MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321T **20 FEBRUARY 2024**

TY BTECH SEMESTER - VI BACKLOG 2016 PATTERN 2023 - 2024 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 Hrs **MAX MARKS :50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES: 2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a)	Explain Merge sort algorithm with example. Also analyze performance of the algorithm in terms of its time complexity. *Algorithm 5 marks, Example 2 marks, Time complexity calculation 3 marks.*	**[10]**	**CO1**	**L1**
b)	Apply Masters Theorem to analyze the given performance equations: i) T(n)= 3T(n/2)+n ii) T (n) = 4T (n/2) + n^2 *3 marks each correct solution.*	**[6]**	**CO1**	**L3**
2 a)	Explain 0/1 Knapsack algorithm. Apply this algorithm to solve problem where n = 4, M = 8, P = {15,9,5,10} W = {1,3,4,5}. Show maximum profit earned in knapsack. *Correct Algorithm : 5 marks, Solution of Prob: 5*	**[10]**	**CO3**	**L3**

	b)	Constuct an optimal Huffman code for the following set of frequencies :- a:42, b:20, c:5, d:10, e:11, f:12. Decode the word "11101101" at the receiver side. *4 Marks for costruction of tree with correct encoding bits, 3 Marks for decoding the word.*	**[7]**	**CO2**	**L4**
3	**a)**	Let the keys {end,goto,print,read} with the successful probablities (1,4,2,1) and unsuccessfull probablities are (4,2,4,1,1) Construct a Binary Search Tree with optimum searching time. *4 marks for Solution with equation , 4 marks for table and 2 marks for tree .*	**[10]**	**CO1**	**L3**
	b)	Find the optimal solution for 0/1 problem, where no of objects are n=4, capacity of sack M=5, profits are (3,4,5,6) and weights are (2,3,4,5). *5 marks for Solution with equation , 2 marks for table.*	**[7]**	**CO2**	**L4**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321/CS347T **07 JUNE 2022**

TY BTECH SEMESTER - VI RE-EXAMINATION 2021 - 2022 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

RE-EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 3 HOURS **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: 6 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Given a list of n elements, Write an algorithm to sort elements using quick sort . Explain the time complexity using Substitution Method. *5 marks for writing correct algorithm ,2marks for example and 3 marks for deriving time complexity correcty using substitition method.*	**[10]**	**CO1**	**L2**
	b)	Justify this statement: "Greedy strategy will not always gives you optimal solution whereas Dynamic Programming gives. *Explanation of strategies 2 marks justification with example 3 marks.*	**[5]**	**CO1**	**L5**
2	**a)**	A motorist wishing to ride from city A to B. Formulate greedy based algorithms to generate shortest path and explain with an example graph.Analyze the time complexity for shortest path algorithm. *Correct algorithm :5 marks Example: 3 Marks Time complexity: 2 marks*	**[10]**	**CO1, CO2**	**L3**

	b)	State the Greedy Knapsack? Find an optimal solution to the Knapsack instance n=3, m=20, (P1, P2, P3) = (25, 24, 15) and (W1, W2, W3) = (18, 15, 10).	**[5]**	**CO1**	**L3**
3	**a)**	Define Traveling salesman problem. Apply TSP using Dynamic programming where the edge lenghts are given as	**[9]**	**CO3**	**L3**

0	9	8	8
12	0	13	6
10	9	0	5
20	15	10	0

Travelling sales person problem: 2 Marks. Step wise solution 7 marks

	b)	Desgin an Optimal Binary Search Tree for n=4 identifiers (a1,a2,a3,a4) = (do,if,read, while) P(1:4)=(3,3,1,1) and Q(0:4)=(2,3,1,1,1). *Step wise solution : 6 marks Correct OBST: 3 marks*	**[9]**	**CO3**	**L3**
4	**a)**	Evaluate following instance of knapsack using LCBB approach: M=12, (P1,P2,P3,P4,P5)=(10,15,6,8,4) and (w1,w2,w3,w4,w5)=(4,6,3,4,2). *8 Marks for stepwise solution of knapsack. 2 marks for correct state space tree.*	**[10]**	**CO3**	**L5**
	b)	Discuss the 4 – queen's problem. Draw the portion of the state space tree for n = 4 queens using backtracking algorithm. *4 queen problem :4 Marks, Correct state space tree :4 marks*	**[8]**	**CO3**	**L3**
5	**a)**	Compare P and NPclass problems, Justify that P is a subset of N *Comaprision 4 marks and 2 marks for justify ans.*	**[8]**	**CO4**	**L5**
	b)	Define NP Complete problem and Prove that 3SAT is NP Complete problem. 3Mfor NP Complete Prob explanation and 5 marks for proving 3SAT is NPC	**[8]**	**CO4**	**L3**

