SELECTION CONSTRUCTS

- You can select between blocks of statements by using the selection construct
- IF statement is used as a selection construct
- Four types of IF constructs
  - IF-ELSE Construct
  - IF Construct
  - IF-ELSEIF Construct
  - Simple IF Construct

IF-ELSE Construct

The general form of the IF- ELSE construct is as follows:

```
IF ( condition ) THEN
    BLOCK1
ELSE
    BLOCK2
ENDIF
```

Where

- condition is a logical expression
- each of block1 and block2 consists of one or more FORTRAN statements
- condition is .TRUE. (execute block1)
- condition is .FALSE. (execute block2)
- the condition should be between parentheses
- **IF** condition **THEN** in the same line
- **ELSE** should be in a line by itself
- **ENDIF** should be in a line by itself

Example 1: Write a FORTRAN program that reads two integer numbers and prints the maximum.

Solution:

```
INTEGER   NUM1, NUM2
PRINT*, 'ENTER TWO DIFFERENT INTEGER NUMBERS'
READ*, NUM1, NUM2
PRINT*, 'INPUT: ', NUM1, NUM2
IF (NUM1 .GT. NUM2)  THEN
   PRINT*, 'MAXIMUM IS ', NUM1
ELSE
   PRINT*, 'MAXIMUM IS ', NUM2
ENDIF
END
```

Example 2 : Write a FORTRAN program that reads an integer number and finds out if the number is even or odd. The program should print a proper message.

Solution:

```
INTEGER   K
PRINT*, 'ENTER AN  INTEGER NUMBER'
READ*, K
PRINT*, 'INPUT: ', K
IF (K/2*2 .EQ.  K) THEN
    PRINT*, ' THE NUMBER IS EVEN'
ELSE
    PRINT*, ' THE NUMBER IS ODD'
ENDIF
END
```

IF Construct

The general form of the IF construct is as follows:

```
IF ( condition ) THEN
    BLOCK
ENDIF
```

Example : Write a FORTRAN program that reads a grade. If the grade is not zero, the program must add 2 points to the grade. Then, the new grade should be printed.

Solution:

```
REAL  GRADE
PRINT*, 'ENTER  A GRADE'
READ*, GRADE
PRINT*, 'ORIGINAL GRADE IS', GRADE
IF (GRADE .GT.  0) THEN
    GRADE = GRADE + 2.0
    PRINT*, 'SCALED GRADE IS ', GRADE
ENDIF
END
```

Exercises

What is the output of the following program ?

```
REAL A, B, C
READ*, A, B, C
IF ( A .LT. B ) THEN
   PRINT*, A + B
   IF( B .GT. 4.0 ) THEN
      PRINT*, B*C
   ELSE
      PRINT*, C
   ENDIF
ELSE
   PRINT*, A*B*C
ENDIF
END
```

Assume the input for the program is:

5.0 6.0 3.0

What is the output of the following program ?

```
INTEGER A, B, C
READ*, A, B, C
IF (A.GT.B) THEN
    IF (B.LT.C) THEN
        PRINT*, B
    ELSE
        PRINT*, C
    ENDIF
ELSE
    PRINT*, A
ENDIF
PRINT*, A, B, C
END
```

Assume the input for the program is:

-2 -4 -3

What is the output of the following program ?

```
REAL  A , B
INTEGER  K
READ*, A, K , B
IF (A .LT. 3.0) THEN
   PRINT*, A + K
   IF (B .LT. 2.5) THEN
      PRINT*, B**K
   ENDIF
ELSE
   PRINT*, A*B*K
ENDIF
END
```

Assume the input for the program is:

2.5 2 2.5

IF-ELSEIF Construct

The general form of the IF- ELSEIF construct is as follows:

```
IF ( condition–1 ) THEN
   BLOCK1
ELSEIF ( condition–2 ) THEN
   BLOCK2
ELSEIF ( condition–3 ) THEN
   BLOCK3
. . .
ELSEIF ( condition–n ) THEN
   BLOCKn
ELSE
   BLOCKn+1
ENDIF
```

