K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024 (B. Tech.)
Program: Information Technology   Scheme: IIB
Regular Examination: TY   Semester: V
Course Code: ITDLC5054 Course Name: Advanced Data Structures and Algorithmic Performance Analysis

Date of Exam: 2/12/2024   Duration: 02.5 Hours   Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)			
a)	Explain example of an application that requires algorithmic content at the application level, and discuss the function of the algorithms involved.	10	CO1	U
b)	Explain the pseudocode for B-TREE-DELETE.		CO2	U
c)	Explain divide and conquer technique with suitable example.		CO3	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain the concept of dynamic programming with suitable example.		CO4	U
b)	Explain the concept of string matching algorithms.		CO5	U
c)	Explain the optimization algorithms with suitable example.		CO6	U
Q.3	Solve any **two** questions out of three. (10 marks each)			
a)	Explain substitution method to solve the recurrence $T(n) = T(n/2) + O(1)$ to show that $T(n) = O(\lg n)$ with detailed proof.	20	CO1	U
b)	Sketch the red-lack tree that results after successfully inserting the keys 41,38, 31,12,19,8 into an initially empty red-black tree. Explain the cases of insertion you have applied for the insertion in this tree.		CO2	A
c)	Demonstrate an optimal placement for 13 programs on three tapes T0, T1 and T2, where the programs are of lengths12,5,8,32,7,5,18,26,4,3,11,10 and 6.		CO3	A
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Solve to determine the cost and structure of an optimal binary search tree for a set of n=7 keys with the following probabilities:		CO4	A

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i	0	1	2	3	4	5	6	7
p_i		0.04	0.06	0.08	0.02	0.10	0.12	0.14
q_i	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05

b)	Working modulo q = 11, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 3141592653589793 when looking for the pattern P = 26?		CO5	A
c)	Find the optical vertex cover for the following graph. Also explain the steps of the algorithm in detail.		CO6	A

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