6	**a)**	Given a String " abcdefgh" and a pattern "def " Apply Rabin Karp pattern matching algorithm to match a pattern. What will be time complexity of Rabin Karp in worst case. 6M for stepwise solution and 2 M for time complexity	**[8]**	**CO5**	**L3**
	b)	State chinese reminder theorem and solve the following using CRT.X=3(mod 9) and X=7(mod13). CRT theorem: *2 marks Correct solution with steps: 3 Marks*	**[5]**	**CO5**	**L2**
	c)	Explain Euclid's algorithm and compute: LCM(7854,4746) using Euclid's algorithm. *3Marks for algorithm 3Marks for calculation*	**[5]**	**CO6**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T **11 MAY 2022**

TY BTECH SEMESTER - VI 2021 - 2022 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 03 **TOTAL NO OF PRINTED PAGES: 02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 **a)** Show the solution for Eight Queen's problem if q1, q2, q3 and q4 is placed in (6,4,7,1) position.Draw the State space search Tree for Four Queen Problem. complete solution of placing remaining Four queen 3 Marks and for Clear and correct State space tree 2 Marks. **[5]** **CO1** **L2**

b) Consider the following Cost Matrix for the vertex A, B,C,D,E for a Travelling Salesperson instance. Determine the shortest path to visit every vertex and Draw State space tree using LCBB approach. Assume Vertes A as a source vertex. step wise calculation of cost matrix 6 Marks and for construction of state space tree 2 Marks. **[8]** **CO4** **L5**

∞	7	3	12	8
3	∞	6	14	9
5	8	∞	6	18
9	3	5	∞	11
18	14	9	8	∞

	c)	Make use of a Backtracking Strategy to design an algorithm for solving knapsack optimization problem using a fixed tuple size formulation. writing a correct and recursive Algorithm 5 Marks	**[5]**	**CO1**	**L3**
2	**a)**	Given a set of non-negative integers, and a value sum, determine if there is a subset of the given set with sum equal to given sum. Example: let Input set [ ] = {3, 34, 4, 12, 5, 2}, sum = 9.There is a subset (4, 5) with sum 9. Explain a Non Deterministic algorithm for the problem and also calculate the time complexity. Explaining ND algorithm for sum of Subset problem 4 Marks and for mentioning the Time complexity 1 mark	**[5]**	**CO2**	**L2**
	b)	Prove that 3SAT is a NP Complete problem. For complete proof 5Marks.	**[5]**	**CO3**	**L5**
	c)	Explain NP Hard and NP Complete problems. Explanation of NP Hard and NP Complete problem 2 Marks for each	**[4]**	**CO4**	**L2**
3	**a)**	Let the Text "ABACAABADCABACAABACABAABB" and the Pattern is "ABACAB". Apply Boyer Moore and KMP string Matching Algorithm to find the pattern in the given Text. Mention the Time complexity of Both the Algorithm. 8 Marks for Boyer Moore Algorithm and 4 Marks for KMP Algorithm.	**[12]**	**CO5**	**L3**
	b)	Define Randomized Algorithm? State any one randomized algorithm with example. Explanation of Randomized Algorithm 3 Marks and explanation of any one type of randomized Algorithm 3 marks.	**[6]**	**CO5**	**L1**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321˙ **11 May 2022**

TY BTECH SEMESTER - VI BACKLOG 2021 - 2022 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES:2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Determine the optimal solution for following instance of knapsack using FIFO approach: M=12, (P1,P2,P3,P4,P5)=(10,15,6,8,4) and (w1,w2,w3,w4,w5)=(4,6,3,4,2). 8 Marks for stepwise solution of knapsack. 2 marks for correct state space tree.	**[10]**	**CO1**	**L4**
	b)	Use the backtracking method for Graph coloring Problem. Define backtracking(2 M),Graph coloring Problem(2) Application of backtracking to Graph coloring.(4)	**[08]**	**CO1**	**L3**
2	**a)**	Compare P and NPclass problems, Justify that P is a subset of N Comaprision 4 marks and 2 marks for justify ans.	**[6]**	**CO2**	**L2**
	b)	Prove that Clique Decision problem is NP hard Problem. Clique decision problem(2 mark) , Tp prove NP hard (6 marks)	**[8]**	**CO2**	**L3**

