Programming Notes

Problem: Write an algorithm an pseudocode which prompts a user to enter the price of an item and then calculate and print the new price after a discount of 12% is given.

Algorithm solution.

1. START
2. PROMPT USER FOR ITEM PRICE
3. CALCULATE THE DISCOUNT AT 12%
4. CALCULATE THE NEW PRICE
5. PRINT THE NEW PRICE
6. STOP

Pseudocode solution

```
BEGIN
INPUT PRICE
DISCOUNT = PRICE * 0.12
LET NEW PRICE = PRICE – DISCOUNT
PRINT NEWPRICE
END
```

Structured programming

The order in which instruction are performed by the computer must be carefully controlled and programming languages normally contain features that allow the order of instruction execution to be controlled. All programming problems, no matter how complex, can be reduced to combinations of controlled sequences, selections, or repetitions (iterations) of basic operations on data.
The concept of structured programming uses three basic program control structures to design the solution to programming problems.
Control structures

1. Sequence: The program statements are executed in the order or sequence in which they appear in the program.
   e.g
   Statement 1
   Statement 2
   Statement 3
   etc.

One sub-problem is solved at a time, until the complete problem is solved.

2. Selection: selection forms part of the decision-making facilities within a programming language. They allow alternative actions to be taken according to the conditions which exist at particular stages in program execution. Conditions are normally if the form of expressions, which when evaluated, give a Boolean result. Examples of selection constructs are: (a) IF.. THEN..ELSE, and SELECT…CASE.
3. Repetition (Iteration): There are many programming problems in which the same sequence of statements need to be performed again and again for some definite or

indefinite number of times. The repetitive performance of the same statements is called looping. Examples of repetitive constructs are:

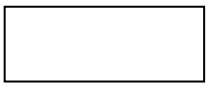
(a) WHILE
(b) DO WHILE
(c) REPEAT…UNTIL
(d) FOR.. NEXT

The WHILE and REPEAT..UNTIL constructs are used for indefinite repetitions, i.e. they do not define the number of repetitions that should occur when the loop is executed, they only give conditions for looping to stop. The FOR construct is used for definite repetitions. It defines the number of repetitions that will occur during execution.

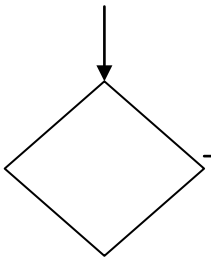
Programming Flowchart Symbols

Oval: indicates STOP, START, END, or EXIT

Parallelogram: Used to specify an INPUT or OUTPUT operation.



Rectangle: Used to specify an operation or process.

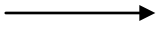


NO /FALSE

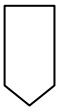
Rhombus: Used to specify a condition. (decision box)

YES /TRUE

Circle: Used as a connection for arrows coming from different directions (connector symbol)



Arrow: (Flowline) shows the direction of data flow.



Off-Page connector

Structure of the IF.. THEN.. ELSE construct.
The IF..THEN.. ELSE construct consists of the word:

1. IF
2. A condition (e.g. B=0)
3. The word THEN
4. One or more statements called “the THEN part”
5. The word ELSE
6. One or more statements called “the ELSE part”
7. The word ENDIF indicating the end of the construct.

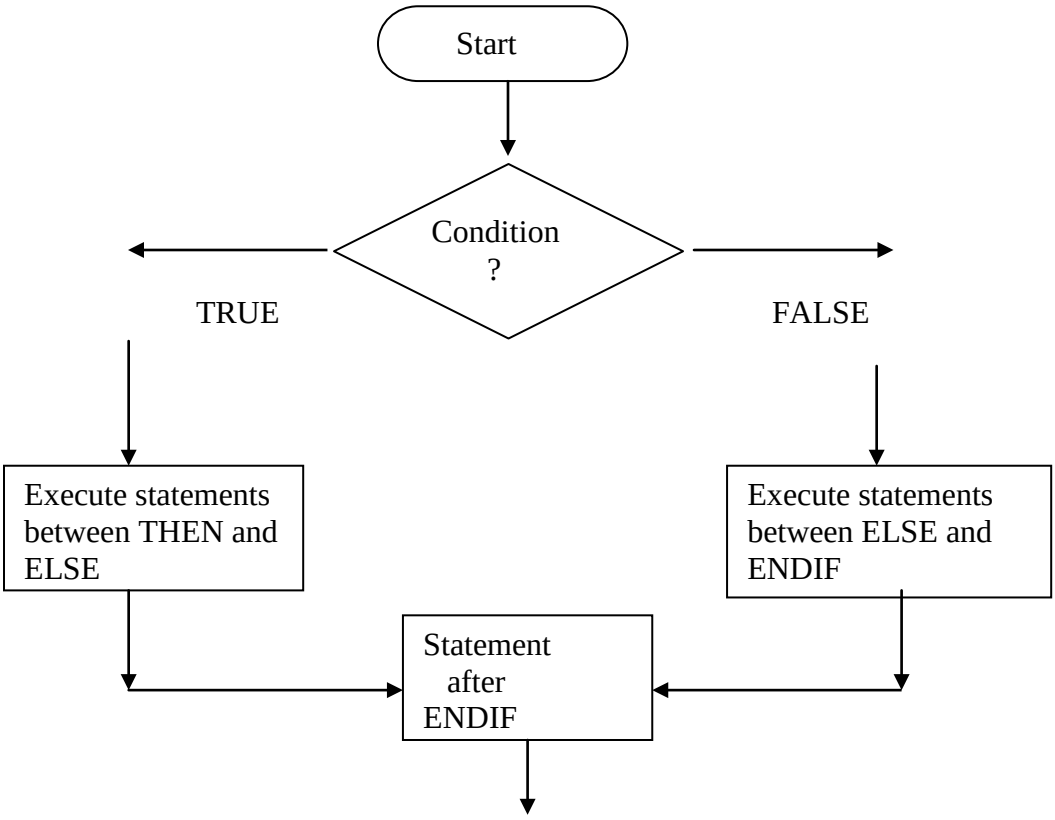
The construct causes the following actions to occur:-

