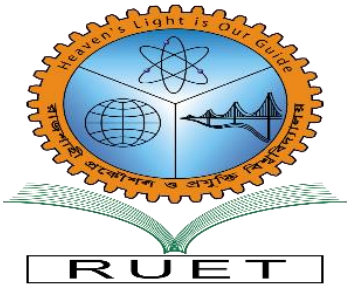


Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 01

Problem Name: Write an assembly code that calculate sum=A+B-C

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-1

Problem Description:

Write an assembly code that calculate sum=A+B-C

Theory:

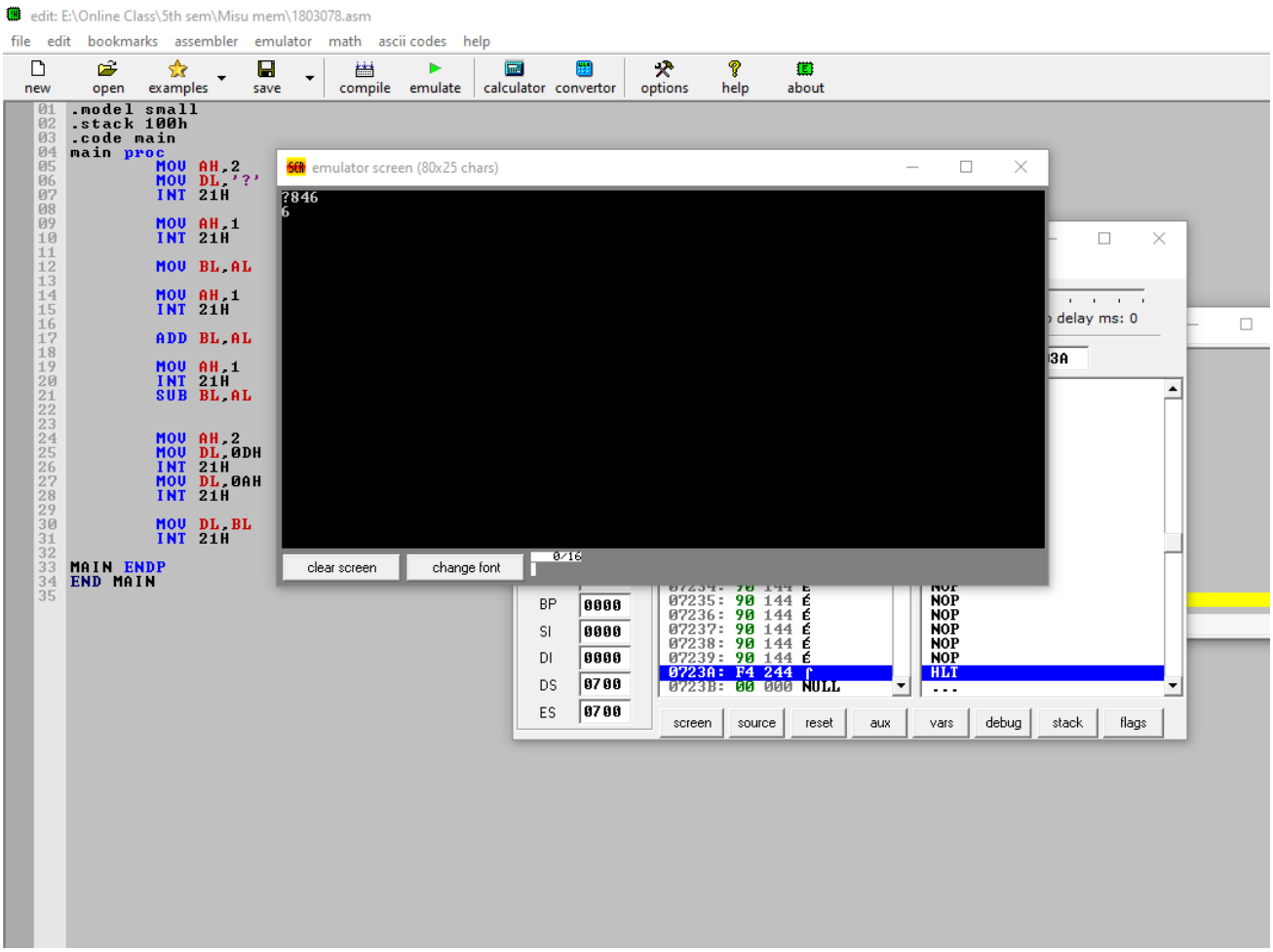
Assembly programming 8086 is hardware oriented programming language which provides architecture and registers functionality for 8086 processors.