3	**a)**	Given a String " abcdefghabc" and a pattern "fgh " Apply Rabin Karp pattern matching algorithm to match a pattern. Evaluate time complexity of Rabin Karp in worst case.6M for stepwise solution and 2 M for time complexity	**[8]**	**CO5**	**L5**
	b)	Discuss the randomized Algorithm with example. Randomized Algorithm 2.5 Marks Example 2.5 Marks	**[5]**	**CO3**	**L2**
	c)	find an integer that has reminder of 3 when divided by 7 and 13 but is divisible by 12.	**[5]**	**CO5**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T **20 FEBRUARY 2024**

TY BTECH SEMESTER - VI 2019 PATTERN 2023 - 2024 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 Hours **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Write and explain Min-Max Algorithm using Divide and Conquer. Write recurrence relation and evaluate performance analysis of Min-Max algorithm using substitution method. **[09] CO1, CO2 L2**

5 Marks for Algorithm & Explaination
1 Mark for correct recurrence equation.
3 Marks for Performance analysis using substitution Method.

b) Consider the following code segment. Analyze the given algorithm in terms of its time complexity. **[03] CO2 L3**

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++) {
    for (j = 2; j <= n; j = j * 2) {
        k = k + n / 2;
    }
}
```

1 Mark for correct recurrence equation.
2 Marks for solving using substitution Method.

c) Differenciate between Big ‘oh’ (O), Omega (Ω) and Theta (Θ) Asymptotic Notations. **[03] CO2 L2**

3 Marks for minimum 3 differences.

d) Apply Masters Theorem to analyze the given performance equation: **[02] CO2 L3**

$T(n) = 4\ T(n/2) + n$

2 Marks correct solution.

2 a) Find the optimal solution for the fractional knapsack problem making use of Greedy approach. **[05] CO1 L3**

m = 104 and n = 8

Wi 25 35 45 5 25 3 2 2

Pi 350 400 450 20 70 8 5 5

5 Marks for correct step by step solution.

b) A file contains the following characters with the frequencies as shown in table. **[06] CO1 L3**

If Huffman Coding is used for data compression, show step by step Huffman Tree creation and find

1) Huffman Code for each character
2) Average code length
3) Length of Huffman encoded message (in bits)

4 Marks for Step by step solution for Tree creation

1 Mark each for average code length and length of encoded message.

Character	Frequency
A	10
E	15
I	12
O	3
U	4
S	13
T	1

c) Explain Job Sequencing with Deadlines algorithm using Greedy approach. Write it's time complexity. **[05] CO1, CO2 L3**

4 Marks for algorithm and explanation.

1 Mark for writing time complexity.

3 a) Define dynamic programming approach. Differenciate between the Greedy method and Dynamic programming. **[04] CO1 L2**

4 Marks for any 4 differences with example.

b) Consider the the sequence {13, 5, 89, 3, 34}. Find optimal cost of matrix multiplication using dynamic programming. **[07] CO1 L3**

7 Marks for correct step by step solution using formula and final sequence of matrix multiplcation.

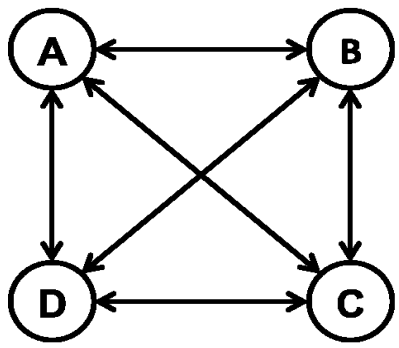
c) Consider the given search keys a(1:3)= (a1, a2, a3), p (1 : 3) = (0.5, 0.1, 0.05) q(0 : 3) = (0.15, 0.1, 0.05, 0.05). Compute and construct optimal binary search tree (OBST) for these values using Dynamic approach. **[06] CO1 L3**

6 Marks for correct step by step solution using formula and final tree construction.

OR

c) Consider the following travelling salesperson problem with 4 cities and distance between them as given in matrix. Find the shortest possible route for salesperson that visits every city exactly once and returns to the starting point A, using dynamic programming. **[06] CO1 L3**

6 Marks for correct step by step solution using formula and final optimal path with cost.



c	A	B	C	D
A	0	16	11	6
B	8	0	13	16
C	4	7	0	9
D	5	12	2	0

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T **20 FEBRUARY 23**

TY BTECH SEMESTER - VI 2022 - 2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 5 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Evaluate the performance analysis of Binary search using Substitution Method. **[3] CO2 L5**

1 Mark for correct recurrence equation 2 Marks for substitution Method.

b) Analyze the given algorithm in terms of its time complexity: **[4] CO2 L4**

