VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY NAMBUR-522508 ANDHRA

YEAR : III B.Tech **SEMESTER:**II

COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS

COURSE CODE: XXXXXXXX

BRANCH: COMMON TO CSE & IT BRANCHES

PREREQUISITE: Knowledge of programming language(s) and basic Algorithms

COURSE OBJECTIVE: To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms, to introduce the different algorithmic approaches for problem solving through numerous example problems, and to provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

COURSE OUTCOMES: Students will be able to:

SN	OUTCOME	Cognitive Levels as per Bloom's Taxonomy	Weightage (%)
CO1	Infer the divide-and-conquer paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.	L1,L2,L3, L4	20
CO2	Infer the greedy paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.	L1,L2,L3, L4	20
CO3	Infer the dynamic-programming paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.	L1,L2,L3, L4	20
CO4	Infer the backtracking paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.	L1,L2,L3, L4	20
CO5	Infer the branch and bound paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.	L1,L2,L3, L4	20

WEIGHTAGE OF BLOOM'S LEGENDS & PERCENTAGEOF QUESTIONS IN EXAMINATIONS:

L1 (Remembering) = 30- 40%, L2 (Understanding) = 30 - 40%,

L3 (Applying) = 10-20 %, L4 (Analysing) = 10 - 20%,

Easy (%) = 15%-20%, Average (%)= 60% - 70%, Difficult (%)= 15% - 20%

TOTAL = L1 + L2 + L3 + L4 = 100%(on an average about 2minutes per mark)

Note: This specification weightage in above shall be treated as a general guideline for students, teachers and paper setters. The actual distribution of marks in the question paper may vary slightly.

DETAILED SYLLABUS:

UNIT-1: INTRODUCTION: Algorithm Definition, Algorithm Specification, Performance Analysis, Performance Measurement, Asymptotic notations.

DIVIDE AND CONQUER: General Method, Binary Search, Finding the Maximum and Minimum, Quick Sort.

UNIT-II: THE GREEDY METHOD: The General Method, Knapsack Problem, Single Source Shortest Path Problem, Optimal Storage on Tapes Problem, Optimal Merge Patterns Problem

UNIT-III: DYNAMIC PROGRAMMING: The General Method, 0/1 Knapsack Problem, Single Source Shortest Path – General Weights, All Pairs-Shortest Paths Problem, Traveling Salesperson Problem, String Editing Problem.

UNIT-IV: BACKTRACKING: The General Method, The N-Queens Problem, Sum of Subsets Problem, Graph Coloring Problem, Hamiltonian Cycles Problem.

UNIT-V: BRANCH AND BOUND: The General Method, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack Problem, Travelling Salesperson Problem.

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, Cook's Theorem.

TEXTBOOKS:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Al-gorithms", 2nd Edition, Universities Press

REFERENCEBOOKS:

1. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

ONLINE REFERENCES:

1. http://nptel.ac.in/courses/106101060/

MICRO-SYLLABUS:

Unit	Module	Micro content
1	Algorithm Analysis	Definition and Algorithm Specification
		Performance Analysis – time and space complexity
		Performance Measurement – step count and frequency count
		Asymptotic Notations – Big Oh, Big Omega, Big Theta
	Divide and Conquer	General Method
		Binary Search – Procedure, Example, Algorithm and Computing Time Complexity.
		Finding the Maximum and Minimum - Procedure, Example, Algorithm, and Computing Time Complexity.
		Quick Sort - Procedure, Example, Algorithm and Computing Time Complexity.
Unit	**Module**	**Microcontent**

2	Greedy Method	General Method
		Knapsack Problem - Description, Example, Algorithm.
		Optimal Storage on Tapes Problem - Description, Example, Algorithm.
		Single Source Shortest Path Problem - Description, Example, Algorithm.
		Optimal Merge Patterns Problem - Description, Example, Algorithm.
Unit	**Module**	**Microcontent**
3	Dynamic Programming	The General Method
		0/1 Knapsack Problem - Description, Example.
		Single Source Shortest Path – General Weights - Description, Example, Algorithm.
		All Pairs-Shortest Paths Problem - Description, Example, Algorithm.
		Travelling Salesperson Problem - Description, Example.
		String Editing Problem - Description, Example.
Unit	**Module**	**Microcontent**
4	Backtracking	The General Method
		The 8-Queens Problem - Description, State Space Tree, Algorithm.
		Sum of Subsets Problem - Description, Example, State Space Tree, Algorithm.
		Graph Coloring Problem - Description, Example, State Space Tree, Algorithm.
		Hamiltonian Cycles Problem - Description, Example, State Space Tree, Algorithm.
Unit	**Module**	**Microcontent**
5	Branch and Bound	The General Method
		FIFO Branch and Bound
		LC Branch and Bound
		0/1 Knapsack Problem - Description, Example.
		Travelling Salesperson Problem - Description, Example.
	NP-Hard and NP-Complete problems	Basics Concepts.
		Cook's Theorem.

