SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF INFORMATION TECHNOLOGY

16IT302 – DESIGN AND ANALYSIS OF ALGORITHMS

III YEAR V SEM

UNIT-I-Introduction

TOPIC: Important Problem Types

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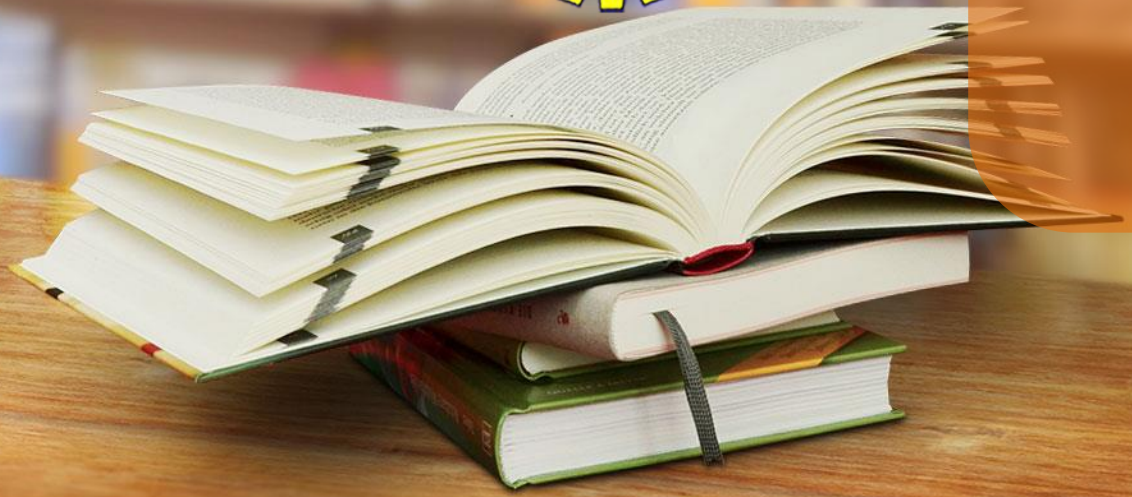
IMPORTANT PROBLEM TYPES



Subject :Design and Analysis of Algorithm
Unit :I

Find the topic name from the picture?

Answer: Important Problem Types

Important Problem Types

- ✓ Sorting
- ✓ Searching
- ✓ String processing
  - Text String
  - Bit String
  - Gene Sequence
- ✓ Graph problems
- ✓ Combinatorial problems
- ✓ Geometric problems
- ✓ Numerical problems

Sorting

Sorting

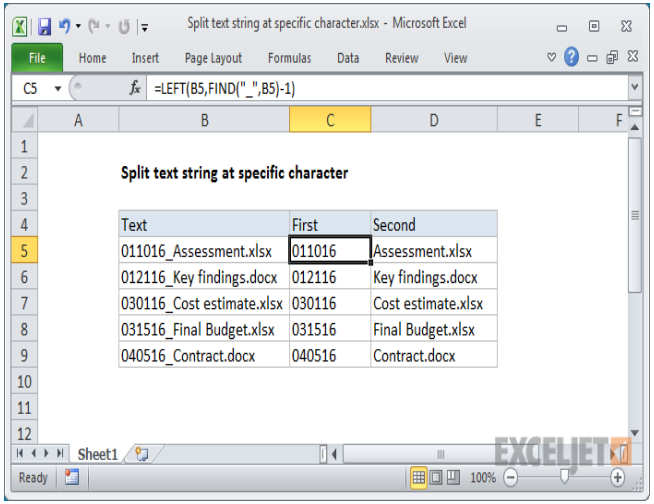
- The *sorting problem* is to **rearrange** the items of a given list in **non decreasing order.**
- A sorting algo- rithm is called ***stable*** if it preserves the relative order of any two equal elements in its input.
- The second notable feature of a sorting algorithm is the amount of extra memory the algorithm requires. An algorithm is said to be ***in-place*** if it does not require extra memory, except, possibly, for a few memory units

Searching

- The ***searching problem*** deals with finding a given value, called a ***search key***, in a given set (or a multiset, which permits several elements to have the same value).
- **Sequential search**
- **Binary search**

String Processing

- A ***string*** is a sequence of characters from an alphabet. Strings of particular interest are text strings, which **comprise letters, numbers, and special characters; bit strings,** which comprise zeros and ones; and gene sequences, which can be modeled by strings of characters from the four-character alphabet {A, C, G, T}.