```
Void Test (int n)
{
if (n>0)
   for (i=0; i<n; i++)
   {
      printf("%d", n);
    }
Test(n-1);
}
```

2 Mark for correct recurrence equation 2 Marks for substitution Method.

c) Show the relation between function f(n) and g(n) in terms of Big "oh" and Omega Notations. **[2] CO2 L1**
1mark for each Notation.

2 a) Apply Masters Theorem to analyze the given performance equations: **[4] CO2 L3**
i) $T(n)= 3T(n/2)+n$
ii) $T(n) = 4T(n/2) + n^2$
2 marks each correct solution

b) Make use of Divide and conquer strategy to find the Maximum and Minimum element of the array. Write the recursive equation of the algorithm. **[5] CO1 L3**
3 Marks for Algorithm & 2 Marks for equation.

3 a) Constuct an optimal Huffman code for the following set of frequencies :- a:42, b:20, c:5, d:10, e:11, f:12. Decode the word "11101101" at the receiver side. **[6] CO1 L3**
4 Marks for costruction of tree with correct encoding bits, 2 Marks for decoding the word.

b) Let's consider a scenario where a company receives multiple orders for the production of customized t-shirts. Each order has a specific deadline [d_i] and a profit [p_i] associated with it. Company can handle only one order at a time.The production of each t-shirt takes a fixed amount of time, and the company needs to schedule the orders on the machines in such a way that it maximizes its profit. The company can only earn the profit associated with an order if it is completed and delivered before the deadline. **[6] CO3 L3**
Identify and write the strategy and algorithm for this problem.
1 Mark for strategy and 5 marks for algorithm.

4 a) Let the keys {end,goto,print,read} with the successful probablities (1,4,2,1) and unsuccessfull probablities are (4,2,4,1,1) Construct a Binary Search Tree with optimum searching time. **[8] CO1 L3**

4 marks for Solution with equation , 2 marks for table and 2 marks for tree.

OR

Find the optimal solution for 0/1 problem, where no of objects are n=4, capacity of sack M=5, profits are (3,4,5,6) and weights are (2,3,4,5).

4 marks for Solution with equation , 2 marks for table and 2 marks for final solution array.

b) Can Bellman Ford Algorithm handles Negative weight cycle? Justify your answer with suitable example. **[4] CO3 L5**

2 marks for Justification , 2 marks for example.

5 a) On a busy Saturday evening, a Zomato delivery boy wanted to deliver his parcels to four different locations across the city and retured back to his starting location.Help him to find the shortest route.The distance between locations (A,B,C,D) are: **[8] CO3 L5**

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

6 marks for complete Solution , 2 marks for path tracing.

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321T **20 FEBRUARY 23**

TY BTECH SEMESTER - VI BACKLOG 2016 PATTERN 2022 - 2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 2 Hrs. **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 4 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Evaluate the performance analysis of Binary search using Substitution Method. **[3] CO2 L5**

1 Mark for correct recurrence equation 2 Marks for substitution Method .

b) Analyze the given algorithm in terms of its time complexity: **[4] CO2 L4**