For storing value in the predeclared variable in data segment we use Three character using MOV AH,1 function. For print the stored values using MOV AH,2 function. Mov operation is applicable between memory location and register but not both memory location. MOV,SUB,ADD,JMP etc operations are used to execute instruction .

Source code:

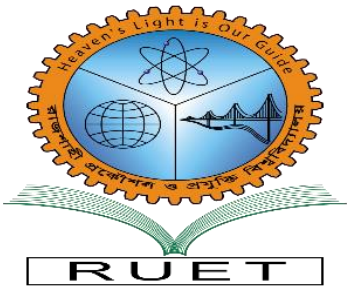
```
.model small
.stack 100h
.code main
main proc
        MOV AH,2
        MOV DL,'?'
        INT 21H

        MOV AH,1
        INT 21H

        MOV BL,AL

        MOV AH,1
        INT 21H

        ADD BL,AL

        MOV AH,1
        INT 21H
        SUB BL,AL


        MOV AH,2
        MOV DL,0DH
        INT 21H
        MOV DL,0AH
        INT 21H

        MOV DL,BL
        INT 21H

MAIN ENDP
END MAIN
```

Output:



Conclusion:

In this program when we input any value for A,B,C 8086-microprocessor use the ASCII value and calculated result.



Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 02

Problem Name: Write a program to display a "?", read two capital letters and display them on the next line in alphabetical order.

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-2

Problem Description:

Write a program to display a “?”, read two capital letters and display them on the next line in alphabetical order.

Theory:

In assembly language, data are stored in register and use the data to solve arithmetic and logical problem. Memory-Memory, Memory-Variable, Variable-Memory data transfer are allowed. But, Variable-Variable data transfer is not allowed in assembly language. ADD, MOV, CMP, SUB, MUL, DIV these keywords are used for different purposes.

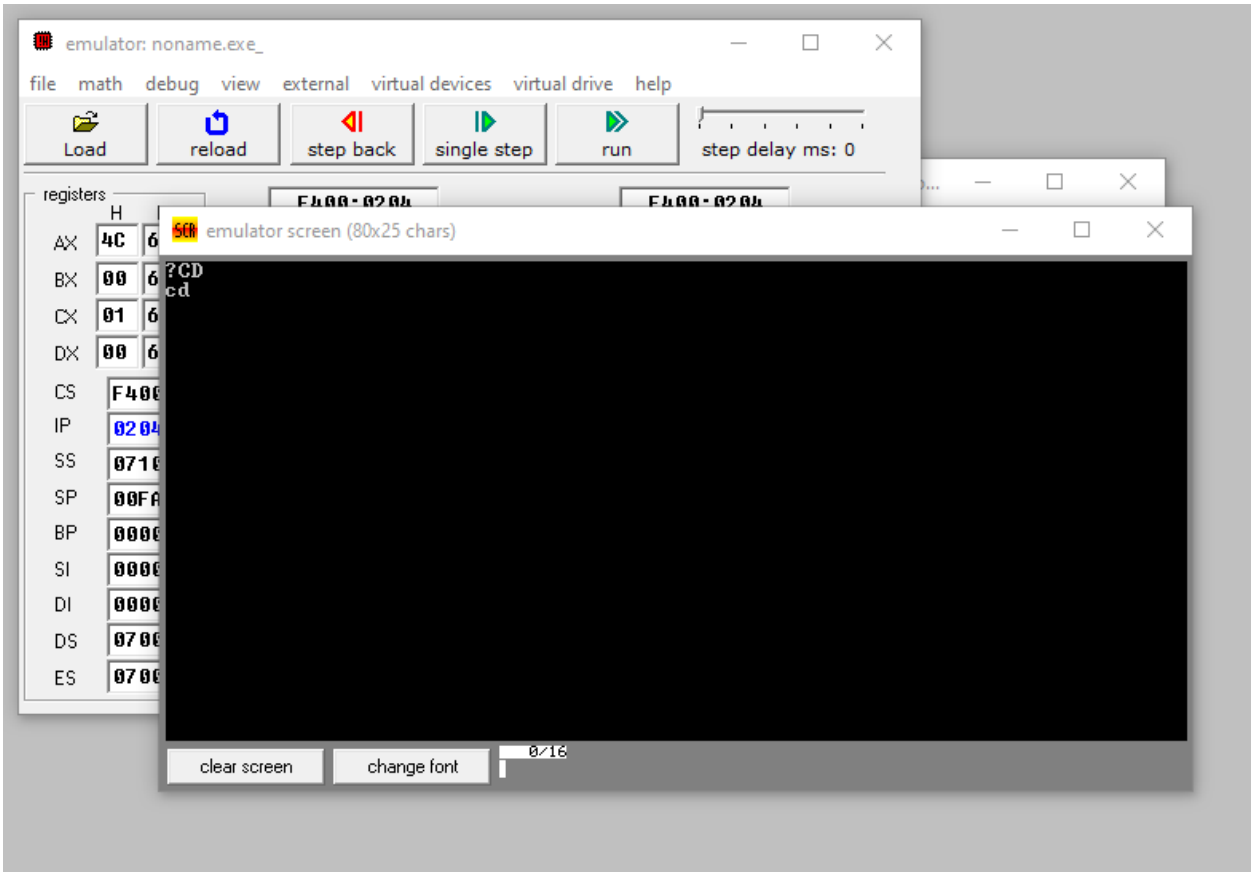
The CMP instruction compares two operands. It is generally used in conditional execution. This instruction basically subtracts one operand from the other for comparing whether the operands are equal or not. It does not disturb the destination or source operands.

