

End Semester Examination

May-June 2023

CS321 - Design and Analysis of Algorithms

Schedule ID: 19619

Faculty/School	Faculty of Engineering & Technology	Term	VIII
Program	Third Year, B. Tech	Duration	2 Hours
Specialization		Max. Marks	50

Instructions to the Candidate:

1. Write the PRN on the top right-hand corner of the question paper.
2. Draw neat diagrams.
3. Assume suitable data, if necessary.

Section 1 (5 X 10 Marks)

Answer any 5 questions

1	A) Discuss Proof Techniques and explain the following with example: 1) Proof by contradiction 2) Proof by mathematical induction B) Show that 1) $6 \cdot 2^n + n^2 = \Theta(2^n)$ 2) $3n + 2 = \Theta(n)$	10 marks	CO1	Applying														
2	A) Solve the following elements using merge sort: E, X, A, M, P, L, E in alphabetical order. Write its complexity equation and complexity - best case, worst case and average case. B) Solve the following recurrence using substitution method $T(n) = T(n - 1) + n^4$	10 marks	CO1	Analysing														
3	Construct the Huffman's tree for the following data and obtain its Huffman code? <table border="1"><tr><td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr><tr><td>Probability</td><td>3</td><td>2</td><td>4</td><td>7</td><td>11</td><td>13</td></tr></table> Encode the text – DADFB E and find compression ration?	Character	A	B	C	D	E	F	Probability	3	2	4	7	11	13	10 marks	CO2	Analysing
Character	A	B	C	D	E	F												
Probability	3	2	4	7	11	13												

4	Solve the Travelling Salesman problem using Dynamic Programming problem for the following graph and find the shortest path <table><tr><td>∞</td><td>9</td><td>8</td><td>8</td></tr><tr><td>12</td><td>∞</td><td>13</td><td>6</td></tr><tr><td>10</td><td>9</td><td>∞</td><td>5</td></tr><tr><td>20</td><td>15</td><td>10</td><td>∞</td></tr></table>	∞	9	8	8	12	∞	13	6	10	9	∞	5	20	15	10	∞	10 marks	CO2	Applying				
∞	9	8	8																					
12	∞	13	6																					
10	9	∞	5																					
20	15	10	∞																					
5	A) Write an algorithm to solve n queen problem using Backtracking B) Differentiate Dynamic programming and Backtracking	10 marks	CO3	Remembering																				
6	Select optimal subset J with an optimal penalty for the following data. What will be the penalty corresponding to the optimal solution? <table><tr><td>Job</td><td>Pi</td><td>di</td><td>ti</td></tr><tr><td>1</td><td>15</td><td>1</td><td>1</td></tr><tr><td>2</td><td>10</td><td>3</td><td>2</td></tr><tr><td>3</td><td>06</td><td>2</td><td>1</td></tr><tr><td>4</td><td>13</td><td>1</td><td>1</td></tr></table> Draw a State Space Tree and Compute C^ and Upper for each node.	Job	Pi	di	ti	1	15	1	1	2	10	3	2	3	06	2	1	4	13	1	1	10 marks	CO3	Analysing
Job	Pi	di	ti																					
1	15	1	1																					
2	10	3	2																					
3	06	2	1																					
4	13	1	1																					
7	What are steps to prove NP-completeness of a problem? Prove that vertex cover problem is NP-complete.	10 marks	CO4	Applying																				
8	A) Differentiate between deterministic and non-deterministic algorithm with example B) Explain Decision and optimization problems with examples	10 marks	CO4	Remembering																				

END OF QUESTION PAPER