Lecture – 4

Section-B

Macro Language
and
Macro processor

Introduction

Macro Instructions

- The assembly language programmer often finds it necessary to repeat some blocks of code many times in the course of a program.
- The block may consist of code to save or exchange set of registers, for eg. Or code to set up linkages or perform a series of arithmetic operations.
- In this situation, the programmer will find a macro instruction facility useful.
- **Macro instructions** (often called **macros**) are single-line abbreviations for groups of instructions. In employing a macro, the programmer essentially defines a single " instruction" to represent a block of code.

- Macro instruction are usually considered an extension of the basic assembler language, and the macro processor is viewed as an extension of the basic assembler program.
- As a form of programming language, however, macro instruction languages differ significantly from assembly language and compiled algebraic

Macro Instructions

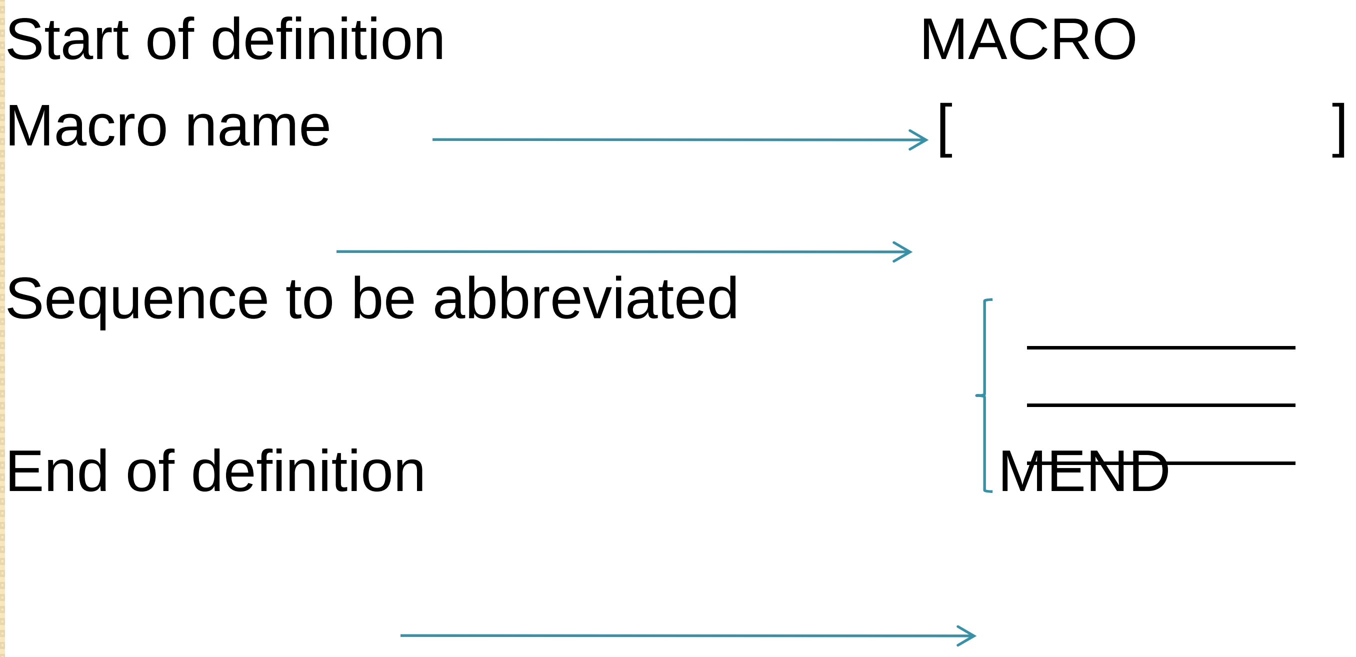
- In its simplest form, a macro is an abbreviation for a sequence of operations. Consider the following program:
- Example 1:

```
    .
    .
    .
A          1, DATA      Add contents of DATA to register 1
A          2, DATA      Add contents  of  DATA to register 2
A          3, DATA      Add contents of DATA to register  3
    .
    .
    .
A          1, DATA      Add contents of DATA to register 1
A          2, DATA      Add contents  of  DATA to register 2
A          3, DATA      Add contents of DATA to register  3
    .
    .
    .
DATA        DC          F'5'
    .
    .
    .
```

In the above program the sequence

```
   A       1, DATA
   A       2, DATA
   A       3, DATA                      occurs twice
```

- A macro facility permits us to attach a name to this sequence and to use this name in its place
- A macro processor effectively constitutes a separate language processor with its own language.
- We attach a name to a sequence by means of a macro instruction definition, which is formed in the following manner :



- The MACRO pseudo-op is the first line of the definition and identifies the following line as the *macro instruction name.*
- Following the name line is the sequence of instructions being abbreviated – the instructions comprising the “macro” instruction.
- The definition is terminated by a line with the MEND (“macro end”) pseudo-op.
- Once the macro has been defined, the use of the macro name as an operation mnemonic in an assembly program is equivalent to the use of the corresponding instruction sequence.
- Our example might be rewritten as follows, assigning the name “INCR” to the repeated sequence

```
• Source                                                        Expanded Source
          MACRO
          INCR
          A                 1,DATA
          A                 2, DATA
          A                 3, DATA
          MEND
          .                                         .
          .                                         .
          .                                         .
          INCR                                       A          1,DATA
          .                                          A          2,DATA
          .                                          A          3. DATA
          .                                         .
                                                    .
                                                    .
          INCR                                       A          1,DATA
          .                                          A          2,DATA
          .                                          A          3. DATA
          .
DATA   DC                    F'5'           DATA   DC                 F'5'
          .
          .
          .
```

- In this case the macro processor replaces each macro call with the lines

A	1, DATA
B	2, DATA
C	3, DATA

- This process of replacement is called *expanding* the macro.
- Notice that the macro definition itself does not appear in the expanded source code.
- The definition is saved by the macro processor. The occurrence in the source program of the macro name, as an operation mnemonic to be expanded, is called a macro call.