

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

Nov – Dec 2023

B.Tech Program: Scheme II

Examination: TY Semester:V

Course Code: ITDLC5054 and Course Name: Advanced Data Structures and Algorithmic  
 Performance Analysis

Date of Exam: 07/12/2023

Duration: 2.5 Hours

Max. Marks: 60

Instructions:				
(1) All questions are compulsory.				
(2) Draw neat diagrams wherever applicable.				
(3) Assume suitable data, if necessary.				
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Explain Theta Notation ( $\Theta$ -notation) with graph.	2	CO1	U
ii)	Explain B-Tree with Example.	2	CO2	U
iii)	Explain the three parts of divide and conquer approach.	2	CO3	U
iv)	Explain the time complexity of optimal merge pattern.	2	CO3	U
v)	Explain the difference between single pair shortest path and all pair shortest path problem.	2	CO4	U
vi)	Explain optimal binary search tree explain with example.	2	CO4	U
vii)	Explain which one is better: KMP algorithm or Boyer-Moore algorithm.	2	CO5	U
viii)	Explain the difference between accuracy and approximation?	2	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Solve the equation by Substitution Method to identify the running time. $T(n) = T\left(\frac{n}{2}\right) + n$	4	CO1	A
ii)	Sketch a RED BLACK Tree by inserting following sequence	4	CO2	A

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	number 8, 18, 5, 15, 17, 25, 40, 80			
iii)	Solve to find max and min from the sequence 33, 11, 44, 55, 66, 22 using divide and conquer approach.	4	CO3	A
iv)	Demonstrate Matrix Chain Multiplication algorithm with the help of suitable example.	4	CO4	A
v)	For string matching, working module $q = 11$ , demonstrate how many spurious hits does the Rabin-Karp matcher encounters in Text $T = 31415926535.....$	4	CO5	A
vi)	Demonstrate the difference between NP hard and NP complete problem.	4	CO6	A
Q.3	Solve any two questions out of three.	16		
i)	Solve following recurrence relation using Master's theorem to identify the asymptotic bound on T- $T(n) = 3T(n/2) + n^2$	8	CO1	U
ii)	Demonstrate and find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach. Consider- $n = 4$ $w = 5$ kg $(w_1, w_2, w_3, w_4) = (2, 3, 4, 5)$ $(b_1, b_2, b_3, b_4) = (3, 4, 5, 6)$	8	CO4	A
iii)	Solve to find the longest common subsequence for strings $X = BACDB$ and $Y = BDCB$ .	8	CO5	A
Q.4	Solve any two questions out of three.	16		
i)	Solve to find the number of different topological orderings possible for the given graph:	8	CO2	A

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<p><b>ii)</b></p>	<p>Given the jobs, their deadlines and associated profits as shown</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Jobs</th> <th>J4</th> <th>J1</th> <th>J3</th> <th>J2</th> <th>J5</th> <th>J6</th> </tr> </thead> <tbody> <tr> <td>Deadlines</td> <td>2</td> <td>5</td> <td>3</td> <td>3</td> <td>4</td> <td>2</td> </tr> <tr> <td>Profits</td> <td>300</td> <td>200</td> <td>190</td> <td>180</td> <td>120</td> <td>100</td> </tr> </tbody> </table> <p>Solve the following questions-                  Write the optimal schedule that gives maximum profit.                  Are all the jobs completed in the optimal schedule?                  What is the maximum earned profit?</p>	Jobs	J4	J1	J3	J2	J5	J6	Deadlines	2	5	3	3	4	2	Profits	300	200	190	180	120	100	8	CO3	A
Jobs	J4	J1	J3	J2	J5	J6																			
Deadlines	2	5	3	3	4	2																			
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<p><b>iii)</b></p>	<p>Solve to find vertex cover of this graph, the set of edges of the given graph is –</p> <p><math>\{(1,6),(1,2),(1,4),(2,3),(2,4),(6,7),(4,7),(7,8),(3,8),(3,5),(8,5)\}</math></p>	8	CO6	A																					

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