Programming Fundamentals CT-175

Dynamic Memory Allocation

Objectives

The objective of this lab is to enable students understand and develop the problem solving skills by using programming concepts. By the end of this lab, students should be able to present solutions to different programming problems by using pseudo-codes and flowcharts.

Tools Required

MS Word or Paint

Course Coordinator –
Instructor –
Lab Instructor –
Department of Computer Science and Information Technology
NED University of Engineering and Technology

Algorithm

An algorithm is defined as a finite set of steps or instructions required to solve a given problem. Algorithms can be described by using two methods

1. Pseudo-codes
2. Flow charts

1. Pseudo-code

Pseudo-code is a compact and informal high-level description of a program. It is platform independent. Following are some keywords which are used while writing pseudo-codes.

BEGIN	indicates start of an algorithm
VARIABLES	indicates the variables used for storing the inputs or outputs
INPUT	indicates a user will be inputting something
OUTPUT	indicates that an output will appear on the screen
WHILE	a loop (iteration that has a condition at the beginning)
FOR	a counting loop (iteration)
REPEAT – UNTIL	a loop (iteration) that has a condition at the end
IF – THEN – ELSE	a decision (selection) in which a choice is made
END	indicates the end of a program
Any instructions that occur inside a selection or iteration are usually indented	

Example 1: Sequential Structure - Write pseudo-code for adding two numbers.

```
Begin
Variables X, Y, sum
Input X
Input Y
sum=X+Y
Output sum
End
```

Example 2: Iterative Structure - Write pseudo-code for finding sum of natural numbers from 1 to 100.

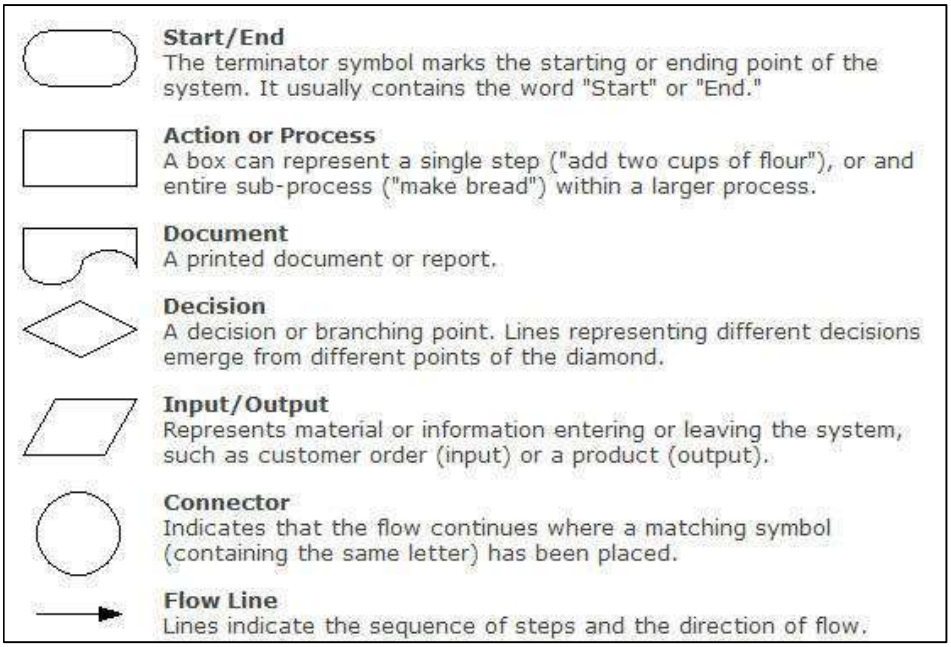
```
Begin
Variables counter, sum=0
For counter=1 to 100 step 1 do
   sum=sum+counter
Endfor
Output sum
 End
```

Example 3: Conditional Structure - Write pseudo-code for checking if a number if positive or negative.

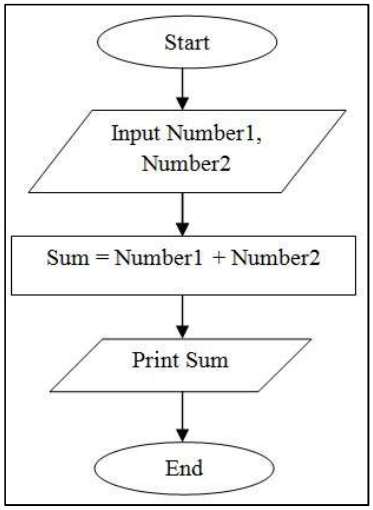
```
Begin
Variable num
Input num
If num>0  then
   output "entered number is positive"
Else if num <0 then
   output "entered number is negative"
Else
   output "entered number is zero"
Endif
End
```

