

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, LUCKNOW

MIDSEM SUBJECTIVE EXAM

DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech 4th Sem – IT/CS/CSAI/CSB

Course Instructor: Dr.Deepshikha Agarwal

Time duration: 2 hours

Max.Marks: 30

- You can make Assumptions wherever necessary and mention it in the answersheet

SECTION-A (Compulsory, 12 Marks)

(Q1) Give one line/short answers: (2+2+2 marks)

- Define Big 'O' and small omega asymptotic notations.
- Differentiate between Greedy approach and Brute Force approach.
- State the TSP problem. What is its Worst and Best case time complexities using greedy approach?

(Q2) State True/False and give explanation : (3+3 marks)

- The solution to the recurrence $T(n) = 2^n$, $T(n-1)$ is $T(n) = \Theta(2^{(n,n+n)})$
- If all the edge weights are not distinct, then both the algorithms will produce same MCSTs. However, the total cost of both the trees will sometimes be same.

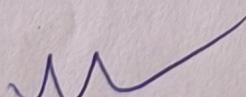
SECTION-B (Attempt any 3 questions, 3 x 6= 18 Marks)

Q3) Suppose in quicksort procedure, we select three pivots in an array 'n' elements– largest element, average value and last element. All the elements of the array are same. Will the algorithm perform the sorting faster? Take a suitable example to show the working and compute the time complexity in worst case. (3+3 marks)

Q4) You have to reach Bangalore urgently by flight from Lucknow. You chose the flight at odd hours because it was less costly. The maximum weight of luggage allowed per person is 28 Kgs. There are plenty of files, books, clothes, cash and delicate art-pieces to be transported. Suggest a suitable way to do the same so that you can bring atleast 2 art-pieces, 4 files, 2 books and 5 set of clothes to Bangalore. Assume the weights to be {13, 22, 100, 45}. (3+3 marks)

Q5) Suppose there are 100 balls available in a single box. 99 balls have the same weight but 01 ball (odd ball) has a different weight than the other balls. You are provided with a weighing scale with two pans moving around a pivot.

- Suggest a divide and conquer technique to find that odd ball in minimum number of weighings.
- Write an algorithm for your proposed technique



- (c) Compute the time complexity of your algorithm in Best case and Worst case
(d) Is your proposed technique better than the Brute-force technique? Why/Why not?

(1+2+2+1 Marks)

- Q6** Explain why the time complexity of Prim's Algorithm is same as Dijkstra's algorithm?
Find the shortest path from A to F for the given Weighted Adjacency Matrix. Can this path be called as a Minimum cost spanning tree? Why /Why not? Show with working.

(2+2+2 Marks)

	A	B	C	D	E	F
A	0	1	3	Infinity	Infinity	Infinity
B	1	0	1	7	5	Infinity
C	3	1	0	9	3	Infinity
D	Infinity	7	9	0	2	1
E	Infinity	5	3	2	0	2
F	Infinity	Infinity	Infinity	1	2	0