UCS 1512
MICROPROCESSORS LAB
END SEMESTER
PRACTICAL EXAM

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Date: 18-11-2020 **Reg. No:** 18 5001 196

AIM:

To write assembly language programs to perform the following:

1. To write an ALP using 8086 to count the number of zeroes and ones in an 8-bit number.
2. To write an ALP using 8051 to find the largest number in a list.

PROGRAM – 1: 8086 ALP – COUNT NUMBER OF 0s AND 1s IN AN 8-BIT NUMBER:

ALGORITHM:

1. Begin.

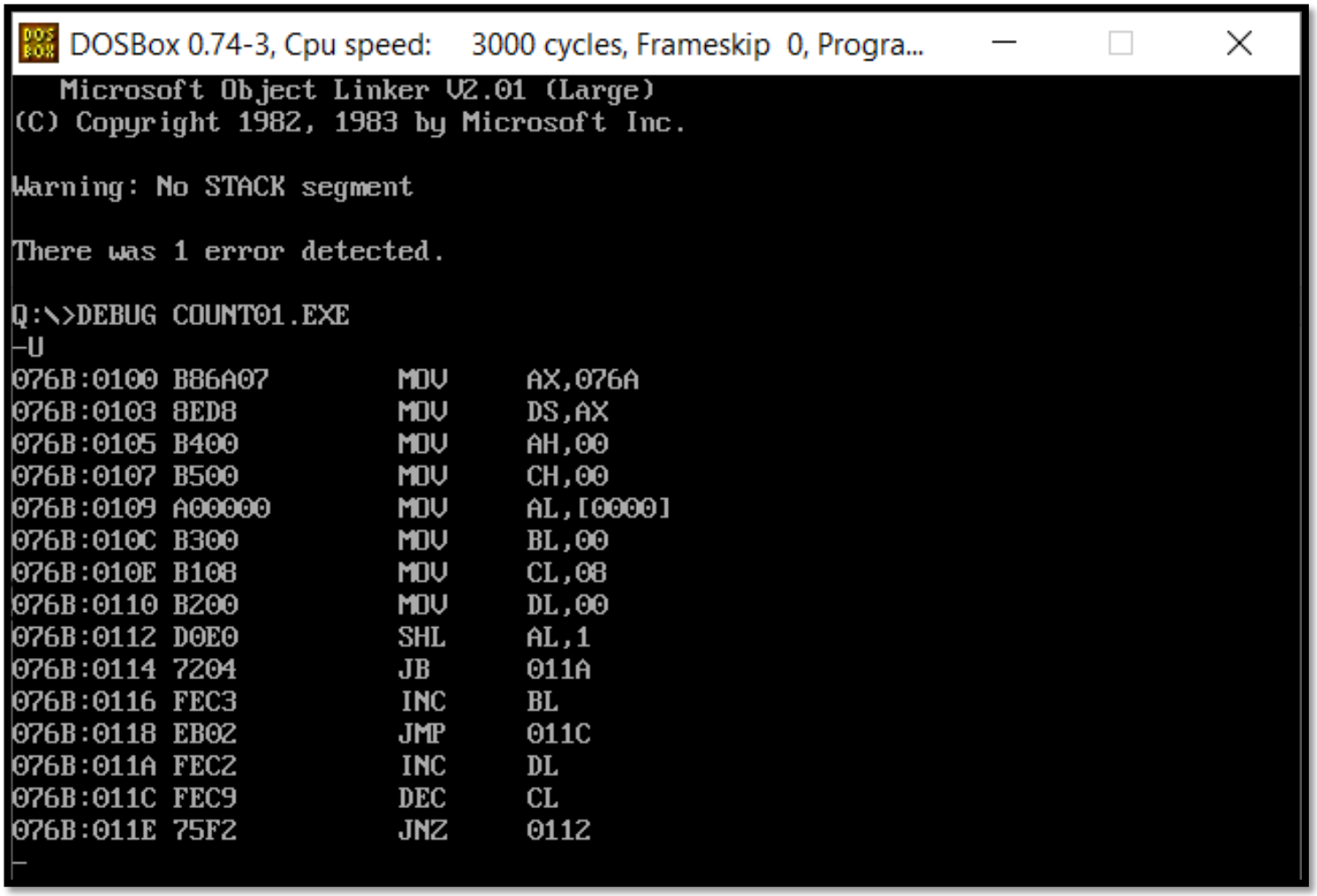
2. Initialize the data segment.
3. Initialize a variable, say *"num"*, to store the 8-bit number.
4. Initialize variables, say *"zeroes"* and *"ones"* to store the number of zeroes and ones in the 8-bit number as output.
5. Close the data segment.