```
Void Test (int n)
{
if (n>0)
   for (i=0; i<n; i++)
   {
      printf("%d", n);
    }
Test(n-1);
}
```

2 Mark for correct recurrence equation 2 Marks for substitution Method.

c)	Show the relation between function f(n) and g(n) in terms of Big "oh" and Omega Notations. *1mark for each Notation.*	**[2]**	**CO2**	**L1**
2 a)	Apply Masters Theorem to analyze the given performance equations: i) $T(n)= 3T(n/2)+n$ ii) $T(n) = 4T(n/2) + n^2$ *2 marks each correct solution.*	**[4]**	**CO2**	**L3**
b)	Explain Merge sort algorithm with example. Also analyze performance of the algorithm in terms of its time complexity *3 Marks for Algorithm & 2 Marks for equation.*	**[5]**	**CO1**	**L3**
3 a)	Constuct an optimal Huffman code for the following set of frequencies :- a:42, b:20, c:5, d:10, e:11, f:12. Decode the word "11101101" at the receiver side. *4 Marks for costruction of tree with correct encoding bits, 2 Marks for decoding the word.*	**[6]**	**CO1**	**L3**
b)	Let's consider a scenario where a company receives multiple orders for the production of customized t-shirts. Each order has a specific deadline [d_i] and a profit [p_i] associated with it. Company can handle only one order at a time.The production of each t-shirt takes a fixed amount of time, and the company needs to schedule the orders on the machines in such a way that it maximizes its profit. The company can only earn the profit associated with an order if it is completed and delivered before the deadline. Identify and write the strategy and algorithm for this problem. *1 Mark for strategy and 5 marks for algorithm.*	**[6]**	**CO3**	**L3**

4 a) Let the keys {end,goto,print,read} with the successful probablities (1,4,2,1) and unsuccessfull probablities are (4,2,4,1,1) Construct a Binary Search Tree with optimum searching time. **[10] CO1 L3**

4 marks for Solution with equation , 2 marks for table and 2 marks for tree.

OR

Find the optimal solution for 0/1 problem, where no of objects are n=4, capacity of sack M=5, profits are (3,4,5,6) and weights are (2,3,4,5).

6 marks for Solution with equation , 2 marks for table and 2 marks for final solution array.

b) On a busy Saturday evening, a Zomato delivery boy wanted to deliver his parcels to four different locations across the city and retured back to his starting location.Help him to find the shortest route.The distance between locations (A,B,C,D) are: **[10] CO3 L5**

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

8 marks for complete Solution , 2 marks for path tracing.

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T/CS321T **15 MAY 2023**

TY BTECH SEMESTER - VI REGULAR 2019 & BACKLOG 2016 PATTERN 2022 - 2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 10.00 am to 12.00 pm **MAX MARKS :50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES:2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Write pseudocode for 0/1 knapsack problem using LCBB.	**[06]**	**CO1 L1**
	b)	Draw the portion of the state space tree generated by LCBB for the following knapsack instances. N=4, (p1,p2,p3,p4)=(40,42,20,12) and (w1,w2,w3,w4)=(4,7,5,3) with maximum capacity m=10. *Rubrics:Correct state tree 4 Marks,at least three value calculation 2 Marks and final optimal solution 2Marks*	**[08]**	**CO1 L3**
	c)	What are implicit and explicit constrains with respect to backtracking *Rubrics correct defination 2 Marks Correct example 2 marks*	**[04]**	**CO1 L1**
2	**a)**	Discuss Satisfiability Problem as NP-Complete problem *Rubrics:Explain Satisfiability Problem with example-3M and explaination of NP-Hrad and NP-Complete-4M*	**[07]**	**CO2 L2**

	b)	What are P and NP classes explain with examples?What is their relationship? *Rubrics:Explaination of P and NP clas 4 Marks and relationship is 3 Marks.*	**[07]**	**CO2**	**L2**
3	**a)**	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. *Rubric: Algorithm: 3 marks , correct steps to check given pattern in the given string:2 mark Correct spurious hits 2 mark.*	**[7]**	**CO5**	**L3**
	b)	Show that the gcd operator is associative.That is,prove that for all integers a,b, and c, gcd(a,gcd(b,c))=gcd(gcd(a,b),c). *Rubric: associative property is 2 Marks and correct explaination is 3 Marks.*	**[3]**	**CO5**	**L2**
	c)	Given Text:G T T A T A G C T G A T C G C G G C G T A G C G G C G A A Pattern:G T A G C G G C G Apply Boyer-Moore Putting it together to find the pattern in the given text. *Rubrics 3 marks for bad character ,3 Marks for good suffix and 2 marks for complete pattern matching.*	**[8]**	**CO5**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321T **7 AUGUST 2023**

TY BTECH SEMESTER - VI REMEDIAL TERM 2022 - 2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

REMEDIAL EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 3 HOURS **MAX MARKS :100**

TOTAL NO OF QUESTIONS: 5 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Given a list of n elements, Write an Algorithm to search any element from the list using D&C approach. Derive the time complexity using Substitution Method. **[10] CO1 L1**

Rubrics: 2 marks for writing correct recurrence, 2 marks for deriving time complexity correctly

b) "Solve below equtation using Masters Theorem: **[6] CO1 L3**

i) $T(n) = 3T(n/2)+n2$

ii) $T(n) = 2T(n/2)+n\log n$

3 marks for each equation

c) Analyze the given algorithm in terms of its time complexity: **[4] CO2 L4**