Source code:

```
.MODEL SMALL
.STACK 100H
.DATA


.CODE
MAIN PROC

    MOV AH,2
    MOV DL, '?'
    INT 21H
```

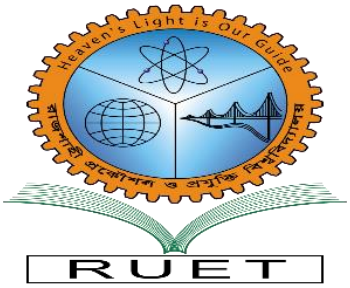
```
    MOV AH, 1
    INT 21H
    MOV BL, AL
    ADD BL, 32

    MOV AH,1
    INT 21H
    MOV CL, AL
    ADD CL, 32

    MOV AH, 2
    MOV DL, 0AH
    INT 21H
    MOV DL, 0DH
    INT 21H


    CMP CL, BL
    JG NEXT

    MOV AH, 2
    MOV DL, CL
    INT 21H
    MOV DL, BL
    INT 21H
    MOV AH, 4CH
    INT 21H

    NEXT:
    MOV AH, 2
    MOV DL, BL
    INT 21H
    MOV DL, CL
    INT 21H
    MOV AH, 4CH
    INT 21H
    MAIN ENDP
END MAIN
```

Output:



Conclusion :

Here in this program ,using CMP instruction we check and then by adding 32 capital letter is converted small letter.



Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 03

Problem Name: Write a program to count number of 1 bits in a binary number and check the number is odd or even.

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-3

Problem Description:

Write a program to count number of 1 bits in a binary number and check the number is odd or even.

Theory:

For counting number of 1 bits in a binary number Loop through all bits check if a bit is set and if it is, then increment the set bit count.