6. Initialize the code segment.
7. Load the 8-bit number *"num"* to the AL register.
8. Clear the contents of AH, BL, CH, DL registers.
9. Use BL register to keep track of number of zeroes, DL to keep track of number of ones.
10. Load the value 08H to CL register to keep count of number of digits.
11. While CL ≠ 0:
    a. Shift left the value in AL register by 1.
    b. If CF ≠ 1:
        i. BL ← BL + 1.
    c. Else:
        i. DL ← DL + 1.
    d. CL ← CL - 1.
12. Transfer the value in BL to *"zeroes"*, and the value in DL to *"ones"*.
13. Close the code segment.

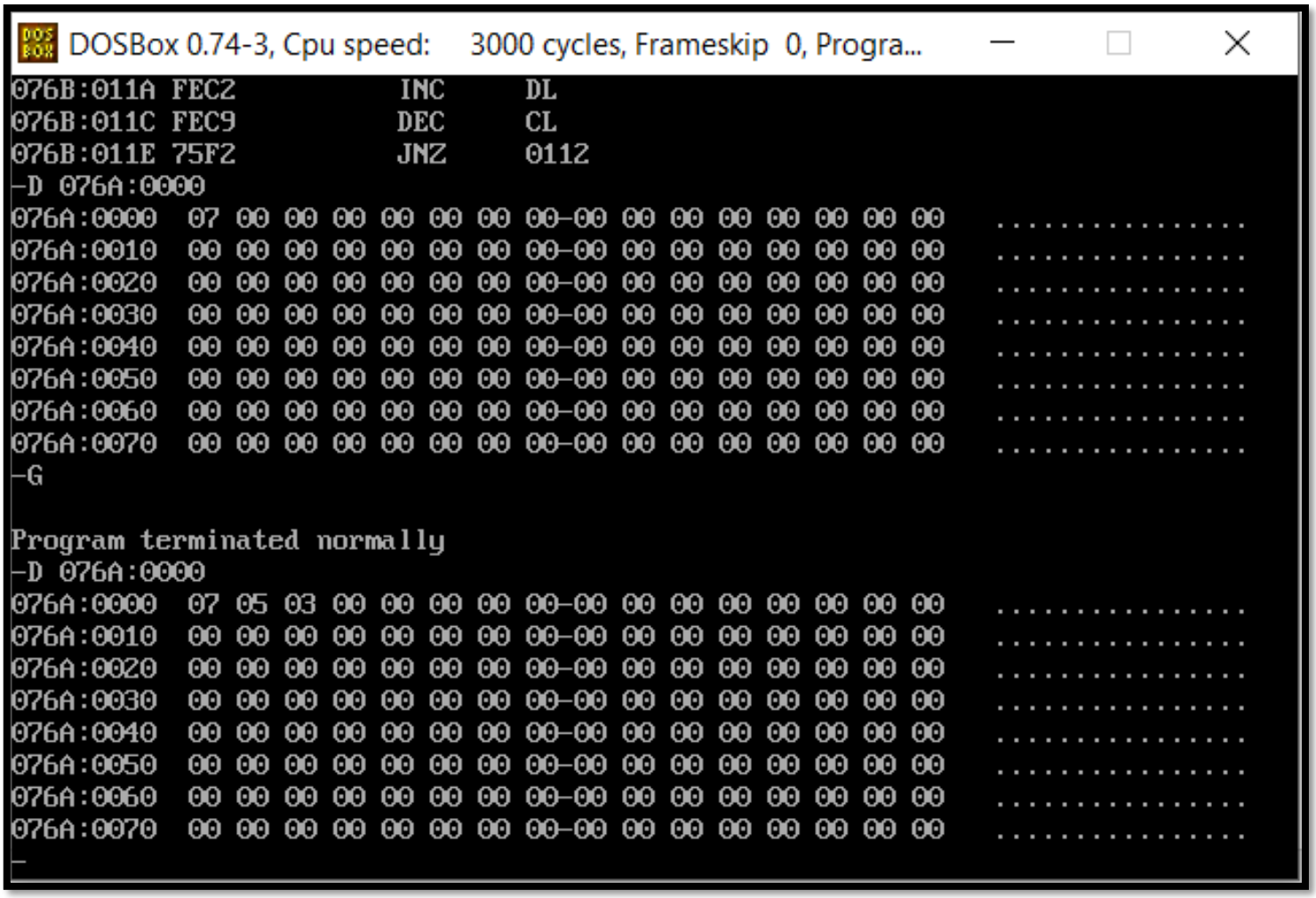
14. End.