1. The condition is tested
2. if the condition is TRUE, the THEN part is executed, and execution continues with the statement following ENDIF
3. If the condition is FALSE, the ELSE part is executed, in this case the THEN part is skipped.
4. Execution then continues with the statement following ENDIF.

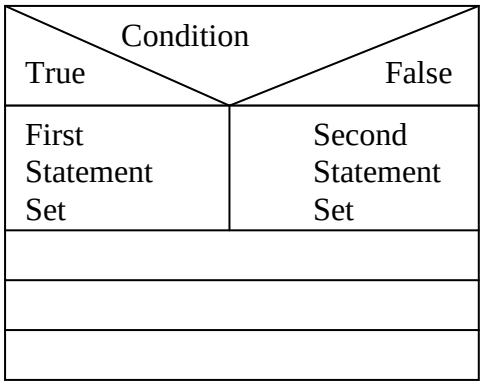
Format (layout) of the IF.. THEN.. ELSE construct.

```
IF condition THEN
        Statement  1
        Statement  2
        Statement  n
ELSE
        Statements
ENDIF
```

Flowchart of IF.. THEN..ELSE construct.



Nassi-Schneidermann Structure Chart:

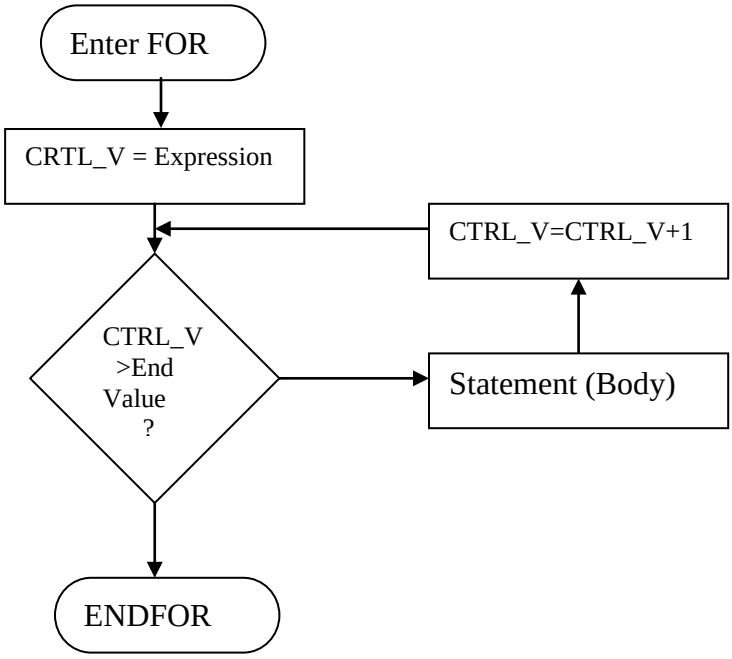


<u>The structure of the FOR construct</u>

The FOR construct consist of:

1. The word FOR
2. The Loop variable
3. The Equal sign
4. An initial (start) value
5. The word TO
6. The final (END) value

7. The word DO
8. One or more statements to be executed each time through the loop
9. The word ENDFOR indicating the end of the construct.

NOTE: The part of the construct between the words FOR and DO is called the control part. This is what determines how many times the loop will be executed. The loop variable is also called the control variable.

Flowchart of the FOR construct