Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: Design and Analysis of Algorithms
Subject Code: 4TE05DAA1 Branch: B.Tech (CE,IT)

Semester: 5 Date: 27/04/2016 Time: 2:30 To 5:30 Marks: 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

a) Define an algorithm.

b) Define asymptotic notation.

c) State principle of Optimality.

d) The Sorting method which is used for external sort is
i) Insertion Sort (ii) Quick sort (iii) Merge sort (iv) Selection sort

e) Sorting is not possible by using which of the following methods?
(i)Insertion (ii)Selection (iii)Exchange (iv) Deletion

f) Define Θ (Theta) notation.

g) The time complexity of the shortest path algorithm can be bounded by
(i) $O(n^2)$ (ii) $O(n^4)$ (iii) $O(n^3)$ (iv) O(n)

h) Which of the following formulas in Omega notation best represent the expression $n^2+15n+6$?
(i) $\Omega(n^3)$ (ii) $\Omega(n^2)$ (iii) $\Omega(n)$ (iv) $\Omega(15)$

i) The θ notation is _____
I. Symmetric. II. Reflexive. III. Transitive.
(i) Only (I) above (ii) Only (II) above
(iii) Only (III) above (iv) All (I), (II) and (III) above.

j) The amount of memory needs to run to completion is known as_____
i. Space complexity ii. Worst case iii. Time complexity
iv. Best case

k) $O(2^n)$ means computing time is _____
i. Constant ii. Quadratic iii. Linear iv. Exponential.

l) Prim's algorithm is based on _____ method
i. Divide and conquer method ii. Dynamic programming
iii. Greedy method iv. Branch and bound

m) Which is an optimal value in the case of job sequence problem?

item :	1	2	3	4	5
profit :	20	15	10	5	1
deadline :	2	2	3	3	3

i. (1,3,4) ii. (4,2,3) iii. (1,2,4) iv. (1,5,2)

n) The complexity of linear search algorithm is
i. O(n) ii. O(n2) iii. O(log n) iv. O(n log n)

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions**

(a) Write down an algorithm of insertion sort. Give the time complexity of insertion sort. **(04)**

(b) Explain Binary Search algorithm with its time complexity. (Using Divide and Conquer approach) **(04)**

(c) Solve the following recurrence equation using Master's Theorem: **(06)**
1. $T(n)= 6T(n/3) + n^2 \lg n$
2. $T(n)= 16T(n/4) + n!$

Q-3 **Attempt all questions** **(14)**

(a) Explain merge sort algorithm with an example. Also derive the time complexity for merge sort algorithm.

(b) Explain Strassen's Matrix Multiplication.

Q-4 **Attempt all questions** **(14)**

(a) Explain various techniques used in amortized analysis.

(b) Consider five items along their respective weights and values
W=<5, 10, 20, 30, 40> and V=<30, 20, 100, 90, 160>. The capacity of Knapsack M=60. Find the solution to the fractional Knapsack problem.

Q-5 **Attempt all questions** **(14)**

(a) Explain Krushkal's algorithm to find minimum spanning tree with an example.

(b) Using Dynamic Programming find an optimal parenthesization of a matrix chain product whose sequence of dimension is (5, 4, 6, 2, 7)

Q-6 **Attempt all questions** **(14)**

(a) Solve following knapsack problem using dynamic programming algorithm with given capacity W=5, Weight and Value are given as: (2, 12), (1, 10), (3, 20), (2, 15).

(b) Differentiate between Dynamic Programming and Greedy algorithm.

Q-7 **Attempt all questions**

(a) What is n-queen problem? Solve 8-Queen problem. **(05)**

(b) What is backtracking? How Knapsack problem can be solved using backtracking? **(05)**

(c) Find Longest Common Subsequence using Dynamic Programming Technique for the given sequences: X={A,B,C,B,D,A,B} Y={B,D,C,A,B,A} **(04)**

Q-8 **Attempt all questions** **(14)**

(a) Explain P, NP, NP- Complete and NP- Hard problems with appropriate examples.

(b) Explain Rabin-Karp String Matching algorithm with an example.