PROGRAM	COMMENTS
ASSUME CS: CODE, DS: DATA	
DATA SEGMENT	INITIALIZE DATA SEGMENT.
NUM DB 07H	*NUM* = 07 (8-BIT NUMBER)
ZEROES DB ?	VARIABLE TO STORE NUMBER OF ZEROES.
ONES DB ?	VARIABLE TO STORE NUMBER OF ONES.
DATA ENDS	
CODE SEGMENT	
ORG 0100H	
START:	
MOV AX, DATA	
MOV DS, AX	DS POINTS TO BASE ADDRESS OF DATA SEGMENT.
MOV AH, 00H	CLEAR AH.
MOV CH, 00H	CLEAR CH.
MOV AL, NUM	AL ← *NUM.*
MOV BL, 00H	TO COUNT THE NUMBER OF ZEROES.
MOV CL, 08H	COUNT OF NUMBER OF DIGITS.
MOV DL, 00H	TO COUNT THE NUMBER OF ONES.
LOOPER:	
SHL AL, 1	SHIFT LEFT BY 1, IF CARRY = 1, THEN THE LSB DIGIT WAS 1.
JC ONE	GO TO *ONE.*
INC BL	ELSE, INCREMENT ZEROES COUNT, I.E BL.
JMP SKIP	GO TO *SKIP.*
ONE:	
INC DL	DL = DL + 1.
SKIP:	
DEC CL	CL = CL + 1.
JNZ LOOPER	IF CL ≠ 0, GO BACK TO *LOOPER.*
MOV ZEROES, BL	*ZEROES* ← BL.
MOV ONES, DL	*ONES* ← DL.
MOV AH, 4CH	TERMINATE THE PROGRAM WITH DOS INTERRUPT.
INT 21H	
CODE ENDS	
END START	

UNASSEMBLED CODE:



SAMPLE I/O SNAPSHOT:



PROGRAM – 2: 8051 ALP TO FIND THE LARGEST NUMBER IN A GIVEN LIST:

ALGORITHM:

