

Total No. of Questions : 10]

SEAT No. :

P2915

[4958]-1110

[Total No. of Pages : 3

**T.E. (Information technology)**  
**DESIGN AND ANALYSIS OF ALGORITHMS**  
**(2012 Course) (314449) (Semester - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, and Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a) Prove by mathematical induction that “sum of the cubes of first n positive integers is equal to the square of sum of these integers”. [5]
- b) Explain the potential method of amortized analysis with example. [5]

OR

- Q2) a) Solve the following recurrence relation using substitution method. [5]

$$T(n) = 2T(\sqrt{n}) + C, \quad n > 2$$
$$= 1, \quad n \leq 2$$

- b) Consider following letters with their probability

Character	a	b	c	d	e
Probability	1/2	1/4	1/8	1/16	1/32

Find out the Huffman coding for a, b, c, d, e. [5]

- Q3) a) Perform multiplication of given large integers  $957 \times 9873$  in time less than  $O(n^2)$ . [8]
- Analyze the time complexity of this multiplication.
- b) State “Principle of Optimality”. [2]

OR

*P.T.O.*

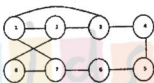
- Q4) a)** Solve the all pairs shortest path problem for the given graph. [6]



- b) Write down recurrence relation for merge sort and find out its time complexity by substitution method. [4]

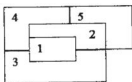
- Q5) a)** Write a recursive algorithm which shows a recursive formulation of the backtracking technique and explain it. [8]

- b) Find out Hamiltonian cycle for following graph [8]



OR

- Q6) a)** Construct planar graph for following map. Explain how to find m-colorings of this planar graph by using m-colorings backtracking algorithm. [8]



- b) Write a recursive backtracking algorithm for sum of subset problem. [8]

- Q7)** a) What is LC Search? Explain in detail Control abstraction for LC Search. [8]  
b) Solve the following instance of 0/1 knapsack problem by FIFO branch and bound approach :  $n = 4$ ;  $M = 15$  and  $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$ ;  $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ . [10]

OR

- Q8)** Write short note on [18]  
a) Various searching techniques in branch and bound.  
b) Bounding function in branch and bound.  
c) Backtracking Vs branch and bound.

- Q9)** a) Specify one example of NP-complete problem. Also justify that why it is NP-complete. [8]  
b) Explain the need and significance of parallel algorithms. Define the speedup of parallel algorithm. [8]

OR

- Q10)** a) Write and explain non-deterministic algorithm for searching an item in an array. What is its complexity? [8]  
b) Differentiate between different models of parallel computations. [8]