Example : Write a FORTRAN program that reads a student ID and his GPA out of 4.0. The program should print a message according to the following:

Condition	Message
GPA >= 3.5	EXCELLENT
3.5 > GPA >= 3.0	VERY GOOD
3.0 > GPA >= 2.5	GOOD
2.5 > GPA >= 2.0	FAIR
GPA < 2.0	POOR

```
REAL  GPA
INTEGER   ID
CHARACTER*10 STATE
READ*, ID, GPA
PRINT*, 'INPUT:', ID, GPA
IF (GPA .GE. 3.5) THEN
    STATE = 'EXCELLENT'
ELSEIF (GPA .GE. 3.0) THEN
    STATE = 'VERY GOOD'
ELSEIF (GPA .GE. 2.5) THEN
    STATE = 'GOOD'
ELSEIF (GPA .GE. 2.0) THEN
    STATE = 'FAIR'
ELSE
    STATE = 'POOR'
ENDIF
PRINT*, ID,'  ', STATE
END
```

Example : Write a FORTRAN program that reads three integer numbers and finds and prints the maximum. Use IF-ELSEIF construct.

Solution:

```
INTEGER X1, X2, X3, MAX
PRINT*, 'ENTER THREE DIFFERENT INTEGER NUMBERS'
READ*, X1, X2, X3
PRINT*, 'THE NUMBERS ARE', X1, X2, X3
IF (X1 .GT. X2 . AND. X1 .GT. X3) THEN
   MAX = X1
ELSEIF (X2 .GT. X3) THEN
   MAX = X2
ELSE
   MAX = X3
ENDIF
PRINT*, 'THE MAXIMUM OF THE THREE NUMBERS =', MAX
END
```

Simple IF Construct

It has the following general form:

IF (condition) STATEMENT

Example : Use simple IF constructs to write a FORTRAN program that reads a student ID and his GPA out of 4.0. The program should print a message according to the following:

Condition	Message
GPA >= 3.5	EXCELLENT
3.5 > GPA >= 3.0	VERY GOOD
3.0 > GPA >= 2.5	GOOD
2.5 > GPA >= 2.0	FAIR
GPA < 2.0	POOR

```
INTEGER  ID
REAL  GPA
CHARACTER*10  STATE
READ*, ID, GPA
PRINT*, 'INPUT:', ID, GPA
IF (GPA .GE. 3.5) STATE = 'EXCELLENT'
IF (GPA .GE. 3.0 .AND. GPA .LT. 3.5) STATE = 'VERY GOOD'
IF (GPA .GE. 2.5 .AND. GPA .LT. 3.0) STATE = 'GOOD'
IF (GPA .GE. 2.0 .AND. GPA .LT. 2.5) STATE = 'FAIR'
IF (GPA .LT. 2.0) STATE = 'POOR'
PRINT*, ID, '  ', STATE
END
```

Example : Write a FORTRAN program that reads three Integer numbers and finds and prints the maximum. Use simple IF constructs.

Solution:

```
INTEGER  X1, X2, X3, MAX
PRINT*, 'ENTER THREE DIFFERENT INTEGER NUMBERS'
READ*, X1, X2, X3
PRINT*, 'THE NUMBERS ARE', X1, X2, X3
MAX = X1
IF (X2 .GT. MAX) MAX = X2
IF (X3 .GT. MAX) MAX = X3
PRINT*, 'THE MAXIMUM OF THE THREE NUMBERS IS', MAX
END
```

Exercise

What is the output of the following program ?

```
INTEGER N, M
N = 15
M = 10
IF (M .GE. N) THEN
   M = M + 1
   IF (N .EQ. M) THEN
      N = N + 5
   ELSEIF (N .GT. 0) THEN
      N = N + 10
   ENDIF
   M = M - 1
ENDIF
M = M - 1
PRINT*, M, N
END
```