Printed Pages : 4

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

PAPER ID : 214313

Roll No.

# 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.

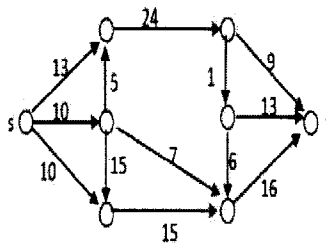(f)    Explain the counting sort with suitable example.

214313]                              **1**                              [ Contd...

**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 $A_1 A_2 A_3 A_4 A_5$ of matrix where $A_1 = 2 \times 3, A_2 = 3 \times 4, A_3 = 4 \times 5, A_4 = 5 \times 3, A_5 = 3 \times 4$.

(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.
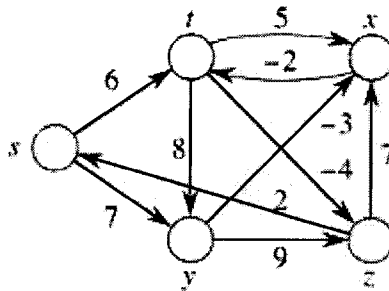


   (c)    Describe the maximum flow problem in detail. Write the
          suitable algorithms to calculate the maximum flow and
          also calculate the maximum flow in the following graph
          from source s to sink t.

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

    (a) What is Fast Fourier Transform? Explain the mechanism to multiply two polynomials using FFT algorithm with suitable algorithms.

    (b) Define different complexity classes in detail with suitable example. Show that CLIQUE problem is NP Complete.

    (c) Describe approximation Algorithm in detail. How it differ with Deterministic Algorithm. Show that TSP is 2 approximate.

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