Code No: R2032423 **R20** SET -1

III B. Tech II Semester Regular/Supplementary Examinations, May/June -2024
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE(AIML),CSE(AI),CSE(DS),CSE(AIDS), AIDS,AIML,CSD)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Compare the features of the algorithm with pseudocode. [7M]
   b) Find the Time complexity of the following code [7M]

```
int fun(int n)
{   int count = 0;
   for (int i = n; i > 0; i /= 2)
      for (int j = 0; j < i; j++)
         count += 1;
   return count;}
```

(OR)

2. a) Explain the algorithm specification for conditional and iterative statements. [7M]
   b) Develop an algorithm to solve the Towers of Honai problem with n disks with three towers. [7M]

UNIT-II

3. a) Develop the control abstraction and derive the time expression for the divide and conquer logic. [7M]
   b) Derive the time complexity for the successful search in the binary search tree. [7M]

(OR)

4. a) Develop the quick sort algorithm and trace it for an example. [7M]
   b) Explain the method of vertex splitting with an example. [7M]

UNIT-III

5. a) Design the algorithm to find the shortest path in the multistage graph using forworrd approach.. [7M]
   b) Explain the 0/1 Knapsack problem in the dynamic programming approach. [7M]

(OR)

6. a) List and explain any two dynamic programming approaches with examples. [7M]
   b) Discuss the issues in designing reliable systems. [7M]

UNIT-IV

7. a) Illustrate the eight-queen problem with suitable diagrams. [7M]
   b) Develop the backtracking solution to the 0/1 Knapsack problem. [7M]

(OR)

8. a) Explain the advantages of backtracking algorithms in detail. [7M]
   b) Develop an algorithm to find all Hamiltonian cycles in graphs. [7M]

UNIT-V

9. a) Develop a non-deterministic algorithm to search for an element in an array. [7M]
   b) Explain NP-Hard and NP-Complete problem with example.. [7M]

(OR)

10. a) Explain the relation among P, NP, Np-complete and NP-hard problems. [7M]
    b) Explain the Cook's theorem. [7M]

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Code No: R2032423 **R20** SET -2

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(Common to CSE(AIML),CSE(AI),CSE(DS)CSE(AIDS), AIDS,AIML,CSD)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
*****

UNIT-I

1. a) List and explain the characteristics of the algorithm. [7M]
   b) Develop an algorithm for selection sort. [7M]

(OR)

2. a) Find the Time complexity of the following code [7M]

```
int fun(int n)
{
   int count = 0;
   for (int i = n; i > 0; i /= 3)
      for (int j = 0; j < i; j=j+2)
         count += 1;
   return count;
}
```

   b) Discuss the design issues of iterative algorithms. [7M]

UNIT-II

3. a) Derive the time complexity for the Unsuccessful search in the binary search tree. [7M]
   b) Derive the time complexity of the logic that finds max and min numbers within an array. [7M]

(OR)

4. a) Solve the recurrence relation. [7M]
   C(n)=2C(n/2)+3 if n>2 and 2 if n=2
   b) Develop the randomised quick sort algorithm and trace it for an example. [7M]

UNIT-III

5. a) Define optimal binary search tree with example.. [7M]
   b) Explain traveling sales person problem with an example.. [7M]

(OR)

6. a) Develop the algorithm for the 0/1 knapsack problem using a dynamic programming approach. [7M]
   b) Write a function Largest(pair,w, t, h, i,m) that uses binary search to determine the largest q, $t \leq q \leq h$, such that pair[q].w+w[i] $\leq$m. [7M]

UNIT-IV

7. a) Develop an algorithm to generate an m-coloring graph. [7M]
   b) Develop an algorithm to find all Hamiltonian cycles in graphs. [7M]

(OR)

8. a) Compare planar and non-planar graphs with examples. [7M]
   b) Explain the steps in recursive backtracking with an example. [7M]

UNIT-V

9.	a)	List and explain any two NP-complete problems.	[7M]
	b)	Explain the Cook's theorem.	[7M]
		(OR)	
10.	a)	Is code generation an NP-hard problem? Justify your answer.	[7M]
	b)	Develop a non-determinsitic clique pseudocode.	[7M]

Code No: R2032423 **R20** SET -3

III B. Tech II Semester Regular/Supplementary Examinations, May/June -2024
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE(AIML),CSE(AI),CSE(DS)CSE(AIDS), AIDS,AIML,CSD)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
*****

UNIT-I

1. a) List and explain the parameters to assess the performance of the algorithm. [7M]
   b) Compute the Space complexity for the following code [7M]

```
int fun(int n)
{   int count = 0;
   for (int i = n; i > 0; i /= 2)
      for (int j = 0; j < i; j++)
         count += 1;
   return count; }
```

