Code No:158FC **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech IV Year II Semester Examinations, June - 2024
RANDOMIZED ALGORITHMS
(Computer Science and Engineering (Artificial Intelligence and Machine Learning))

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	When do we say that the two events are said to be independent?	[2]
b)	Write the Randomized Quicksort algorithm.	[3]
c)	What is a Markov chain?	[2]
d)	State and prove Markov Inequality Theorem.	[3]
e)	State Edmond's Theorem.	[2]
f)	Make a comparison of the two types of fingerprinting techniques.	[3]
g)	Draw a full, endogenous binary search tree for the set of keys {7, 9, 13, 1 5}.	[2]
h)	Write a Faster Min-Cut Algorithm.	[3]
i)	Describe randomized incremental sorting.	[2]
j)	Prove that the Greedy MIS algorithm terminates in O(m) time with a maximal independent set, if the input is given in the form of an adjacency list.	[3]

PART – B

(50 Marks)

2. Show that there exists a set of line segments for which no binary planar partition can avoid breaking up some of the segments in to pieces, if each segment is to lie in a different region of the partition. [10]

OR

3. State and prove von Neumann's Minimax Theorem. [10]

4. Suppose m balls are thrown into n bins. Give the best bound you can on m to ensure that the probability of there being a bin containing at least two balls is at least 1 /2. [10]

OR

5. Write the algorithm for 2-SAT problem and analyze it by studying the properties of random walks on the line. [10]

6. Illustrate fingerprinting by describing a technique for verifying matrix multiplication.[10]

OR

7. Design an algorithm to the problem of pattern matching in two-dimensional strings.[10]

8. What is a Hash function? Describe a hashing scheme that processes the FIND operation using 0(1) time in the worst case. [10]

OR

9. Explain Boruvka's algorithm. Also, show that Boruvka's algorithm can be implemented to run in time O(min{m log n, n^2}). [10]

10.a) Give a note on duality and its role in designing algorithms.

b) Show that the expected number of vertices created at any step of the randomized incremental half-space intersection algorithm is a constant. [5+5]

OR

11. Explain the PRAM Model and describe Sorting process on a PRAM. [10]

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