III B. TECH II SEMESTER REGULAR EXAMINATION MODEL PAPER
MICROPROCESSORSANDMICROCONTROLLERS
(COMMON TO ECE & EEE BRANCHES)

Time : 3 Hours **Max. Marks : 70**

Note : Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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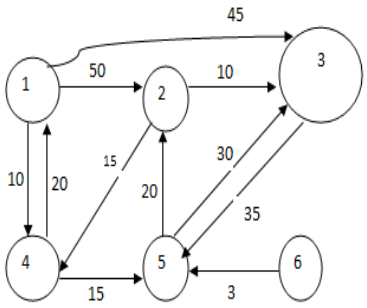
		UNIT-I		CO	BL
1.	a)	Discuss various asymptotic notations used to represent complexity of algorithms with examples.	[7M]	CO1	L2
	b)	Write algorithm for Min Max Problem.	[7M]	CO1	L3
		(OR)			
2.	a)	Discuss Quick sort with an example and derive its time complexity in worst case.	[7M]	CO1	L2
	b)	Write algorithm for calculating multiplication of matrices and derive its time complexity using step count method.	[7M]	CO1	L3
		UNIT-II			
3.	a)	Find an optimal solution to the knapsack instance n=5 objects and the capacity of knapsack m=10. The profits and weights of the objects are (P1, P2, P3, P4, P5) = (15, 7, 6, 18, 3), (W1, W2, W3, W4, W5) = (5, 7, 1, 4, 1) respectively.	[7M]	CO2	L1
	b)	Define optimal merge pattern? Find optimal merge pattern for ten files whose record lengths are 28, 32, 12, 5, 84, 53, 91, 35, 3, and 11.	[7M]	CO2	L1
		(OR)			
4.	a)	Find shortest paths in the following graph using Dijkstra's algorithm. 	[14M]	CO2	L1
		UNIT-III			
5.	a)	Define merging and purging rules in 0/1 knapsack problem and explain with an example..	[7M]	CO3	L2
	b)	Write and explain an algorithm to compute the all pairs shortest path using dynamic programming and prove that it is optimal.	[7M]	CO3	L3
		(OR)			
6.	a)	Explain the methodology of Dynamic programming. Mention the applications of Dynamic programming.	[7M]	CO3	L2
	b)	Let X = a,a,b,a,a,b,a,b,a,a and Y = b,a,b,a,a,b,a,b. Find a minimum-cost edit sequence that transforms X and Y.	[7M]	CO3	L1
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UNIT-IV					
7.	a)	Explain the Graph–Coloring problem and draw the state space tree for m= 3 colors and n=4 vertices graph.	[7M]	CO4	L2
	b)	Write an algorithm to determine the Hamiltonian Cycle in a given graph using backtracking.	[7M]	CO4	L3
(OR)					
8.	a)	Find all possible subsets of w that sum to m. Let w={5,7,10,12,15,18,20}and m=35 and construct the portion of the state space tree that is generated using backtracking.	[7M]	CO4	L3
	b)	Illustrate the process of backtracking on the 8 Queens problem. Explain with a suitable example.	[7M]	CO4	L2
UNIT-V					
9.	a)	State the concept of branch and bound method and mention its applications.	[7M]	CO5	L1
	b)	Discuss 0/1 Knapsack problem with respect to branch and bound method.	[7M]	CO5	L2
(OR)					
10.	a)	Deduce an optimal tour of the following travelling salesperson problem using LCBB. $\begin{bmatrix} 0 & 10 & 9 & 3 \\ 5 & 0 & 6 & 2 \\ 9 & 6 & 0 & 7 \\ 7 & 3 & 5 & 0 \end{bmatrix}$	[14M]	CO5	L4

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THE ABOVE MODEL PAPER ATTAINMENTS OF BLOOM'S TEXONOMY AS FOLLOWS

L1: 4*7 + 1*14 = 42= 30%
L2: 7*7 = 49 = 35%
L3: 5*7 = 35 = 25%
L4: 1*14 = 14 = 10%

SIGNATURES OF

COURSE COORDINATER MODULE COORDINATER HOD