



RIET

RAJASTHAN INSTITUTE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE and Affiliated to Rajasthan Technical University, Kota.



Established in Year 2000 - RTU QIV RANKED A

Department of Computer Science Engineering

B.TECH , V-SEM

SUBJECT:- DAA

TOPIC:- Review of Algorithm Methods

By:- Mr. Dinesh Swami



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year-V Semester: B.Tech. Computer Science and Engineering

5CS4-05: Analysis of Algorithms

Credit: 3
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Background: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. Divide And Conquer Method: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	Greedy Method: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. Dynamic Programming: Matrix Chain Multiplication, Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	Branch And Bound: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	Assignment Problems: Formulation of Assignment and Quadratic Assignment Problem. Randomized Algorithms- Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	Problem Classes Np, Np-Hard And Np-Complete: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

UNIT -1

Background:-

- Review of Algorithm,
- Complexity Order Notations: definitions and calculating complexity.

Divide and Conquer Method:-

- Binary Search,
- Merge Sort,
- Quick sort
- Strassen's matrix multiplication algorithms

Review of Algorithm Methods:-

Definition of Algorithm:-

An algorithm is a set of self-contained sequence of instructions or actions that contains finite space or sequence and that will give us a result to a specific problem in a finite amount of time.

An Algorithm is a step by step procedure to solve logical and mathematical Problem.

Types of algorithm

Well there are many types of algorithm but the most fundamental types of algorithm are:

1. Divide and conquer algorithm
2. Dynamic programming algorithm
3. Backtracking algorithm
4. Greedy algorithm
5. Brute Force algorithm
6. Randomized algorithm
7. Recursive algorithms

1) Divide and conquer algorithm

Divide and conquer consist of two parts first of all it divides the problems into smaller sub problems of the same type and solve them solve them recusively and then combine them to form the solution of the original problem.

Example: Quick sort, Merge sort , Binary Search

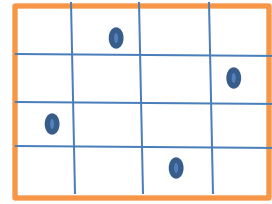
2) Dynamic programming algorithm

A dynamic programming algorithm (also known as dynamic optimization algorithm) remembers the past result and uses them to find new result means it solve complex problems by breaking it down into a collection of simpler sub problems, then solving each of those sub problems only once ,and storing their solution for future use instead of re-computing their solutions again.

Example:

Fibonacci sequence

3) Backtracking algorithm



How about we learn backtracking using an example so let's say we have a problem "Monk" and we divide it into four smaller problems "M, R, A, A". It may be the case that the solution of these problems did not get accepted as the solution of "Monk".

In fact we did not know on which one it depends. So we will check each one of them one by one until we find the solution for "Monk".

So basically we attempt solving a subproblem but if we did not reach the desired solution undo whatever you have done and start from the scratch again until you find the solution.

Example:

Queens Problem

4) Simple recursive algorithm

Solves the base case directly and then recurs with a simpler or easier input every time (A base value is set at the starting for which the algorithm terminates).

It is use to solve the problems which can be broken into simpler or smaller problems of same type.

Example:

To find factorial using recursion

5) Greedy algorithm

Greedy algorithm is an algorithm that solves the problem by taking optimal solution at the local level (without regards for any consequences) with the hope of finding optimal solution at the global level.

Greedy algorithm is used to find the optimal solution but it is not necessary that you will definitely find the optimal solution by following this algorithm.

Like there are some problems for which an optimal solution does not exist (currently) these are called NP complete problem.

Example: Huffman tree

6) Brute force algorithm

A brute force algorithm simply tries all the possibilities until a satisfactory solution is found.

Such types of algorithm are also used to find the optimal (best) solution as it checks all the possible solutions.

And also used for finding a satisfactory solution (not the best), simply stop as soon as a solution of the problem is found.

Example:

Exact string matching algorithm

7) Randomized algorithm

A randomized algorithm uses a random number at least once during the computation to make a decision.

Example:

Quick sort

As we use random number to choose the pivot point.