2. Flow charts

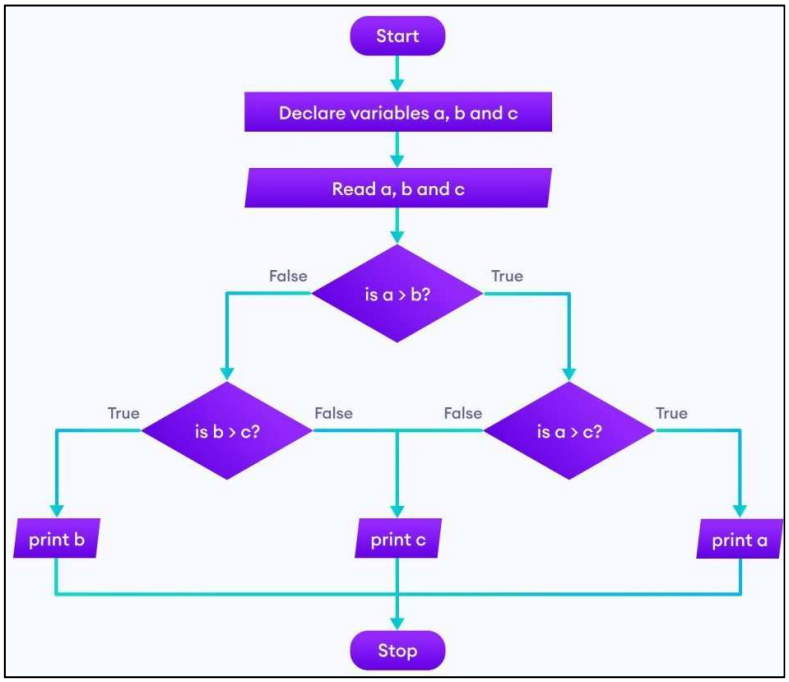
A flowchart is a pictorial representation of an algorithm in which the steps are drawn in the form of different shapes of boxes and the logical flow is indicated by interconnecting arrows. A flowchart is a graphical representation of the problem solving process.



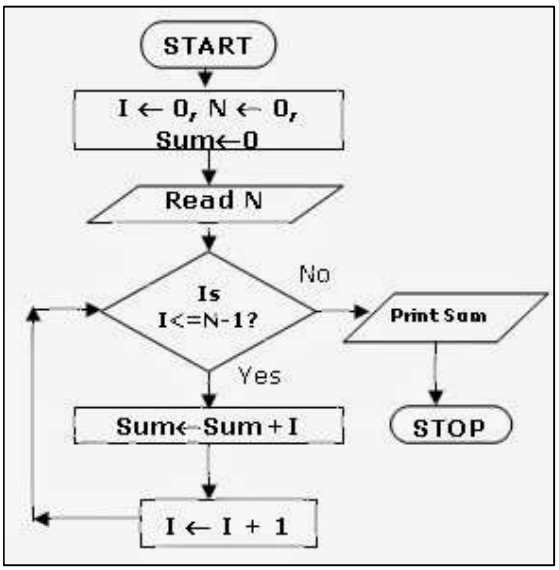
Example 4: Sequential Structure - Draw the flowchart of a program for adding two numbers.



Example 5: Conditional Structure - Draw the flowchart of a program for finding the maximum out of three numbers.



Example 6: Iterative Structure - Draw the flowchart of a program for finding sum of the initial "N" natural numbers.



Exercise

1. Write pseudo-code for Example 5 of Lab 01.
2. Write pseudo-code and draw flow chart. Ask a user to enter exam scores for five different courses and determine whether the student is passing or failing the course. Calculate the average score, the number of failed courses, and the number of passed courses. To confirm your solution, trace through the designed flowchart and pseudo-code by using the following test case: 88, 65, 45, 23, 77.
3. Ask a user to enter a number and then display the factorial of the entered number.
4. One of the jobs that Joe Roberts has been given at work is to order special paper for a report for a board meeting. The paper comes in reams of 500 sheets. He always makes five more copies than the number of people that will be there. Joe wants to know how many reams of paper he needs for a meeting. He can order only whole, not partial, reams. Assume the required number of pages will not equal an exact number of reams. Test your solution with the following data: The report is 140 pages long. There will be 25 people at the meeting.
5. Joe would like to build several bookcases that are different heights and widths. All will be 12 inches in depth. The bookcases will have three shelves, in addition to the bottom and the top. Write a solution to print the number of feet of 12-inch-wide boards that will Joe need to complete a bookcase, given the height and width.