MCA-312/NMCA-312

M. C. A.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

DESIGN AND ANALYSIS OF ALGORITHMS

Time : **3 Hours**]

[Total Marks : **100**

1   Attempt any four parts of the following :   **5×4=20**

   (a)   Solve the following recurrences using suitable methods:

   i) $T(n) = 5\ T(n/2 + 16) + n^2$

   ii) $T(n) = T(\sqrt{n}) + n$

   (b)   What do you mean by stable sort algorithms? Explain it with suitable example.

   (c)   What do you mean by asymptotic notations? Differentiate the O and o notation with suitable example.

   (d)   Discuss the best case and average case complexities of quick sort algorithm in detail.

   (e)   Sort the following sequence of input using heap sort: $\{10, 2, 1, 5, 3, 8, 11, 24, 7\}$. Also discuss the average and worst case complexities.

   (f)   Explain the counting sort with suitable example.

2   Attempt any two parts of the following :   **10×2=20**

(a)   Describe the properties of binomial Tree. Construct the binomial heap for the following sequence of numbers 7,2,4,17,1,11,6,8,15,10,20. Also apply the operation of extracting the minimum key in the resulting binomial heap.

(b)   Derive a relation in between degree and the height of n keys B-tree. Insert the following information $F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E$ into an empty B-Tree with degree $t = 3$.

(c)   What do you mean by augmenting data structure? Explain it with suitable example.

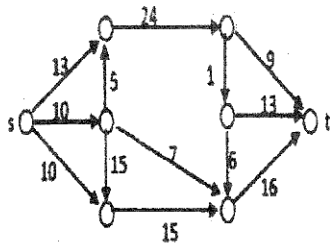3   Attempt any two parts of the following :   **10×2=20**

(a)   Differentiate between Backtracking and Branch and Bound approach. Write an algorithms for sum subset problem using back tracking approach. Find all possible solution for following instance using same if $m=35$, $S=< 1,2,5,7,8,10,15,20,25 >$.

(b)   Write an algorithm for chain matrix multiplication. Calculate the minimum number of multiplication required to compute the chain $A_1A_2A_3A_4A_5$ of matrix where $A_1= 2\times3, A_2= 3\times4$, $A_3= 4\times5, A_4= 5\times3, A_5= 3\times4$.

(c)   What is 0/1 knapsack problem? Solve the following instance using Greedy approach, also write the algorithm. Knapsack Capacity=10 $P=<1,6,18,22,28>$ and $w=<1,2,5,6,7>$.
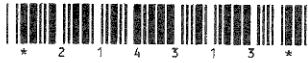
4   Attempt any two parts of the following :   **10×2=20**

(a)   What do you mean by minimum spanning tree? Write an algorithm that always generate a single forest tree and also explain with suitable example.

(b)   Define the single source shortest path problem. Write an algorithm for single source shortest path problem, where graph is having negative weight edges and also apply the same on following graph.
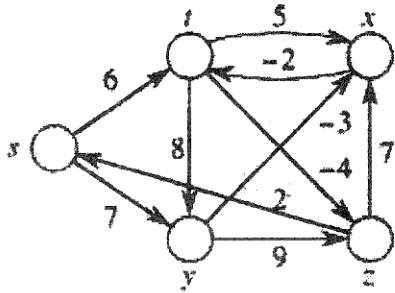
(c)   Describe the maximum flow problem in detail. Write the suitable algorithms to calculate the maximum flow and also calculate the maximum flow in the following graph from source s to sink t.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 214313

Roll No.

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