



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
BLOCK EXAMINATION (REPEATER)
SUBJECT: (IT 509) Design And Analysis of Algorithm

Examination : B.TECH Semester - V	Seat No. :	
Date : 22/10/2018	Day : Monday	
Time : 11:00 – 12:15	Max. Marks : 36	

INSTRUCTIONS:

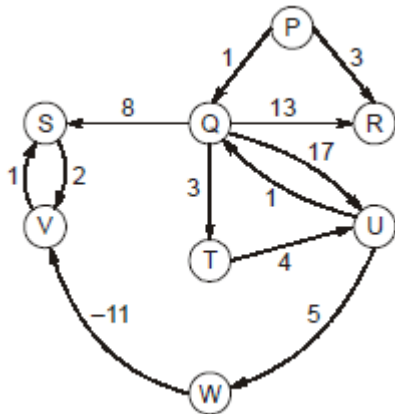
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume any necessary data but giving proper justifications.
4. Be precise, clear and to the point in answering the questions. Unnecessary elaborations will not fetch more marks.

Q.1 Do as directed. [12]

- (a) What are the properties of algorithm? Explain each in brief. [2]
- (b) Solve the following recurrence using master theorem: $T(n) = 4T\left(\frac{n}{3}\right) + n$ [2]
- (c) Compare greedy technique with dynamic programming. Give an example with brief justification where greedy paradigm is preferable compare to dynamic programming. [2]
- (d) Prove or disprove the optimal substructure property of finding longest path in a graph problem. [2]
- (e) Discuss the difference between backtracking and branch and bound techniques. [2]
- (f) If $A \leq_p B$ and B belongs to NP-Hard, then A belongs to which class? [P/NP/NP-Complete/NP-Hard] [Justification Required] [2]

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

- (a) Find the Edit Distance between string $x = \text{"SUNDAY"}$ and $y = \text{"SATURDAY"}$ using dynamic programming. [6]
- (b) Write the MIN-MAX algorithm using Divide and Conquer paradigm. Derive the recurrence equation and find the asymptotic 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) $\in [-20, 20]$ and 'P' is the source vertex are? [Detail Justification Require]

- Q.3**
- (a) Explain the dynamic programming based algorithm for 0/1 knapsack problem and derive its time complexity. [6]
 - (b) Explain best case and worst case behavior of Quick Sort algorithm. Also, suggest how to make sure $O(n \log n)$ complexity for Quick sort algorithm? [6]

OR

- Q.3**
- (a) 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]
 - (b) Discuss backtracking solution for Hamiltonian Cycle problem and write the algorithm for the same. [6]