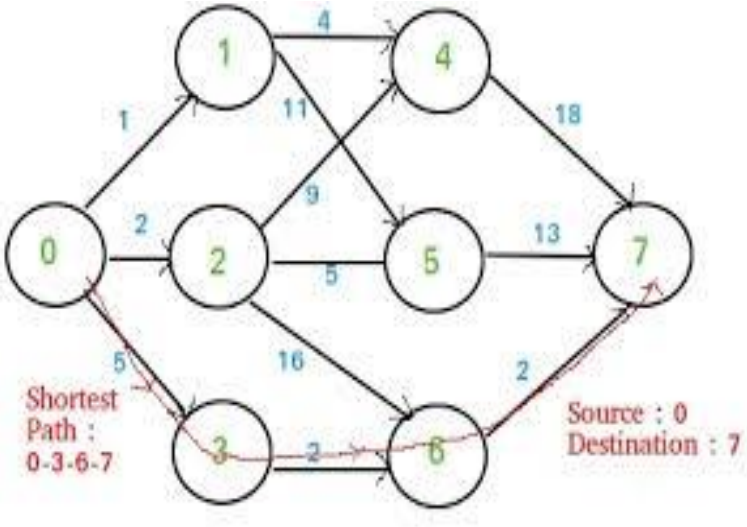
String Processing

- It should be pointed out, however, that string-processing algorithms have been important for computer science for a long time in conjunction with **computer languages and compiling issues**.

- One particular problem—that of searching for a given word in a text—has attracted special attention from researchers. They call it ***string matching***.

Graph Problems

A ***graph*** can be thought of as a collection of points called **vertices**, some of which are connected by line segments called **edges**



Graph Problems

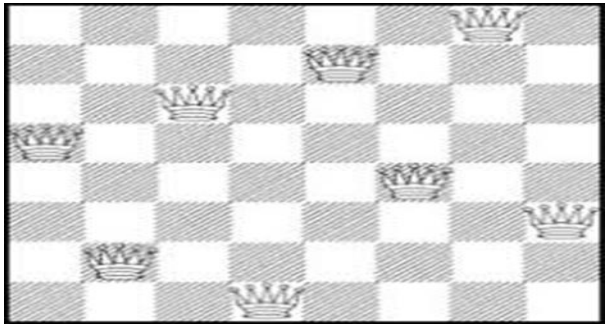
- Graphs can be used for modeling a wide variety of applications, including **transportation, communication, social and economic networks, project scheduling, and games**. Studying different technical and social aspects of the Internet in particular is one of the active areas of current research involving **computer scientists, economists, and social scientists**

Graph Problems

- **Basic graph algorithms include**
- Shortest-path Algorithms
- Topological Sorting For Graphs With Directed Edges
- Traveling Salesman Problem (TSP)
- Graph-coloring Problem

Combinatorial Problems

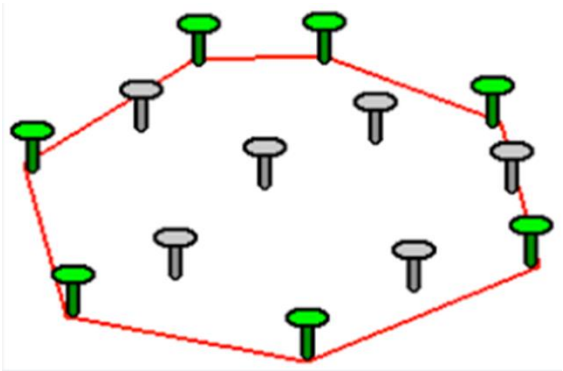
- From a more abstract perspective, the traveling salesman problem and the graph-coloring problem are examples of ***combinatorial problems***. These are problems that ask, explicitly or implicitly, to find a combinatorial object—such as a **permu- tation, a combination, or a subset—that satisfies certain constraints**. A desired combinatorial object may also be required to have some additional property such as **a maximum value or a minimum cost**.



Geometric Problems

Geometric algorithms deal with geometric **objects such as points, lines, and poly- gons**. The ancient Greeks were very much interested in developing proc edures (they did not call them algorithms, of course) for solving a variety of geometric problems, including problems of constructing simple geometric **shapes—triangles, circles, and so on—with an unmarked ruler and a com pass**

- ✓ **closest-pair problem**
- ✓ **convex-hull problem**



Numerical Problems

Numerical problems, another large **special area of applications,** are problems that Involve mathematical objects of continuous nature: **solving equations** and systems of equations, **computing definite integrals**, **evaluating functions**, an so on. The majority of such mathematical problems can be solved only approximately.

5. Estimate the amount work done on the previous problem 3 given the empirical equation below from the distance of x_1 = 5ft up to x_2 = 35ft using **Multiple application Trapezoidal Rule** with n = 12 segments.

$$W = \int_{x_1}^{x_2} f(x)\cos[\theta(x)]\,dx$$

Assessment

Match the following

Arrange the Elements in order	-	Graph problems
N Queen Problem	-	String processing
Convex hull	-	Numerical Problems
Integral Calculus	-	Searching
Graph coloring	-	Combinatorial problem
Find a new string in existing one	-	Geometric problem
Find the given number	-	Sorting


Thank you!