CC410: System Programming

Dr. Manal Helal – Fall 2014 – Lecture 2

Learning Objectives

- Study More SIC Programming Examples – Chapter 1

1.3.3 SIC Programming Examples

```
        LDA     #5              LOAD VALUE 5 INTO REGISTER A
        STA     ALPHA           STORE IN ALPHA
        LDA     #90             LOAD ASCII CODE FOR 'Z' INTO REG A
        STCH    C1              STORE IN CHARACTER VARIABLE C1
          .
          .
          .
ALPHA   RESW    1               ONE-WORD VARIABLE
C1      RESB    1               ONE-BYTE VARIABLE
```

(b)

Figure 1.2 Sample data movement operations for (a) SIC and (b) SIC/XE.

1.3.3 SIC Programming Examples

- Sample arithmetic operations
  - (ALPHA+INCR-1) assign to BETA (Fig. 1.3)
  - (GAMMA+INCR-1) assign to DELTA

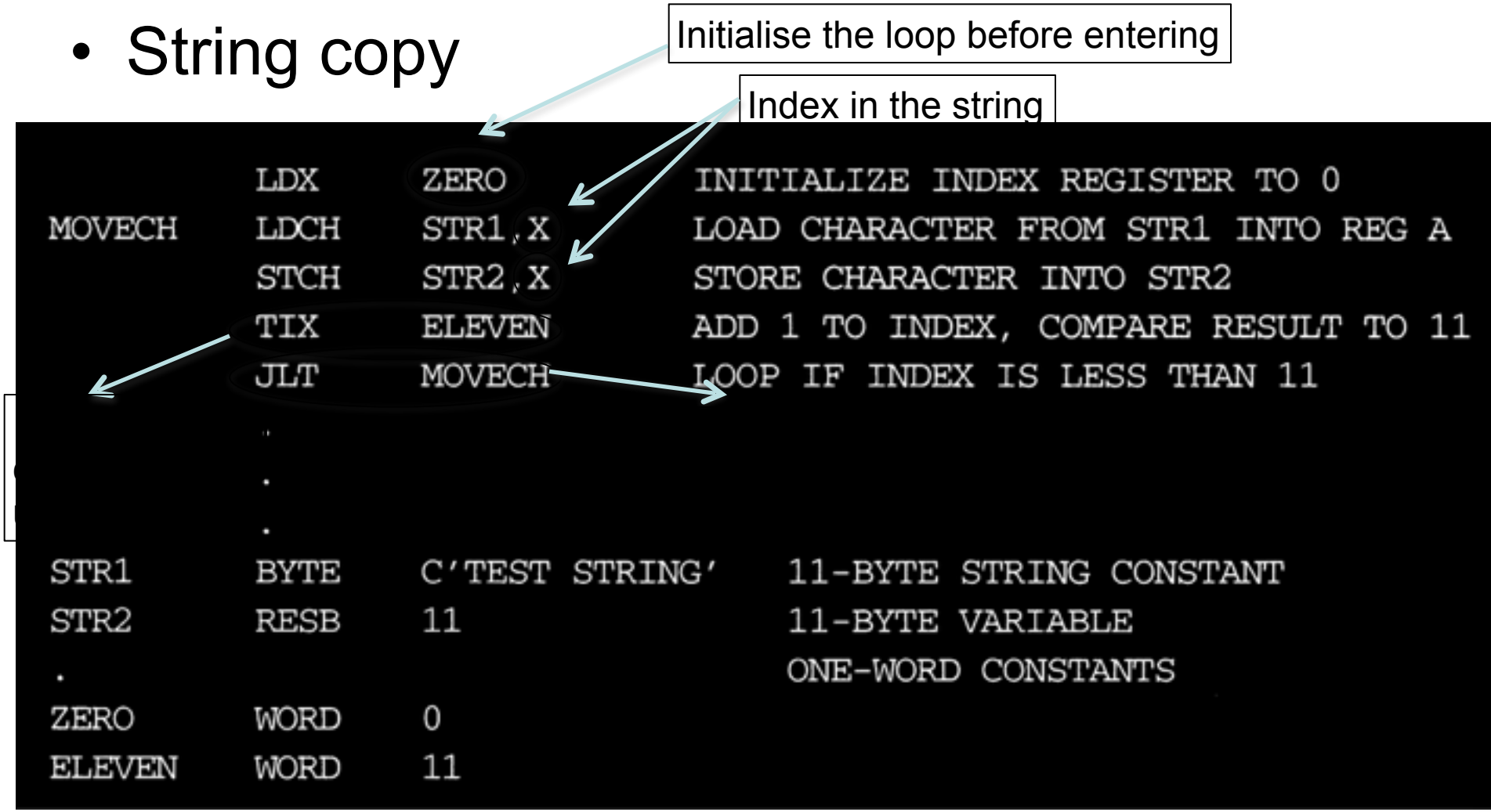
```
          LDA       ALPHA          LOAD ALPHA INTO REGISTER A
          ADD       INCR           ADD THE VALUE OF INCR
          SUB       ONE            SUBTRACT 1
          STA       BETA           STORE IN BETA
          LDA       GAMMA          LOAD GAMMA INTO REGISTER A
          ADD       INCR           ADD THE VALUE OF INCR
          SUB       ONE            SUBTRACT 1
          STA       DELTA          STORE IN DELTA
            .
            .
            .
ONE       WORD      1              ONE-WORD CONSTANT
.                                  ONE-WORD VARIABLES
ALPHA     RESW      1
BETA      RESW      1
GAMMA     RESW      1
DELTA     RESW      1
INCR      RESW      1
```