```
Void Test (int n)
{
if (n>0)
  for (i=0; i<n; i++)
  {
    printf("%d", n);
   }
Test(n-1);
}
```

2 Mark for correct recurrence equation 2 Marks for substitution Method.

2 a) Construct a Huffman code for the expression "bad" where frequiencies of variables are a =5, b = 9, c = 12, d = 13 **[10] CO2 L3**

Construction of Huffman Tree: 6 marks, Assignning code to expression : 4 marks.

b) Find optimal solution for 0/1 knapsack problem using Dynamic Programming Approach(w1,w2,w3,w4)=(10,15,6,9) ,(p1,p2,p3,p4)=(2,5,8,1) and m =30 **[10] C03 L3**

1 Mark for correct recursive formula,2 mark steps for generation of table ,2 mark for correct final table , 1 mark optimal solution.

3 a) Define Traveling salesman problem. Apply TSP using Dynamic programming where the edge lenghts are given as **[10] CO3 L3**

0	9	8	8
12	0	13	6
10	9	0	5
20	15	10	0

Step wise marking .for each correct step 2 marks

	b)	Write a an Algorithm for N Queen Problem using Backtracking Approach. Show the solution for Eight Queen's problem if q1, q2, q3 and q4 is placed in (6,4,7,1) position.Draw the State space search Tree for Four Queen Problem. *Algorithm 5 Marks, State space 3 marks , Queen placing 2 Marks*	**[10]**	**CO1**	**L2**
4	**a)**	Solve o/1 knapsack problem using LC Branch & Bound Approach where Profits are (10,10,12,18) and weights are (2,4,6,9) and Maximum Capacity is 15. *Step wise marking .for each correct step 2 marks*	**[10]**	**CO4**	**L5**
	b)	Explain NP Hard & NP Complete problem .Prove that 3SAT is a NP Complete problem. *For NP Hard & NP Complete 3 Marks each. complete proof 6 Marks.*	**[10]**	**CO3**	**L3**
5	**a)**	Explain the working of KMP String Matching algorithm for the following inputs: Text: abadaabaccabacabaabb Pattern: baabb *4 Marks for KMP Table, 4 Marks for Algorithm 2 Marks for Shifting*	**[10]**	**CO5**	**L3**
	b)	Explain the working of Boyar Moore String Matching algorithm for the following inputs: Text: abadaabaccabacabaabb Pattern: baabb *4 Marks for Bad charactor, 4 Marks forGood suffix 2 Marks for Shifting*	**[10]**	**CO5**	**L3**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS321T **20 JUNE 2023**

TY BTECH SEMESTER - VI RE-EXAMINATION 2022-2023
EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

RE-EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: 6 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Write Two Real Time Application of Divide & Conquer (Apart from Binary Search, Merge Sort & Quick Sort. *Rubrics:2 marks for each application.*	**[04]**	**CO1 L1**
	b)	Prove that the Worst case time complexity of quick sort is $O(n^2)$ and Average case Time complexity is O(nlogn) *Rubrics:2 marks for each complexity proof.*	**[04]**	**CO1 L1**
	c)	Explain the Asymptotic notations with example.	**[06]**	**CO1 L1**
2	**a)**	Find out the character encoding for the following message using Huffman coding. Message: yoyoyoutube *Rubrics:4 marks for coding of message, 4 marks for construction of a tree.*	**[08]**	**CO2 L3**

b) Why Greedy strategy does not always give you a optimum Solution. Justify your answer with Suitable Example. **[06] CO2 L1**

