

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012**

**Subject code: 173205****Date: 28/12/2012****Subject Name: Design and Analysis of Algorithm****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**Q.1 (a)** Define algorithm. Write and explain insertion sort algorithm. Also state its complexity. **07**

**(b)** Solve the following recurrences:- **07**

(i)  $T(n) = 4T(n/2) + n^2$ , where  $n$  is power of two.

(ii) The number of rings required for the tower of Hanoi problem can be given as:-

$$T(m) = \begin{cases} 0 & , \text{ if } m = 0 \\ 2T(m-1) + 1 & , \text{ otherwise} \end{cases}$$

**Q.2 (a)** Write and explain briefly the divide and conquer strategy for merge sort algorithm. Also, explain briefly the worst-case analysis for the same. **07**

**(b)** Explain binary search using the concept of divide and conquer. Also search for 14 from the given array  $A = \langle 2, 7, 9, 12, 14, 22, 23 \rangle$ . Show each step and the value of each variable at each step. **07**

**OR**

**(b)** Explain quick sort using the concept of divide and conquer. Also sort the given array  $A = \langle 3, 6, 1, 4, 5, 2 \rangle$ . Show pivot element and the sub-array at each step. **07**

**Q.3 (a)** Briefly explain the activity selection problem with example using greedy approach. **07**

**(b)** Briefly explain the Kruskal's algorithm with example. **07**

**OR**

**Q.3 (a)** Compare the 0-1 knapsack problem with the fractional knapsack problem for greedy approach. Justify your answer with example. **07**

**(b)** Briefly explain the Prim's algorithm with example. **07**

- Q.4 (a)** Derive all the equations for finding the longest common subsequence using dynamic approach. Also, find the longest common subsequence for the following:- **07**

$X = \langle A, B, C, D \rangle$  and  $Y = \langle C, B, D \rangle$

- (b)** Compare dynamic and greedy approach using knapsack problem. **07**

**OR**

- Q.4 (a)** Derive all the equations for matrix chain multiplication using dynamic approach and solve for the following sequence:- **07**

5 X 10 , 10 X 4 , 4 X 8

- (b)** Compare dynamic and greedy approach using making change problem. **07**

- Q.5 (a)** Explain the concept of backtracking using the knapsack problem. **07**

- (b)** Write and explain the Rabin-Karp algorithm for string matching. **07**

**OR**

- Q.5 (a)** Explain the concept of backtracking using the 8 queen's problem. **07**

- (b)** Explain class P and NP. Also, briefly explain the NP-Completeness problem. **07**

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