1.3.3 SIC Programming Examples

```
        LDS     INCR        LOAD VALUE OF INCR INTO REGISTER S
        LDA     ALPHA       LOAD ALPHA INTO REGISTER A
        ADDR    S,A         ADD THE VALUE OF INCR
        SUB     #1          SUBTRACT 1
        STA     BETA        STORE IN BETA
        LDA     GAMMA       LOAD GAMMA INTO REGISTER A
        ADDR    S,A         ADD THE VALUE OF INCR
        SUB     #1          SUBTRACT 1
        STA     DELTA       STORE IN DELTA
        .
        .
        .
.                           ONE WORD VARIABLES
ALPHA   RESW    1
BETA    RESW    1
GAMMA   RESW    1
DELTA   RESW    1
INCR    RESW    1
```

1.3.3 SIC Programming Examples

- String copy



1.3.3 SIC Programming Examples

```
         LDT    #11              INITIALIZE REGISTER T TO 11
         LDX    #0               INITIALIZE INDEX REGISTER TO 0
MOVECH   LDCH    STR1,X          LOAD CHARACTER FROM STR1 INTO REG A
         STCH    STR2,X          STORE CHARACTER INTO STR2
         TIXR    T               ADD 1 TO INDEX, COMPARE RESULT TO 11
         JLT     MOVECH          LOOP IF INDEX IS LESS THAN 11
         .
         .
         .
STR1     BYTE    C'TEST STRING'   11-BYTE STRING CONSTANT
STR2     RESB    11               11-BYTE VARIABLE
```

Trace the following SIC/XE assembly code, by showing the registers S, T, X, A and variables values how they change after the execution of each line, given that the initial values of Alpha is {5, 6, 7}, and Beta is {8, 9, 10}

```
1                LDS     #3
2                LDT     #9
3                LDX     #0
4       ADDLP    LDA     ALPHA,X
5                ADD     BETA,X
6                STA     GAMMA,X
7                ADDR    S,X
8                COMPR   X,T
9                JLT     ADDLP
10      ALPHA    RESW    3
11      BETA     RESW    3
12      GAMMA    RESW    3
```

Write a sequence of instructions for SIC/XE to set ALPHA equal to the 4*BETA-9. Assume ALPHA and BETA both are one word variables.

(HINT: SUB, RESW, LDA, MUL, STA)

```
        LDS     INCR        LOAD VALUE OF INCR INTO REGISTER S
        LDA     ALPHA       LOAD ALPHA INTO REGISTER A
        ADDR    S,A         ADD THE VALUE OF INCR
        SUB     #1          SUBTRACT 1
        STA     BETA        STORE IN BETA
        LDA     GAMMA       LOAD GAMMA INTO REGISTER A
        ADDR    S,A         ADD THE VALUE OF INCR
        SUB     #1          SUBTRACT 1
        STA     DELTA       STORE IN DELTA
        .
        .
        .
.                           ONE WORD VARIABLES
ALPHA   RESW    1
BETA    RESW    1
GAMMA   RESW    1
DELTA   RESW    1
INCR    RESW    1
```