



R23 Regulation

Subject code: 4E4EE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, April 2023

DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE, CSE(AI&ML) & CSE(DS))

Maximum Marks: 80

Date: 01.05.2023

Duration: 3 hours

- Notes:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry 10 marks each

10X10=100 Marks

	Marks	CO	Bloom Tx
1.a) Write the basic principle of divide and conquer method?	10M	1	2
b) What is the worst case time complexity of merge sort algorithm?	10M	1	2
c) Find the time complexity of sum of 'n' natural numbers	10M	1	1
d) Give the formula to find the number of spanning trees in a graph	10M	2	1
e) Give the formula to identify the articulation point in a graph	10M	2	1
f) Jobs $J = (J_1, J_2, J_3, J_4)$ are given, their processing time $T = (1, 1, 2, 3)$ and deadlines $D = (3, 4, 2, 3)$ maximum how many jobs can be scheduled?	10M	3	2
g) What is a greedy algorithm?	10M	4	1
h) Write the principle of optimality?	10M	4	1
i) Define P and NP class.	10M	5	1
j) Differentiate non-deterministic and deterministic time complexity classes.	10M	5	2

Part-B

Answer All the following questions.

5X10M=50 Marks

	Marks	CO	Bloom Tx
2 a) Explain the concept of asymptotic notation and its importance in algorithm analysis.	5M	1	2
b) Explain the process of Strassen's Matrix Multiplication with an example.	5M	1	2
OR			
3 a) Sort the following elements using Quick Sort 11, 21, 41, 30, 5, 8, 9, 15, 22, 89, 6 and write the worst case and best-case time complexity.	5M	3	3
b) Solve the recurrence relation and find the time complexity $T(n) = 7T(n/2) + 18n^2$	5M	1	3
4 Develop a state space tree by recursive backtracking for sum of subsets of $\{1: n\} = \{5, 10, 12, 13, 15, 18\}$ $n=30$	10M	2	3

	OR																												
5	a) Explain AND/OR graph with suitable example.	5M	2	3																									
	b) Write the algorithm for graph colouring?	5M	2	1																									
6	Develop the solution for Job sequencing when $n=6$ $(p_1 \dots p_6) = (3, 5, 20, 18, 1, 6)$ and $(d_1 \dots d_6) = (1, 3, 4, 3, 2, 1)$	10M	3	3																									
	OR																												
7	Write the Dijkstra's algorithm to find the shortest path in a graph and apply the same for the below mentioned graph 	10M	3	3																									
8	Construct an optimal binary search tree for the following keys with probabilities <table><tr><td>Items</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Keys</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr><tr><td>Probabilities</td><td>0.25</td><td>0.2</td><td>0.05</td><td>0.2</td><td>0.3</td></tr></table>	Items	1	2	3	4	5	Keys	A	B	C	D	E	Probabilities	0.25	0.2	0.05	0.2	0.3	10M	4	3							
Items	1	2	3	4	5																								
Keys	A	B	C	D	E																								
Probabilities	0.25	0.2	0.05	0.2	0.3																								
	OR																												
9	Apply the matrix chain multiplication for the matrices with sizes $M_1 (5 \times 4)$ $M_2 (4 \times 6)$ $M_3 (6 \times 2)$ $M_4 (2 \times 7)$	10M	4	3																									
10	a) Prove that the clique decision problem is NP complete.	5M	5	2																									
	b) Explain Cook's theorem.	5M	5	2																									
	OR																												
11	Solve a control abstraction of LC – Branch & Bound technique. Solve given Travelling Sales Men Problem. <table><tr><td>∞</td><td>20</td><td>30</td><td>10</td><td>11</td></tr><tr><td>15</td><td>∞</td><td>16</td><td>4</td><td>2</td></tr><tr><td>3</td><td>5</td><td>∞</td><td>2</td><td>4</td></tr><tr><td>19</td><td>6</td><td>18</td><td>∞</td><td>3</td></tr><tr><td>16</td><td>4</td><td>7</td><td>16</td><td>∞</td></tr></table>	∞	20	30	10	11	15	∞	16	4	2	3	5	∞	2	4	19	6	18	∞	3	16	4	7	16	∞	10M	5	3
∞	20	30	10	11																									
15	∞	16	4	2																									
3	5	∞	2	4																									
19	6	18	∞	3																									
16	4	7	16	∞																									