Rubrics:3 marks for the 1st part and 3 marks for the justification

c) A farmer wants to sell his vegetable in a market which is located 100 kilometres away from his house. He wants to carry only those items which will give the higher profit. Help the farmer to choose the items that will give him the highest possible profit using fractional method. The items are Brinjal, Tomato, Potato,Onion, Cauliflower, Cabbage, and Bottle guard. The quantity and price pair are (5,3), (6,4), (8,5), (12,7), (7,3), (8,3), and (7,3) respectively. (Quantity is in kg) **[08] CO2**

Rubrics:step wise marking.

3 a) Let n=4, (a1, a2, a3, a4) = (do, if return, while). Let (p1, p2, p3, p4)=(3,3,1,1) and (q0, q1, q2, q3, q4)=(2,3,1,1,1) Construct OBST for this problem. **[10] CO3 L3**

Rubrics:step wise marking.

b) Consider the Chain Matrices A1,A2,A3,A4 with dimension given below.Give the optimal parthenzation to get product A1,A2…A4 **[08] CO3 L3**

Matrix Dimension

A1 3*2

A2 2*4

A3 4*2

A4 2x5

4 a) A School bus must pick up the students at four different locations (1,2,3,4, and 5) as shown in the table, starting and ending at 1. The bus driver wants to minimize the total length of the trip. Find the best path using B&B. **[10] CO4 L3**

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	16	4	2
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

Rubrics:step wise marking.

b) Differentiate between Branch and bound and dynamic programming. **[06] CO4 L2**
Rubrics:2marks for one difference.

5 a) Write a Non deterministic algorithm for 0/1 knapsack problem. **[06] CO5 L1**
Rubrics:step wise marking.

b) Prove that TSP is NP-Complete. **[06] CO5 L3**
Rubrics:Justification of NP & NP Complete 3 marks each.

c) How NP Complete and NP Hard Problems are related with each other and
How NP Hard problems can be converted to NP Complete problems. **[08] CO3 L2**
Rubrics:2 marks each for NP Complete & NP Hard. 4 marks for reduction of NP Hard to NP Complete.

6 a) Find the prefix function for pattern ababaca. **[10] CO4 L3**
Apply the KMP algorithm to check pattern ababaca is present in given string
bacbababababacaab
Rubrics:7 marks for finding correct pattern. 3 marks for Pi table

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T **07 AUGUST 2023**

TY BTECH SEMESTER - VI REMEDIAL TERM 2022 - 2023

EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

REMEDIAL EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 3 HOURS **MAX MARKS :100**

TOTAL NO OF QUESTIONS: 5 **TOTAL NO OF PRINTED PAGES:**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Given a list of n elements, Write an Algorithm to search any element from the list using D&C approach. Derive the time complexity using Substitution Method. *Rubrics: 2 marks for writing correct recurrence, 2 marks for deriving time complexity correctly*	**[10]**	**CO1**	**L1**
	b)	"Solve below equtation using Masters Theorem: i)T(n) = 3T(n/2)+n2 ii)T(n) = 2T(n/2)+nlogn *3 marks for each equation*	**[6]**	**CO1**	**L3**

c) Analyze the given algorithm in terms of its time complexity: **[4] CO2 L4**

