

Total No. of Questions: 6

Total No. of Printed Pages: 2

PRN No.	
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PAPER CODE	U314-231-ESE
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**(AY:2024-25) December 2024 (ENDSEM) EXAM
TY (SEMESTER - I)**

**COURSE NAME: Design & Analysis of Algorithms Branch: COMPUTER ENGINEERING COURSE CODE: CSUA31208
(T.Y PATTERN 2020)**

Time: [1Hr 30 Min]

[Max. Marks: 40]

Instructions to candidates:

- 1) **Figures to the right indicate full marks. Use of scientific calculator is allowed**
- 2) **Use suitable data wherever required**
- 3) **All questions are compulsory. Solve any two sub question each from Questions 1 and 2**
- 4) **Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level															
Q.1	a) Solve the following recurrence relation by using Masters theorem $T(n) = 2T(n/2) + n \log n$	[4]	CO 1	Apply															
	b) state whether the following functions are correct or incorrect and justify your answer (i) $3n+2=O(n)$ (ii) $100n+6=O(n)$	[4]	CO 1	Apply															
	c) Analyze merge sort and find the time complexity of merge sort	[4]	CO 1	Apply															
Q2	a) Apply Dynamic programming following instances of the knapsack problem and solve <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Item</th> <th>Weight</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> <td>\$12</td> </tr> <tr> <td>2</td> <td>1</td> <td>\$10</td> </tr> <tr> <td>3</td> <td>3</td> <td>\$20</td> </tr> <tr> <td>4</td> <td>2</td> <td>\$15</td> </tr> </tbody> </table>	Item	Weight	Value	1	2	\$12	2	1	\$10	3	3	\$20	4	2	\$15	[4]	CO 2	Apply
	Item	Weight	Value																
1	2	\$12																	
2	1	\$10																	
3	3	\$20																	
4	2	\$15																	
	b) Solve the following instances of job sequencing problem using the greedy approach let $n=6$, Profit $P(1:6)=(30,20,15,10,5,1)$ and deadline $d(1:6)=(4,2,2,1,4,3)$ c) What is optimal Huffman codes for the following set of frequencies based on first 8 Fibonacci numbers a:1,b:1,c:2,d:3,e:5,f:8,g:13,h:21	[4]	CO 2	Apply															

Q3	a) Discuss and analyze the problem of graph coloring using backtracking	[2]	CO 3	Understand
	OR			
	b) Explain the Traveling Salesperson Problem (TSP) and describe why it is considered a challenging computational problem.	[2]	CO 3	Understand
	c) Generate at least 2 solution for 5 queens problem	[4]	CO 3	Understand
Q4	a) What is a non-deterministic algorithm, and how does it differ from a deterministic algorithm	[2]	CO 4	Understand
	OR			
	b) Prove the Vertex Cover problem is NP Complete	[2]	CO 4	Understand
	c) Explain the 3-SAT problem and describe why it is significant in computational complexity theory. Additionally, how does the 3-SAT problem relate to the broader class of NP-complete problems	[4]	CO 4	Understand
Q.5	a) What is a clique in a graph, and how can randomized algorithms be applied to find large cliques in graphs?	[2]	CO 5	Apply
	OR			
	b) What is Simulated Annealing, and how is it used to solve optimization problems?	[2]	CO 5	Apply
	c) How can approximation algorithms be used to solve the Traveling Salesperson Problem (TSP), and what is the benefit of using such algorithms?	[4]	CO 5	Apply
Q.6	a) What are the key factors to consider in the analysis of parallel algorithms, and why is speedup important?.	[2]	CO 6	Understand
	OR			
	b) What is the Dining Philosopher problem, and how does it relate to issues in concurrent algorithm design?	[2]	CO 6	Understand
	c) What is a parallel algorithm, and how does it differ from a sequential algorithm.	[4]	CO 6	Understand