

OCT.-16/B. E./Insem. -226
B.E. (Computer Engineering)
DESIGN & ANALYSIS OF ALGORITHMS
(2012 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Figures to the right indicate full marks.
- 2) Draw neat diagram wherever necessary.
- 3) Make suitable assumptions where ever necessary.

Q1) a) Solve following recurrence equation using Master Theorem. [6]

$$T(n) = T(3n/4) + 1$$

b) Prove the following theorem:

If $f(n) = a_m n^m + \dots + a_1 n + a_0$ and $a_m > 0$, then $f(n) = \Omega(n^m)$ [4]

OR

Q2) a) Write Binary search algorithm with time complexity analysis of this algorithm. [6] ✓

b) Explain Asymptotic notations with suitable examples using $f(x)$ and $g(x)$ functions. [4] ✓

Q3) a) Let No. of keys, $n = 4$ and Keys $\{k_1, k_2, k_3, k_4\} = \{\text{do, if, int, while}\}$.

Let Probability of successful search, $p(1:4) = \{3, 3, 1, 1\}$

Let probability of unsuccessful search $q(0:4) = \{2, 3, 1, 1, 1\}$

Compute & construct OBST for above values. [8] ✓

b) State and explain the principle of dynamic programming. Name the elements of dynamic programming. [2] ✓

OR

Q4) a) Find an optimal solution for following greedy knapsack problem:

Number of objects $n=4$. Knapsack capacity $M=70$, Weights $W = \{10, 20, 30, 40\}$, Profits $P = \{20, 30, 40, 50\}$ [6]

b) Write control abstraction (General Strategy Algorithm) of dynamic programming [4]

- Q5) a) Write an algorithm to solve 8 queen's problem using backtracking method. [6]
- b) Explain how Travelling Salesperson problem is solved using branch and bound method. [4]

OR

- Q6) a) Write an algorithm for graph coloring problem using backtracking method. [6]
- b) Explain in detail backtracking strategy and give control abstraction (General Strategy Algorithm) for the same. [4]

OR

- Q7) a) Explain Knapsack problem using Greedy Strategy. [6]
- b) Calculate the worst case complexity of $f(x) = ax^2 + bx + c$ using running time complexity. [4]

