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Problem Solving and Python Programm

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by

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Course Name:Problem Solving and Python Programming

Unit No: I

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Problem Solving and Python Programming

Unit I: Algorithmic Problem Solving

What is Problem Solving?

Problem solving is the systematic approach to defining problems and creating solutions. The process starts with problem specifications and ends with a correct program.

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Building Blocks of Algorithms



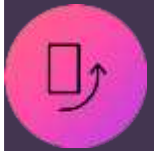
Statements

Single actions: input data, process data, output data



State

Transition from one process to another under specified conditions



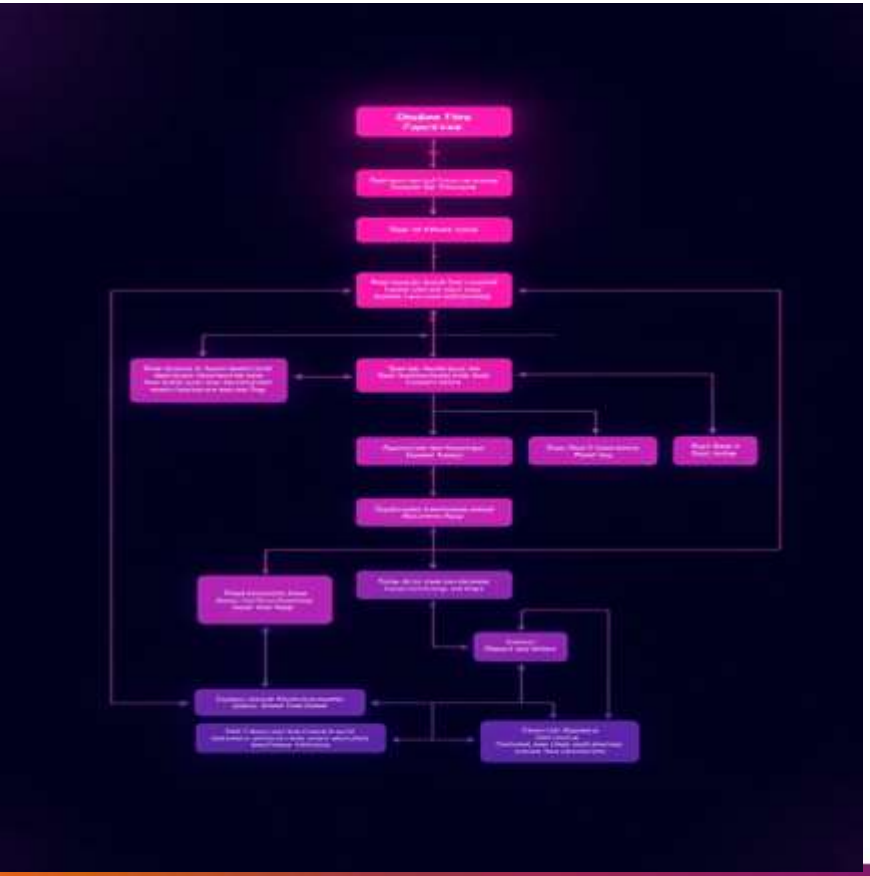
Control Flow

Executing statements in order: sequence, selection, iteration



Functions

Subprograms performing particular tasks through code blocks



Control Flow Structures

Sequence

Execute instructions **one after another**

Selection

Transfer control based on conditions

Iteration

Execute statements repeatedly

Functions: Benefits and Structure

Why Use Functions?

- **Reduction in lines of code**
- **Code reuse and better readability**
- **Information hiding**
- **Easier debugging and testing**
- **Improved maintainability**

Algorithm Characteristics

Simple English

Written in clear, understandable language

Unambiguous

Each instruction must be precise and clear

Finite Steps

Must conclude after a finite number of steps

Well-Defined

Ordered sequence of finite, unambiguous instructions

Qualities of Good Algorithms

Time Efficiency

Lesser execution time required for better performance

Memory Usage

Less memory space required during execution

Accuracy

Provides suitable and correct solutions to problems

Sequence

Must follow logical order with proper repetition

Generability

Handles a range of input data effectively

Algorithm Notations



Algorithm

Ordered sequence of instructions for solving a task

Flowchart

Graphical representation using standard symbols

Pseudocode

English-like representation of program logic

Flowchart Symbols



Terminal

Oval shape for start/end points



Process

Rectangle for operations



Decision

Diamond for conditions



I/O

Parallelogram for data flow



Flow Lines

Arrows



Connector

Circle for jump points

Algorithmic Problem Solving Process

Understand the Problem

Define inputs and requirements

Design Algorithm

Apply appropriate techniques

Analyze Efficiency

Time and space complexity

Choose Approach

Exact vs. approximate solving

Prove Correctness

Verify for all legitimate inputs

Code Implementation

Translate to programming language

Thank You!