```
Void Test (int n)
{
if (n>0)
   for (i=0; i<n; i++)
   {
      printf("%d", n);
    }
Test(n-1);
}
```

2 Mark for correct recurrence equation 2 Marks for substitution Method.

2 a) Construct a Huffman code for the expression "bad" where frequiencies of variables are a =5, b = 9, c = 12, d = 13 **[10] CO2 L3**

Construction of Huffman Tree: 6 marks, Assignning code to expression : 4 marks.

b) Find optimal solution for 0/1 knapsack problem using Dynamic Programming Approach(w1,w2,w3,w4)=(10,15,6,9) ,(p1,p2,p3,p4)=(2,5,8,1) and m =30 **[10] C03 L3**

1 Mark for correct recursive formula,2 mark steps for generation of table ,2 mark for correct final table , 1 mark optimal solution **.**

3 a) Define Traveling salesman problem. Apply TSP using Dynamic programming where the edge lenghts are given as **[10] CO3 L3**

0	9	8	8
12	0	13	6
10	9	0	5
20	15	10	0

Step wise marking .for each correct step 2 marks

b) Write a an Algorithm for N Queen Problem using Backtracking Approach. Show the solution for Eight Queen's problem if q1, q2, q3 and q4 is placed in (6,4,7,1) position.Draw the State space search Tree for Four Queen Problem. **[10] CO1 L2**

Algorithm 5 Marks, State space 3 marks , Queen placing 2 Marks

4 a) Solve o/1 knapsack problem using LC Branch & Bound Approach where Profits are (10,10,12,18) and weights are (2,4,6,9) and Maximum Capacity is 15. **[10] CO4 L5**

Step wise marking .for each correct step 2 marks

b) Explain NP Hard & NP Complete problem .Prove that 3SAT is a NP Complete problem. **[10] CO3 L3**

For NP Hard & NP Complete 3 Marks each. complete proof 6 Marks.

5	**a)**	Explain the working of KMP String Matching algorithm for the following inputs: Text: abadaabaccabacabaabb Pattern: baabb *4 Marks for KMP Table, 4 Marks for Algorithm 2 Marks for Shifting*	**[10]**	**CO5**	**L3**
	b)	Explain the working of Boyar Moore String Matching algorithm for the following inputs: Text: abadaabaccabacabaabb Pattern: baabb *4 Marks for Bad charactor, 4 Marks forGood suffix 2 Marks for Shifting*	**[10]**	**CO5**	**L3**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS347T **20 JUNE 2023**

TY BTECH SEMESTER - VI RE-EXAMINATION 2022-2023
EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

RE-EXAMINATION

DESIGN AND ANALYSIS OF ALGORITHMS

TIME : 3 Hrs **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: 6 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Write Two Real Time Application of Divide & Conquer (Apart from Binary Search, Merge Sort & Quick Sort.	**[04]**	**CO1**	**L1**
	b)	Prove that the Worst case time complexity of quick sort is O(n 2) and Average case Time complexity is O(nlogn)	**[04]**	**CO2**	**L1**
	c)	Explain the Asymptotic notations with example.	**[06]**	**CO2**	**L1**
2	**a)**	Find out the character encoding for the following message using Huffman coding and its transmission cost. Message: yoyoyoutube	**[08]**	**CO3**	**L3**
	b)	Why Greedy strategy does not always give you a optimum Solution. Justify your answer with Suitable Example.	**[05]**	**CO2**	**L1**

c) A farmer wants to sell his vegetable in a market which is located 100 kilometres away from his house. He wants to carry only those items which will give the higher profit. Help the farmer to choose the items that will give him the highest possible profit using fractional method. The items are Brinjal, Tomato, Potato,Onion, Cauliflower, Cabbage, and Bottle guard. The quantity and price pair are (5,3), (6,4), (8,5), (12,7), (7,3), (8,3), and (7,3) respectively. (Quantity is in kg) **[08] CO3 L3**

3 a) Let n=4, (a1, a2, a3, a4) = (do, if return, while). Let (p1, p2, p3, p4)=(3,3,1,1) and (q0, q1, q2, q3, q4)=(2,3,1,1,1) Construct OBST for this problem. **[10] CO3 L3**

b) Consider the Chain Matrices A1,A2,A3,A4 with dimension given below.Give the optimal parthenzation to get product A1,A2…A4 **[08] CO3 L3**

Matrix Dimension
A1 3*2
A2 2*4
A3 4*2
A4 2x5

4 a) A School bus must pick up the students at four different locations (1,2,3,4, and 5) as shown in the table, starting and ending at 1. The bus driver wants to minimize the total length of the trip. Find the best path using B&B. **[10] CO3 L3**

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	16	4	2
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

	b)	Differentiate between Branch and bound and dynamic programming.	**[06]**	**CO1**	**L2**
5	**a)**	Write a Non deterministic algorithm for 0/1 knapsack problem. What are the Three functions of ND Algorithm?	**[04]**	**CO2**	**L1**
	b)	Prove that TSP is NP-Complete	**[06]**	**CO2**	**L3**
	c)	How NP Complete and NP Hard Problems are related with each other and How NP Hard problems can be converted to NP Complete problems.	**[07]**	**CO4**	**L2**
6	**a)**	Describe in pseudo-code of the KMP algorithm. Find the prefix function for pattern ababaca. Apply the KMP algorithm to check pattern ababaca is present in given string bacbababababacaab	**[09]**	**CO5**	**L3**
	b)	Explain Las vegas and Monte carlo algorithm.	**[05]**	**CO5**	**L2**