

M C A
(SEM III) THEORY EXAMINATION 2017-18
DESIGN & ANALYSIS OF ALGORITHMS

Time: 3 Hours

Total Marks: 70

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
 2. Any special paper specific instruction.

SECTION A1. Attempt *all* questions in brief.

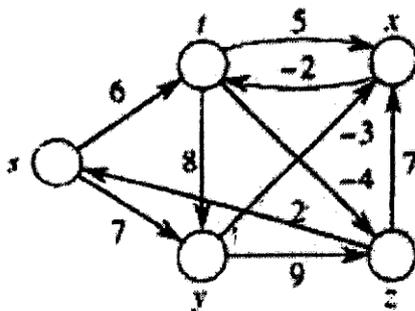
2 x 7 = 14

- Differentiate between asymptotic notations O , Ω and Θ .
- Write all the 3 cases of master method to solve the recurrence $T(n): aT(n/b) + f(n)$.
- Solve the 4-queen problem using backtracking technique and find.
- Why Disjktra and Bellmen-Ford algorithm are differ from each other? Even both are single source shortest path.
- What do you Mean by augmenting data structure?
- Define P, NP and NP-complete class of problem. Write three problems which are NP-complete.
- Explain randomized algorithm with the help of an example.

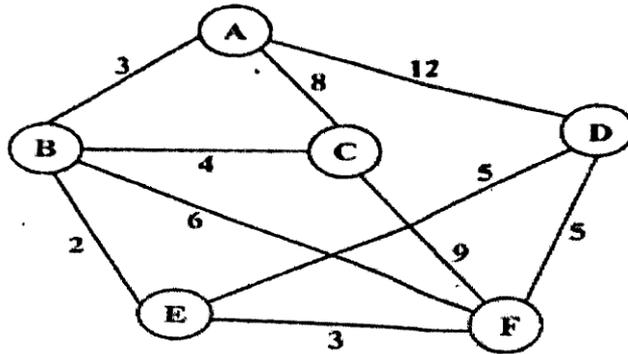
SECTION B2. Attempt any *three* of the following:

7 x 3 = 21

- 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.
- 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 $M:35, S:< 1,2,5,7,8, 10,15,20,25 >$.
- 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.



- d. Discuss the Kruskal's algorithm and find the minimum cost spanning tree of the following graph:



- e. Construct the string matching automation algorithm for the pattern $P = \text{aabab}$ and illustrate its operation on the text string:
 $T = \text{aababaabaababaab}$

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Write the algorithm of Quick sort and using master method to give an asymptotic tight solution to the recurrence.
 $T(n) = 4T(n/2) + n^2\sqrt{n}$
- (b) Prove that a red black tree with n internal nodes has height at most $2 \log(n+1)$.
4. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Derive a relation 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 $t=3$.
- (b) Design a recursive solution to the Longest Common Subsequence (LCS) problem. Determine an LCS of (22112121) and (211221121).
5. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Write an algorithm for chain matrix multiplication. Calculate the minimum number of multiplications required to compute the chain $A_1A_2A_3A_4A_5$ of matrix where $A_1=2 \times 3$, $A_2=3 \times 4$, $A_3=4 \times 5$, $A_4=5 \times 3$, $A_5=3 \times 4$.
- (b) What do you mean by greedy algorithm? Write greedy algorithm for Huffman code. Show that your algorithm has greedy choice property.
6. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Describe Branch and Bound technique. How the branch and bound technique can be used to solve the Travelling Salesman Problem?
- (b) Write the short note on following with examples:
- i. Graph Coloring
 - ii. n-Queen Problem
 - iii. Hamiltonian Cycles
 - iv. Sum of subsets.
7. Attempt any *one* part of the following: 7 x 1 = 7
- (a) Define string matching problem and describe any string matching algorithm with suitable example.
- (b) Write short notes on any two of the following:
- (i) Randomized algorithms
 - (ii) Matrix operations
 - (iii) Fast Fourier Transform