(OR)

2. a) Compare the Little-Oh and Theta notations with examples. [7M]
   b) Develop the randomised algorithm for primality testing. [7M]

UNIT-II

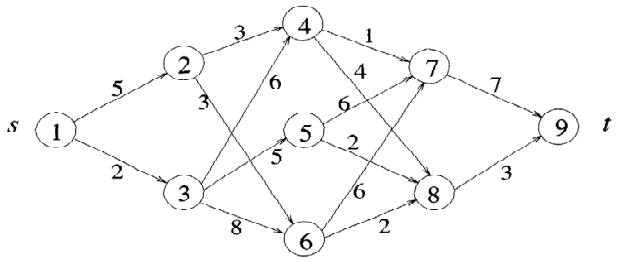
3. a) Develop the merge sort algorithm and trace it for an example. [7M]
   b) Find out the strategy to reduce the complexity of matrix multiplication? Justify your answer. [7M]

(OR)

4. a) Derive the time complexity for Insertion sort. [7M]
   b) Develop an algorithm to find the Kth smallest number. [7M]

UNIT-III

5. a) Compute the shortest path for the following graph using dynamic programming. [7M]



   b) Illustrate the reliable system design using a dynamic programming approach in detail. [7M]

(OR)

6. a) Explain all pairs of shortest path problems with an example. [7M]
   b) Identify the possible binary search trees for the identifier set {do, while, if, else}. [7M]

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UNIT-IV

7.	a)	Explain graph coloring with examples.	[7M]
	b)	Let w = {5,7,10,12,15,18,20}and m=35. Find all possible subsets of w that sum to m. Do this using SumOfSub. Draw the portion of the state space tree that is generated.	[7M]
		(OR)	
8.	a)	Illustrate the 4-Queen problem-solving with suitable diagrams.	[7M]
	b)	Develop the algorithm for recursive backtracking.	[7M]

UNIT-V

9.	a)	Develop a non-deterministic clique pseudocode.	[7M]
	b)	Explain the terms NP-hard and NP-complete.	[7M]
		(OR)	
10.	a)	List and explain any two NP-complete problems.	[7M]
	b)	Compare the features of deterministic and non-deterministic algorithms with examples.	[7M]

Code No: R2032423 **R20** SET -4

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Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
*****

UNIT-I

1. a) Illustrate step table representation for the Fibonacci series computation algorithm. [7M]
   b) Find the Time complexity of the following code [7M]

```
void fun(int n, int arr[])
{   int i = 0, j = 0;
   for (; i < n; ++i)
      while (j < n && arr[i] < arr[j])
         j++;}
```

(OR)

2. a) Compare the Big-Oh and Omega notations with examples. [7M]
   b) Given a 2-sided unbiased coin. Using this coin, how will you simulate an n-sided coin [7M]
   (i) When n is a power of 2?.
   (ii) When n is not a power of 2?

UNIT-II

3. a) Develop an algorithm to Merge two sorted subarrays using auxiliary storage. [7M]
   b) Develop Greedy method control abstraction for the subset paradigm. [7M]

(OR)

4. a) Find the feasible solutions for the following instance of the knapsack problem: [7M]
   $n = 3, m = 20, (p_1,p_2,p_3) = (25,24,15)$, and $(w_1,w_2,w_3) = (18,15,10)$.
   b) Develop the algorithm for Tree vertex splitting. [7M]

UNIT-III

5. a) Explain the solution to the travelling salesperson problem with a dynamic programming approach. [7M]
   b) Formulate the cost function for finding the shortest path in the k-stage graph problem in dynamic programming. [7M]

(OR)

6. a) Explain flow shop scheduling with an example. [7M]
   b) Explain the features of dynamic programming. [7M]

UNIT-IV

7. a) With m = 35, run SumOfSub on the data [7M]
   (a) w = {5,7,10,12,15,18,20},
   (b) w = {20,18,15,12,107,5}
   (c) w = {15,7,20,5,18,10,12}.
   Are there any differences in the computing times?
   b) Develop the algorithm to solve the 8-queen problem. [7M]

(OR)

8. a) Develop an algorithm to solve the problem of the sum of subsets. [7M]
   b) Explain the steps in recursive backtracking with an example. [7M]

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UNIT-V

9.	a)	Develop an algorithm for non-deterministic knapsack.	[7M]
	b)	List and explain any two NP-complete problems.	[7M]
		(OR)	
10.	a)	Compare the features of deterministic and non-deterministic algorithms with examples.	[7M]
	b)	Illustrate the Node cover decision problem with a neat sketch.	[7M]