

B.Tech. SEM -VI ( Computer) 2014 Course (CBCS) : WINTER - 2018  
SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS

Date: Wednesday  
Day: 14/11/2018

W-2018-2461

Time: 10.00 AM TO 01.00 PM  
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data if necessary.

- Q.1 Take an example of sequential search with unsorted list of numbers to be passed in an array and analyze this algorithm with respect to following (10)
- a) Effect of size of algorithm's input (number of samples)
  - b) Number of matching operations.
  - c) Best-case efficiency.
  - d) Worst-case efficiency.

OR

- Q.1 Consider the following algorithm (10)
- ALGORITHM Mystery(n)  
//input: A nonnegative integer n  
S ← 0  
for i ← 1 to n do  
    S ← S + i \* i  
return S
- f) What does this algorithm compute?
  - g) What is its basic operation?
  - h) How many times is the basic operation executed?
  - i) Calculate efficiency of this algorithm.
  - j) Suggest improvement if any? Otherwise prove that it is improved one.

- Q.2 Write a pseudo code to implement a stack using queue data structure. Is it efficient? Justify. (10)

OR

- Q.2 a) Suppose that we first insert an element X into a binary search tree that doesn't already contain X. Suppose that we then immediately delete X from the tree. Will the new tree be identical original one? If yes justify it otherwise give counter example. (05)
- b) Compare the quick sort and merge sort algorithms in terms of their time and space complexities and with justification, conclude the better one. (05)

- Q.3 Consider Insertion-Sort and Merge-Sort. For each algorithm, what will be the worst case asymptotic upper bound on the running time if you know additional that (10)
- i) The input is already sorted?
  - ii) The input is reversely sorted?
  - iii) The input is a list containing n copies of the same number?
- For each case and each sorting algorithm, state your answer and justify it.

OR

P. T. O.

Q.3 Which is the best sorting method to sort a list (10)  
A= (65, 70, 75, 80, 85, 60, 55, 50, 54).  
Write an algorithm & sort above list using quick sort.

Q.4 Write Dijkstra's Algorithm and explain it in detail with example and (10)  
analyze its efficiency.

OR

Q.4 a) For the given instance of a knapsack problem obtain the optimal solution (05)

Item	Weight	Values
01	05	100
02	07	63
03	08	56

when capacity  $W=05$ .

b) Explain optimal binary search tree algorithm with example and analyze its (05)  
efficiency.

Q.5 a) Design an algorithm to solve 8-Queens problems using backtracking. (05)

b) Draw the tree representation to solve the sum of subset problem for a set (05)  
 $A = (3, 5, 6, 7, 2)$  with the sum=15. Derive all the subsets.

OR

Q.5 Write backtracking algorithm for: (10)

- i) The n-queens problem
- ii) Hamiltonian problem
- iii) The subset-Sum problem

Q.6 What is meant by non-deterministic algorithm give an example and explain (10)  
in brief.

OR

Q.6 How to identify whether a given problem is NP-complete or not, explain (10)  
with example.

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