NEW HORIZON COLLEGE

SUBJECT: PROBLEM SOLVING TECHNIQUES USING C

SEMESTER: I SEMESTER

COURSE: BCA

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PROBLEM SOLVING TECHNIQUES USING C

Chapter – 1

Introduction to computer programming

Problem solving

- It is a systematic approach to find and implement the solution to a problem.

Program

- It is a set of instructions written in computer languages

Software

- It is a collection of computer data and instructions. It is responsible for controlling, integration and managing hardware components and perform specific tasks.

Classification of software

- **System software**

It is a set of one or more programs that manage and support a computer system hardware and its data processing activities.

E-x Operating system, Compilers, Assemblers

- **Application software**

It is a set of one or more programs, designed to solve a specific problem or a specific task.

E-x Ms-word ,Ms-excel,Ms-powerpoint

Steps in Problem Solving

- Problem Definition
- Problem Analysis
- Design
- Coding
- Testing
- Maintenance

Problem Definition

- To solve a problem, the first step is to identify and define the problem.
- The problem must be stated clearly, accurately and precisely.

E-x Find largest of three numbers

Problem Analysis

- The problem analysis helps in designing and coding for that particular problem.

1. **Input specifications**

The number of inputs and what forms the input are available

2.Output specifications

The number of outputs and what forms the output should be displayed.

E-x input – a,b,c

output - c

Designing a program

- 1. Algorithms
- 2.Flowcharts
- Algorithm - step by step procedure of solving a problem
- Flowcharts – It is the graphical representation of the algorithm.

Coding

- Writing instructions in a particular language to solve a problem.

Testing a Program

- After writing a program, programmer needs to test the program for completeness, correctness, reliability and maintainability.
- Unit testing
- Program Testing
- Verification Testing
- Validation Testing

Maintaining the program

- It means periodic review of the programs and modifications based on user requirements.

Algorithm

- An algorithm is a step by step procedure to solve a given problem in finite number of steps.

The characteristics of an algorithm are

(i) Algorithm must have finite number of steps.

(ii) No instructions should be repeated.

(iii) An algorithm should be simple.

(iii) An algorithm must take atleast one or more input values.

(iv) An algorithm must provide atleast one or more output values.

Advantages

- An algorithms are very easy to understand.
- Algorithm is programming language independent.
- Algorithm makes the problem simple, clear, correct.

Example-1

Problem definition : To find simple interest

Problem Analysis :

inputs – p, r, t

Output – simple interest

Algorithm

Step 1:Start

Step 2:input p,r,t

Step 3: calculate si=p*r*t/100

Step 4: output si

Step 5:stop

Example - 2

Problem definition : To Convert temperature in Celsius to Fahrenheit

Problem Analysis :

input – c

Output – f

Algorithm

Step 1:Start

Step 2:input c

Step 3: calculate f=9/5*c+32

Step 4: output f

Step 5:stop

Example - 3

- **Problem definition** : To find the largest of three numbers
- **Problem Analysis** :

  input - a,b,c

  output – string

Algorithm

step 1: start

step 2: input a,b,c

Step 3: if (a>b) and (a>c) then print “a is greater”

Else if (b>a) and (b>c) then print “b is greater”

Else

Print “c is greater”

Step 4: stop

FLOWCHART

- A flow chart is a step by step diagrammatic representation of the logic paths to solve a given problem.
- A flowchart is graphical representation of an algorithm.

Advantages

- The flowchart shows the logic of a problem displayed in pictorial fashion
- It is useful for debugging and testing of programs.
- Program could be coded efficiently using flowcharts.
- The Flowchart is good means of communication to other users.

Disadvantages

- It is not useful to represent complex program logic
- For any alterations, the flowcharts have to be redrawn completely.

Rules for writing flowcharts

- It should be drawn from top to bottom.
- A flowchart always begins with start symbol and ends with stop symbol.
- Flow lines are used to join the symbols
- Decision box should have one entry point and two exit points.
- For lengthy flowcharts, connectors are used to join them.

Symbols used in flowcharts

start or stop (terminal)

- **Oval**: Rectangle with rounded sides is used to indicate either START/ STOP of the program.

Input/output

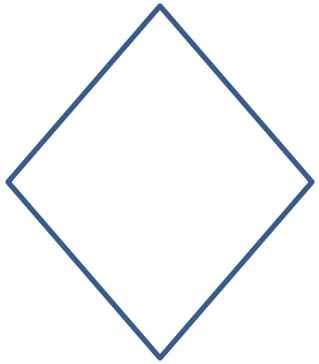
- Used to read or print data or information

Processing

- Represents calculations, Processing or data manipulation.

Decision

- Represents comparisons or decisions and branching

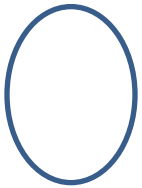


Looping

- Represents a group of instructions to be executed repeatedly.

Connectors

- Indicates an entry or an exit to another part of the flowchart.



Directions of flow

- Indicates the direction of processing or flow of control.

Write Algorithm and flowchart for the following problems

- Find the largest of two numbers
- Check whether the given number is positive or not
- Input a age of person and check whether he is eligible for voting or not.
- Check whether the given number is odd or even
- Check whether the given year is leap year or not.

Coding

- Coding is the translation of an algorithm or flowchart into a suitable computer language c,c++,java

Testing and Debugging

- To achieve the required output, the program that is written in coding must be tested ,compiled and executed.
- Types of errors

  syntax error

  semantic error

  Run-time error

Debugging

- It is the process of identifying and correcting the bugs.

Documentation

- Documentation is the reference material which explains the use and maintenance of the program.
- Two types of documentation

  Internal Documentation

  variable names, program code

  External Documentation

  User's manual, Administrator manuals, Developers manual

Maintenance

- Periodic review of the program and modifications based on their user requirements.

Structured Programming

- Structured programming is a technique for organizing and coding computer programs in which a hierarchy of modules is used ,each having single entry and single exit point.

Three types of control structures

Sequence

Selection

Iteration

Rules for structured programming

- Every program should specify input and output variables.
- The flow of the program should be top-down approach.
- Every program and function must have a comment at the beginning.
- Divide the big programs in to subprograms (functions or procedures).
- Documentation should be short.

Advantages of structured programming

- Easy to write.
- Easy to debug
- Easy to understand
- Easy to change.

Modular programming

- The modular approach to programming involves breaking a program down into sub-components called modules.
- Each module is composed of some set of instructions.

Advantages of modular programming

- Easy to write
- Easy to debug
- The types of approaches

  Top-down approach

  Bottom-up approach