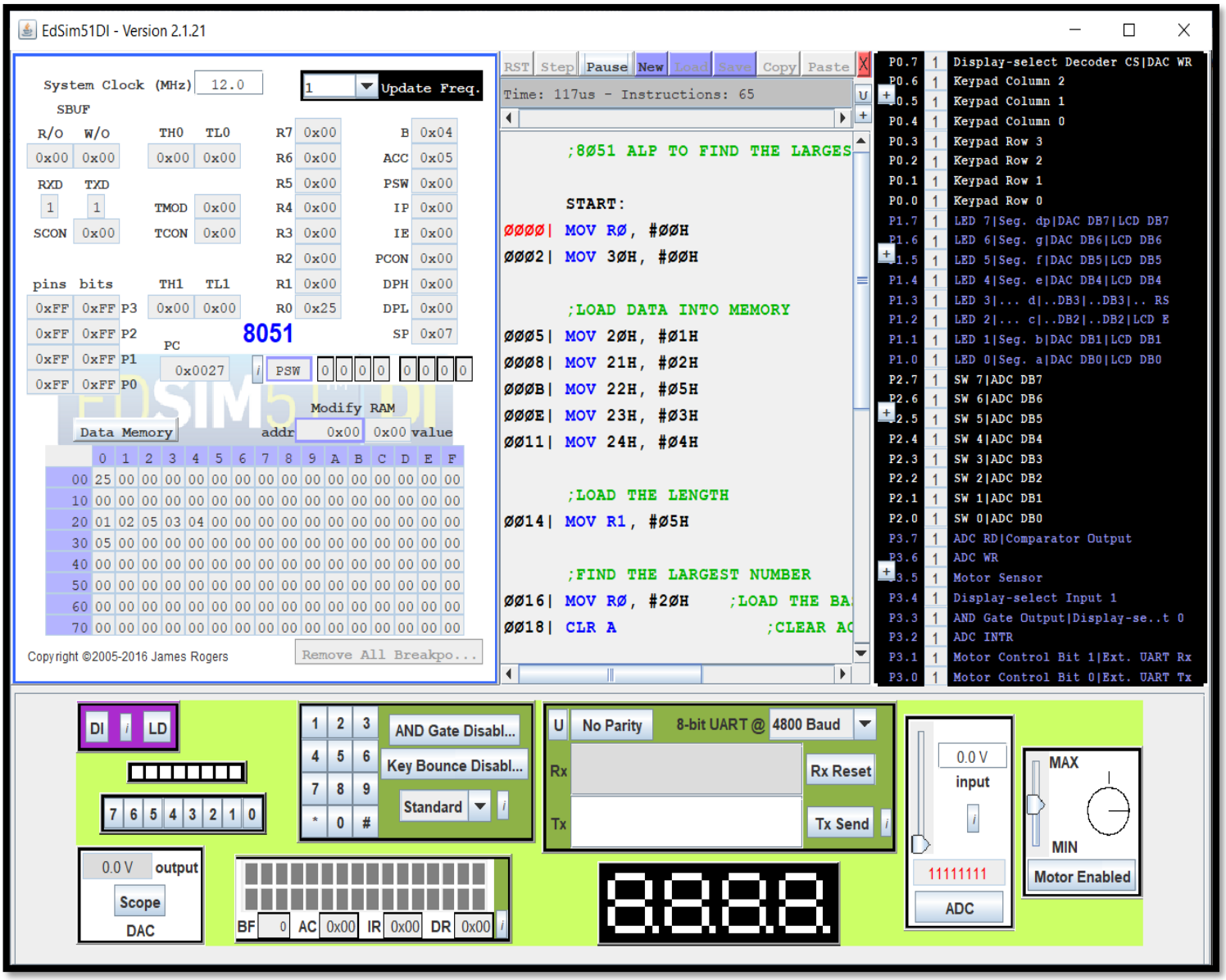
1. Begin.

2. Initialize the list in the internal memory with some values starting from a base address in the internal RAM, say 20H.
3. Store the number of elements in a register, say R1.
4. Store the base address of the list in a register, say R0.
5. Clear the accumulator register.
6. While R1 ≠ 0:
    a. Transfer to B the value pointed by the address stored at R0.
    b. Compare the values of A and B.
    c. If A < B:
        i. A ← B.
    d. Else:
        i. R0 ← R0 + 1.
    e. R1 ← R1 – 1.
7. Transfer the value stored in register A to a location in the internal RAM, say 30H.

8. End.

PROGRAM	COMMENTS
START:	
MOV R0, #00H	CLEAR THE VALUE OF REGISTER R0.
MOV 30H, #00H	CLEAR THE VALUE AT ADDRESS 30H.
MOV 20H, #01H	LOAD THE LIST DATA INTO MEMORY.
MOV 21H, #02H	
MOV 22H, #05H	
MOV 23H, #04H	
MOV 24H, #03H	
MOV R1, #05H	LOAD THE LENGTH OF THE LIST INTO R1.
MOV R0, #20H	LOAD THE BASE ADDRESS INTO R0.
CLR A	CLEAR ACCUMULATOR REGISTER.
BACK:	
MOV B, @R0	MOVE THE VALUE POINTED BY THE ADDRESS AT R0 TO B.
CJNE A, B, NEXT	IF A ≠ B, JUMP TO NEXT.
NEXT:	
JNC SKIP	IF A < B, THEN CARRY FLAG = 1. ELSE CARRY FLAG = 0.
MOV A, B	A ← B. A IS THE CURRENT LARGEST VALUE.
SKIP:	
INC R0	GOTO NEXT ELEMENT BY INCREMENTING R0 BY 1.
DJNZ R1, BACK	IF R1 ≠ 0, GO TO *"BACK".*
MOV 30H, A	MOVE LARGEST ELEMENT, I.E VALUE IN A, TO 30H.
HALT:	
SJMP HALT	HALT THE PROGRAM WITH AN INFINITE LOOP.

SAMPLE I/O SNAPSHOT:



RESULT:

The assembly level programs were written to perform the above specified tasks (counting the number of 0s and 1s in an 8-bit number and finding the largest number in a list using 8086 and 8051 respectively) and their outputs were verified.