**Registration No:**

**Total Number of Pages :2**

B.TECH. DEGREE EXAMINATION-Nov-Dec.2018
End Semester Examination-III Semester
**BCSPC3010-Design and Analysis of Algorithms**
**(Regulations 2017) (CSE Branch)**

Time : 3 Hours          Maximum : 100 Marks          Question Code:231712

Answer ALL Questions

PART-A (10 X 2=20 Marks)

1.
   a) Which method is not used to solve recurrence relation? [CO1][PO1]
   (A)Master method (B) Recursion-tree  (C) Substitution (D) Dynamic Programming

   b) Which notation is used for average case analysis? [CO1][PO1]
   (A)Big-oh  (B) Big-omega  (C) Theta  (D) Small-oh

   c) The total running time of merge sort algorithm is.............. [CO2][PO1]
   (A)$O(n)$ (B) $O(n^2)$ (C) $O(\log n)$ (D) $O(n \log n)$

   d) The dynamic programming approach can work in which of the following way? [CO1][PO1]
   (A)Bottom-up (B) Top-down (C) Both (A) (B) (D) None of these

   e) Coin changing problem can be solved by using which of the following technique? [CO2][PO1]
   (A)Backtracking (B) Greedy (C) Branch and Bound (D) Dynamic Programming

   f) Which of the following operation is not belongs to Disjoint set data structures? [CO3][PO1]
   (A)Make-Set(x) (B) Union(x, y) (C) Intersection(x, y) (D) Find-Set(x)

   g) If all edges have the same weight in an undirected graph, which algorithm will find the shortest path between two nodes more efficiently? [CO3][PO2]
   (A)Dijkstra  (B) Bellman-Ford (C) Depth-First Search (D) Breadth-First Search

   h) An All-pairs shortest-paths problem is efficiently solved by using: [CO3][PO1]
   (A)Dijkstra' algorithm (B) Floyd-Warshall algorithm (C) Kruskal algorithm
   (D) Bellman-Ford algorithm

   i) What is the worst case time complexity of Rabin-Karp string matching algorithm. [CO4][PO2]
   (A) $O(n)$  (B) $O(m^2)$  (C) $O(n + m)$  (D) $O(m(n-m))$

   j) A Problem that can be solved by a deterministic machine polynomial time is [CO4][PO2]
   (A) P   (B) NP  (C) NP-Complete  (D) NP-Hard

PART-B (10 X 2=20 Marks)

2.
   a. Arrange the following functions from the lowest asymptotic order to the highest. [CO1][PO2]
   $2^n$, $10n$, $n \log n$, $4n^3$, $\log n$, $5n^2$.

   b. Define Time and Space complexity of an algorithm. [CO1][PO1]

   c. Solve the following recurrence relation using master theorem. If not justify your answer. $T(n) = 0.5T(n/2) + n$ [CO1][PO3]

   d. Among Quick Sort and Merge Sort which one is the best? Justify your answer. [CO2][PO2]

   e. What is Principle of Optimality? Explain its use in Dynamic Programming Method. [CO2][PO1]

   f. What are the applications of BFS & DFS? Mention any two applications for each. [CO3][PO1]

   g. Define Minimum Spanning Tree. Write any two applications of MST. [CO3][PO1]

   h. Given a weighted graph where weights of all edges are unique (no two edge have same weights),Is there is always a unique shortest path from a source to destination in such a graph? Justify your answer. [CO3][PO2]

   i. Why is the traveling salesman problem NP complete? [CO4][PO2]

   j. What is Hamiltonian cycle? [CO4][PO1]

## PART-C (4 X 15=60 Marks)

3a.  i.  What is asymptotic notation? Why asymptotic notation is used? Explain different asymptotic notations briefly.  [8][CO1][PO1]

 ii.  Write down limit theorems to define the different asymptotic notations for given two function f(n) & g(n).  [7][CO1][PO1]

(or)

b.  i.  (i)Solve the following recurrence relation using substitution method. $T(n) = 2T(n/2) + n$. Here $T(1) = 1$.  [7][CO1][PO2]

 ii.  (ii) Explain why analysis of algorithm is important? Explain: Worst Case, Best Case Average Case Complexity with suitable algorithm.  [8][CO1][PO1]

4.a  i.  Show that the running time of Quick Sort is $\theta(n2)$ when the array A contains distinct elements and is sorted in increasing order.  .[7][CO2][PO2]

 ii.  Sort the following list using Merge Sort Algorithm :  [8][CO2][PO2]
       (25, 15, 23, 16, 5, 1, 34, 11, 22, 12)

(or)

b.  i.  Explain in brief characteristics of greedy algorithms. Compare Greedy Method with Dynamic Programming Method.  [7][CO2][PO1]

 ii.  What is the running time of Quick Sort when all elements of an array A have the same value.  [8][CO2][PO2]

5a.  i)Use Dijkstra's single-source-shortest-path algorithm to find the shortest distance from the source a, of the fig. 1.  [7][CO3][PO3]

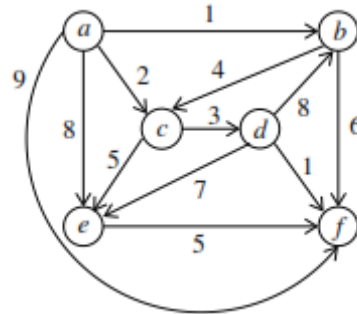ii) Write and explain the Floyd-Warshall algorithm for finding all pair shortest path for a weighted directed graph.  [8][CO3] [PO1]

(or)

b  i) Compute the shortest distance from s to t for the Graph given Fig.2 by using Bellman Ford Algorithm.  [7][CO4][PO3]
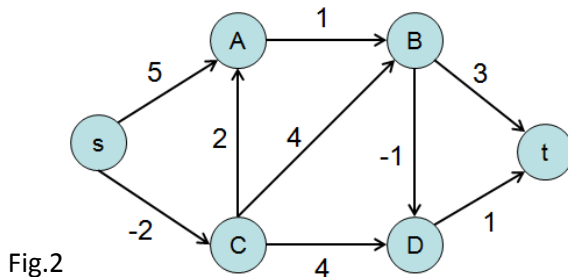


Fig.1



Fig.2

ii) Define disjoint sets. Briefly explain about the different disjoint set operations.  [8][CO4][PO1]

6a.  i.  Given a set S = {5, 10, 12, 13, 15, 18} and Sum=30, find the subset sum using backtracking approach.  [7][CO4][PO3]

 ii.  Define P, NP, NP complete and NP-Hard problems. Give examples of each.  [7][CO4][PO1]

(or)

b.  i.  Justify that Naive string matching algorithm uses Brute force approach.  [7][CO4][PO2]

 ii.  Explain use of branch and bound technique for solving assignment problem.  [8][CO4][PO1]

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