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Total Number of Pages : 02

B.Tech.  
PCS41102

**4<sup>th</sup> Semester Regular / Back Examination 2017-18**  
**DESIGN & ANALYSIS OF ALGORITHMS**  
**BRANCH : CSE**  
**Time : 3 Hours**  
**Max Marks : 100**  
**Q.CODE : C893**

**Answer Part-A which is compulsory and any four from Part-B.**  
**The figures in the right hand margin indicate marks.**  
**Answer all parts of a question at a place.**

**Part – A (Answer all the questions)**

**Q1 Answer the following questions: *multiple type or dash fill up type:* (2 x 10)**

- a) The time factor for determining the efficiency of algorithm is measured by -----  
-----.
- b) ----- notation provides an asymptotic lower bound on a function.
- c) Determining the connected components of an undirected graph is an application of -----.
- d) The running time of Quick sort depends heavily on the selection of -----.
- e) Kruskal's algorithm uses a ----- to determine whether an edge connects vertices in different components.
- f) ----- algorithm design technique is used in finding all pairs of shortest distances in a graph.
- g) Backtracking is ----- search with some bounding function.
- h) Any problem for which answer is either zero or one is called a ----- problem.
- i) Optimization problems are often solved efficiently by expanding a partial solution until the problem is solved, using ----- algorithms.
- j) Merging 4 sorted files containing 50, 10, 25 and 15 records will take ----- time.

**Q2 Answer the following questions: *Short answer type:* (2 x 10)**

- a) The recurrence relation  $T(n)=1$  for  $n=1$  and  $T(n)= 2T(n-1) + n$  for  $n \geq 2$  evaluate to  $2^{n+1} - n - 2$ . Justify.
- b) Order the following time complexities in increasing order  
 $1, \log_2 n, n \log_2 n, n, n^3, 2^n, 3^n$
- c) What is the recurrence relation if two matrices of  $n \times n$  are multiplied.
- d) Find the minimum number of comparisons required to determine if an integer appears more than  $n/2$  times in a sorted array of  $n$  integers.
- e) Mention the elements of the Greedy algorithm.
- f) Write the Huffman code for the letters a, b, c, d, e, f?
- g) Describe the steps of a Dynamic programming designing of an algorithm.
- h) What are the constraints required for a Backtracking method
- i) Which data structure is generally used to implement Branch and Bound?
- j) Determine whether the following problems are P, NP or NP-Complete, Satisfiability problem, Hamiltonian cycle, TSP problem, Knapsack problem, Clique, Set partitioning

**Part – B (Answer any four questions)**

- Q3** a) Solve the following recurrence relation  $T(n) = 2T(\sqrt{n}) + \log n$  (5)  
b) Sort the following elements using Quick sort algorithm. Analyze the time complexity. (10)  
21, 17, 34, 28, 11, 9, 18, 76
- Q4** a) Explain the Divide-and Conquer technique. Design a recursive algorithm for binary search. (7½)  
b) Sort the given list using the Merge sort (7½)  
50, 40, 20, 70, 15, 35, 20, 60
- Q5** a) Given the 10 activities along with their start and finish time as (10)  
 $S_i = \langle 1, 2, 3, 4, 7, 8, 9, 11, 12 \rangle$   
 $F_i = \langle 3, 5, 4, 7, 10, 9, 11, 13, 12, 14 \rangle$   
b) Prove that fractional Knapsack problem has the Greedy choice property. (5)
- Q6** a) Define all pairs shortest path problem. Discuss the solution of this problem basing on dynamic programming (5)  
b) Determine LCS of  $\langle 1, 0, 0, 1, 0, 1, 0, 1 \rangle$  and  $\langle 0, 1, 0, 1, 1, 0, 1, 1, 1, 0 \rangle$  (10)
- Q7** a) Describe the Krushkal's algorithm for MST with an example. (10)  
b) What is a branch and bound technique? How the TSP can be solved using this technique? (5)
- Q8** a) What is the backtracking? Give the solution for the 8 queen's problem. (10)  
b) Differentiate between NP-Complete and NP-hard problems. (5)
- Q9** Write short notes (Any THREE) of the following : (5 x 3)  
a) Approximation Algorithm  
b) Amortized Analysis  
c) Disjoint-set Operations  
d) Rabin-Karp algorithm