This question paper contains 3 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper : 775 **G**

Unique Paper Code : 234301

Name of Paper : **Design and Analysis of Algorithms (CSHT : 305)**

Name of Course : **B.Sc. (Hons.) Computer Science**

Semester : **III**

Duration : : **3 hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

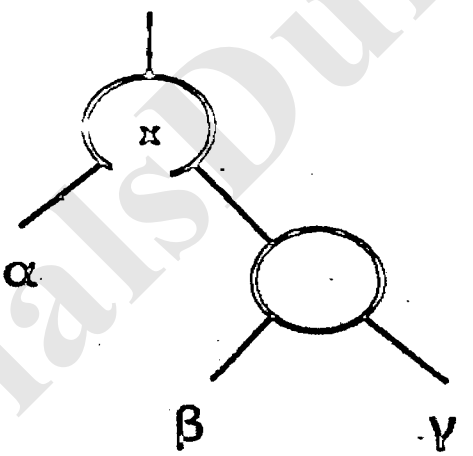
Q. No. 1 of 35 marks is compulsory. Attempt any four questions from Q. No. 2 to Q. No. 7.

Section A

Q1.

a) Which sorting algorithm is best if the list is already sorted? Why? 2

b) Let a, b and c be arbitrary nodes in subtrees α, β and γ respectively, in the following figure.



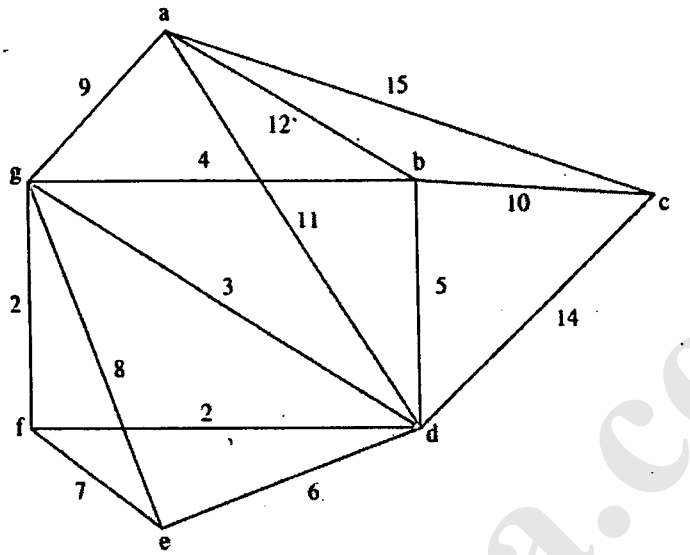
How do the depths of a, b and c change when a left rotation is performed on node x in the figure ? 3

c) Prove that the average running time of Quicksort is O(nlgn) where n is the number of elements. 5

d) What are stable algorithms? Is it necessary for Count Sort to be stable? Why? 1+1+3

e) Find the minimum spanning tree for the following graph using Kruskal's algorithm. 5

P. T. O.



f) Illustrate the operation of Bucket Sort Algorithm on the following Array A:
{.79, .13, .16, .64, .56, .69, .79, .47} 5

g) Solve the following recurrence relation: 5
$T(n) = T(n-1) + n$
$T(1) = 1$

h) Give a dynamic programming algorithm to solve the 0-1 knapsack problem. 5

Section B

Q2. a) Sort the following list using Heap Sort technique, displaying each step.
20, 12, 25 6, 10, 15, 13 5

b) Prove that the number of comparisons required by any comparison sort algorithm in the worst case is $\Omega(n \lg n)$. 5

Q3.

a) Prove that the height of a Red Black tree with n internal nodes is at most $2\lg(n+1)$. 5

b) What is an interval tree? Give algorithm for a function to search a node from an interval tree "T", whose interval overlaps interval "i" 5

Q4.

