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CS 131604

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2019

B.Tech. 6th Semester End-Term Examination

Computer Science and Engineering

DESIGN AND ANALYSIS OF ALGORITHMS

Full Marks – 100

Time – Three hours

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The figures in the margin indicate full marks  
for the questions.

Answer Q.No. 1 and any six from the rest.

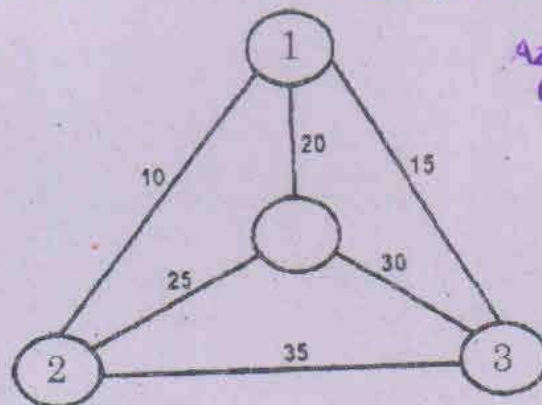
1. Answer the following questions : (10 × 1 = 10)
  - (a) \_\_\_\_\_ is the first step in solving the problem.
  - (b) The complexity of three algorithms is given as:  
 $O(n)$ ,  $O(n^2)$  and  $O(n^3)$ . Which should execute slowest for value of  $n$ ?
  - (c) What do you mean by principle of optimality?
  - (d) There are four algorithms A1, A2, A3, A4 to solve the given problem with the order  $\log(n)$ ,  $n\log(n)$ ,  $\log(\log(n))$ ,  $n/\log(n)$  Which is the best algorithm.
  - (e) The time complexity of binary search is \_\_\_\_\_.

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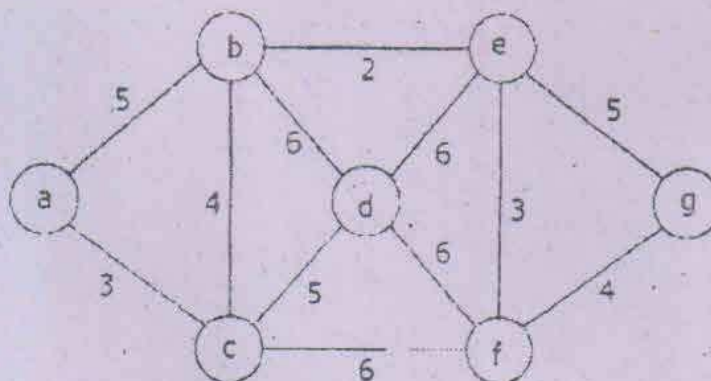
- (f) Which of the following sorting procedures is the slowest?
- Quick Sort
  - Heap Sort
  - Merge
  - Bubble.
- (g) What do you mean by MST?
- (h) In which stage of complexity analysis binary search = Linear search?
- (i) How many passes are required to sort a file of size  $n$  by bubble sort method?
- (j) The worst-case time complexity of Quick Sort is \_\_\_\_\_.
2. (a) Solve the recurrence relation, where  $T(1)=1$  and  $T(n)$  for  $n \geq 2$  satisfies  $T(n) = 2T(n/2) + n^2$  using Master Theorem.
- (b) What do you mean by algorithm analysis? What are the types of algorithm analysis?
- (c) Show that  $(n + a)^b = \theta(n^b)$ . (8+4+3)
3. (a) Define the recursion with example.
- (b)  $T(n) = T(n/4) + T(n/2) + n^2$ , solve using recursion tree method.
- (c) Express the formula  $(n-1)*(n-5)$  in terms of Big Oh notation. (2 + 10 + 3)
4. (a) Explain the complexity of merge search.
- (b) Design a divide and conquer type algorithm to compute the maximum of  $n$  numbers.
- (c) In quick sort, why pivot is chosen from the centre of the list rather than from one end.
- (d) Write the algorithm for binary search. (5 + 4 + 3 + 3)



5. (a) What is the difference between dynamic programming and Greedy algorithm?
- (b) Explain SSSP algorithm for the following graph.



- (c) Find the LCS from the following "ABCB" and "BDCAB" using back tracking. (3+5+8)
6. (a) What is the greedy criterion for knapsack problem?
- (b) Show that the space complexity of quick sort varies in between  $\phi(\log n)$  to  $\phi(n)$ .
- (c) Find the MST using Kruskal's Algorithm (Step By Step).



7. (a) Solve the following 0/1 Knapsack problem using dynamic programming  $P = (20, 18, 15)$ ,  $W = (60, 14, 10)$ ,  $C = 116$ ,  $n = 3$ .
- (b) Explain topological sorting.
- (c) Explain the difference between 0/1 knapsack problem and fractional knapsack problem. (8+4+3)
8. (a) Explain the DFS algorithm with an example.
- (b) Explain the difference between NP Complete and NP Hard class.
- (c) Is the dynamic programming algorithm for 0-1 knapsack problem a polynomial time algorithm? (5+5+5)
9. (a) Explain the algorithm for Huffman coding with example.
- (b) Explain backtracking approach for 4 queen problem.
- (c) Find the chromaticity for the following graph.

