Total No. of Questions : 10]

SEAT No. :

P2915

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T.E. (Information technoloy)

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]**

$$T(n) = 2T\left(\sqrt{n}\right) + C \quad , \; n > 2$$

$$= 1 \qquad\qquad , \; n <= 2$$

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 × 9873 in time less than $O(n^2)$. **[8]**

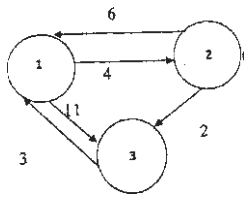
Analyze the time complexity of this multiplication.

b) State "Principle of Optimality". **[2]**

OR

P.T.O.

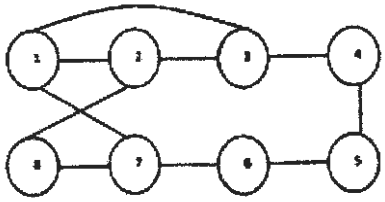
Q4) a) Solve the all pairs shortest path problem for the given graph. **[6]**



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

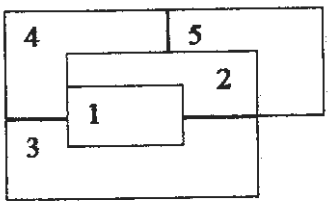
Q5) a) Write a recursive algorithm which shows a recursive formulation of the backtracking technique and explain it. **[8]**

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 planer 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 (p1, p2 , p3, p4) = (10, 10, 12, 18); (w1, w2, w3, w4) = (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]**