, write the divide and conquer Quick Hull algorithm for finding convex hull in the Euclidean plane and derive its complexity. **[6]**

(c) For the graph given below Dijkstra's algorithm does not provide correct shortest path tree. **[6]**



Suppose a new graph that is different only in weight between Q to S is created. The number of values of edge [Q to S] that ensures that Dijkstra's provide the correct shortest path tree where the values of edge (Q to S) ∈ [–20, 20] and 'P' is the source vertex are? [Detail Justification Require]

Q.3 (a) Consider two strings *P* = '*B A C B A D*' and *Q* = '*A B A Z C D*'. **[6]**

1.) Find the length of longest common subsequence (LCS) between *P* and *Q* using Dynamic Programming.

2.) Also find all possible subsequences with largest length.

(b) Explain the Union-Find Data Structure with necessary terminologies and write Kruskal's algorithm for finding minimum spanning tree using Union-Find Data Structure. **[6]**

OR

Q.3 (a) Let denomination system D = {d_1 = 1, d_2 = 5, d_3 = 6, d_4=8} and each denomination is available in unlimited quantity. Make change for N = 11 Rs, using minimum total number of coins using greedy paradigm as well as dynamic programming and compare both the solution. **[8]**

(b) Explain the dynamic programming based algorithm to binomial coefficient problem. **[4]**