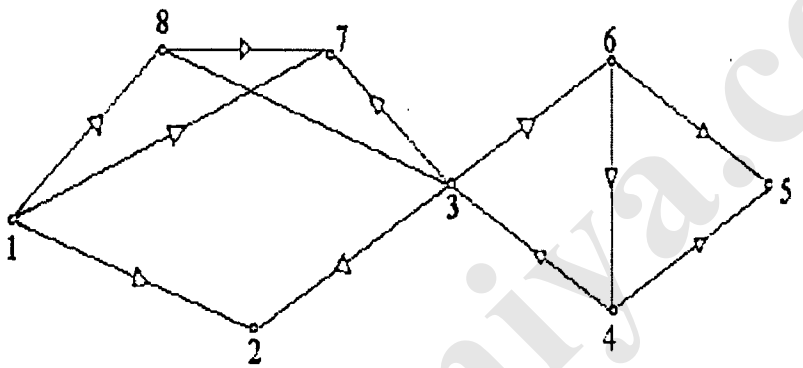
a) Determine an LCS of <1, 0, 0, I, 0, 1, 0, 1> and <0, 1, 0, 1, 1, 0, 1, 1, 0>. 5

b) Suppose that the dimensions of the matrices A, B,C and D are 20 × 2, 2 ×15, 15 × 40, 40 × 4 respectively. Find the best way to compute A×B×C×D. 5

Q5.

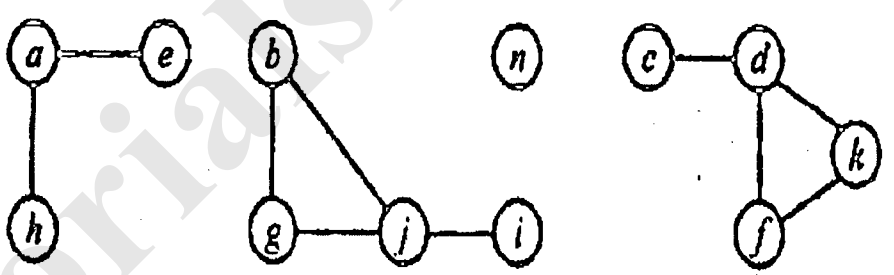
a) Construct an optimal Huffman code for the following set of frequencies: B:5, D:5, A:7, C:8, F:10, E:11 5

b) Show the result of running DFS on the directed graph given below using vertex 3 as source. Show the status of the data structure used at each stage. 5



Q6. a) What is topological Sort? Give algorithm for performing a topological sort on a graph G. 5

b) Show the execution of connected components on the following undirected Graph G. 5



Q7.

a) Design an O(n) algorithm for checking whether the given two words are anagrams, i.e., whether one word can be obtained by permuting the letters of the other. For example, the words "eat" and "tea" are anagrams. Assume that the length of both the words is n characters. Argue that the running time of your algorithm is O(n). 4+1

b) Is Prim's minimum spanning tree algorithm a greedy algorithm? Justify your answer. Also give running time of the algorithm. 5

300

TutorialsDuniya.Com

Visit https://www.tutorialsduniya.com/question-papers to get Delhi University Question Papers of all the following courses,

- General Electives
- B.Sc. (H) Computer Science
- B.Sc. (H) Chemistry
- B.Sc. (H) Electronics
- B.Sc. (H) Botany
- B.Sc. (H) Home Science
- B.Com (H)
- B.Sc. Physical Science
- B.A. Programme
- B.A. (H) Psychology
- B.A. (H) Economics
- B.A. (H) Hindi
- B.A. (H) Journalism
- B.A. (H) Political Science
- B.A. (H) Sanskrit
- AECC
- B.Sc. (H) Mathematics
- B.Sc. (H) Physics
- B.Sc. (H) Statistics
- B.Sc. (H) Geology
- B.Sc. (H) Zoology
- B.Sc. (H) Microbiology
- B.Sc. Mathematical Science
- BMS
- B.Sc. Life Science
- B.A. (H) English
- B.A. (H) History
- B.A. (H) Philosophy
- B.A. (H) Geography
- B.A. (H) Sociology

❖ **Get FREE Compiled Books, Notes, Programs, Books, Question Papers with Solution* etc at https://www.tutorialsduniya.com**

- For any query, contact us at *help@tutorialsduniya.com*

✓ **Facebook: https://www.facebook.com/tutorialsduniya**

✓ **Youtube: https://www.youtube.com/user/TutorialsDuniya**

✓ **LinkedIn: https://www.linkedin.com/company/tutorialsduniya**