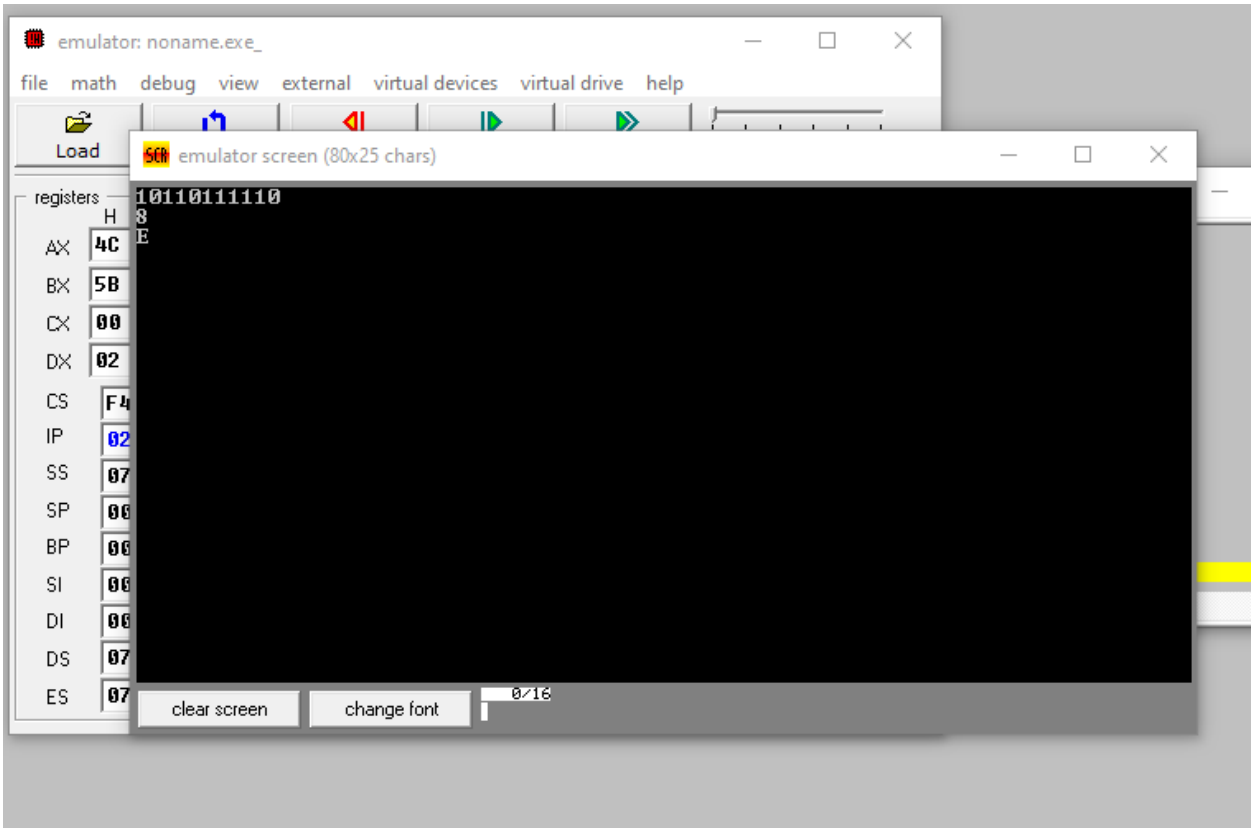
For Odd Even checking ,we can determine one number is odd or even by checking only the LSB. When LSB is 1, the number is odd, otherwise it is even. In this program we are taking a number from memory and then ANDing 01H with it. if the result is nonzero, then the number is odd, otherwise it is even.

Source code:

```
.MODEL SMALL
.STACK 100H
.DATA
.CODE
MAIN PROC

    XOR BX, BX
    MOV CL, 0
    MOV AH, 1
    INT 21H

    WHILE:
        CMP AL, 0DH
        JE END_WHILE
        AND AL, 0FH
        SHL BX, 1
        OR BL, AL
        INT 21H
        JMP WHILE
```

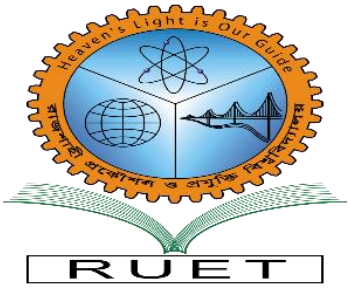
```
    END_WHILE:
    MOV AH, 2
    MOV DL, 0AH
    INT 21H
    MOV DL, 0DH
    INT 21H

    XOR AX, AX
    MOV CX, 16
    TOP:
        ROL BX, 1
        JNC NEXT
        INC AX
    NEXT:
       LOOP TOP
    ADD AX, 48
    MOV AH, 2
    MOV DX, AX
    INT 21H
    MOV AH, 2
    MOV DL, 0AH
    INT 21H
    MOV DL, 0DH
    INT 21H
    AND BL,1
    CMP BL,0
    JE NEXT1
    MOV AH,2
    MOV DL,'O'
    INT 21H
    JMP END
    NEXT1:
    MOV AH, 2
    MOV DL, 'E'
    INT 21H
    END:
    MOV AH, 4CH
    INT 21H
    MAIN ENDP
END MAIN
```

Output:



Conclusion:

Here RCL or RCR instructions are used for counting 1 bits in the number.The right shift shifts the bits to the right and the LSB is shifted into Carry Flag. The left shift shifts the bits to the left and the MSB is shifted into Carry Flag.



Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 04

Problem Name: Write a program to input a string and reverse every word of the string.

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-4

Problem Description:

Write a program to input a string and reverse every word of the string.

Theory:

For this program first of all we need to take a array which can contain duplicate letters and push letter into stack until getting space or carriage return. SI point to the initial address of the array. Then Take CX=0 , to count the number of letter in a word and BX=0 ,to use as a flag. If BX=1 ,then program don't take any input otherwise take input from user. When get space or carriage return then perform pop operation. When get a small vowel then turn it into capital letter using CAPITAL level, otherwise no change.

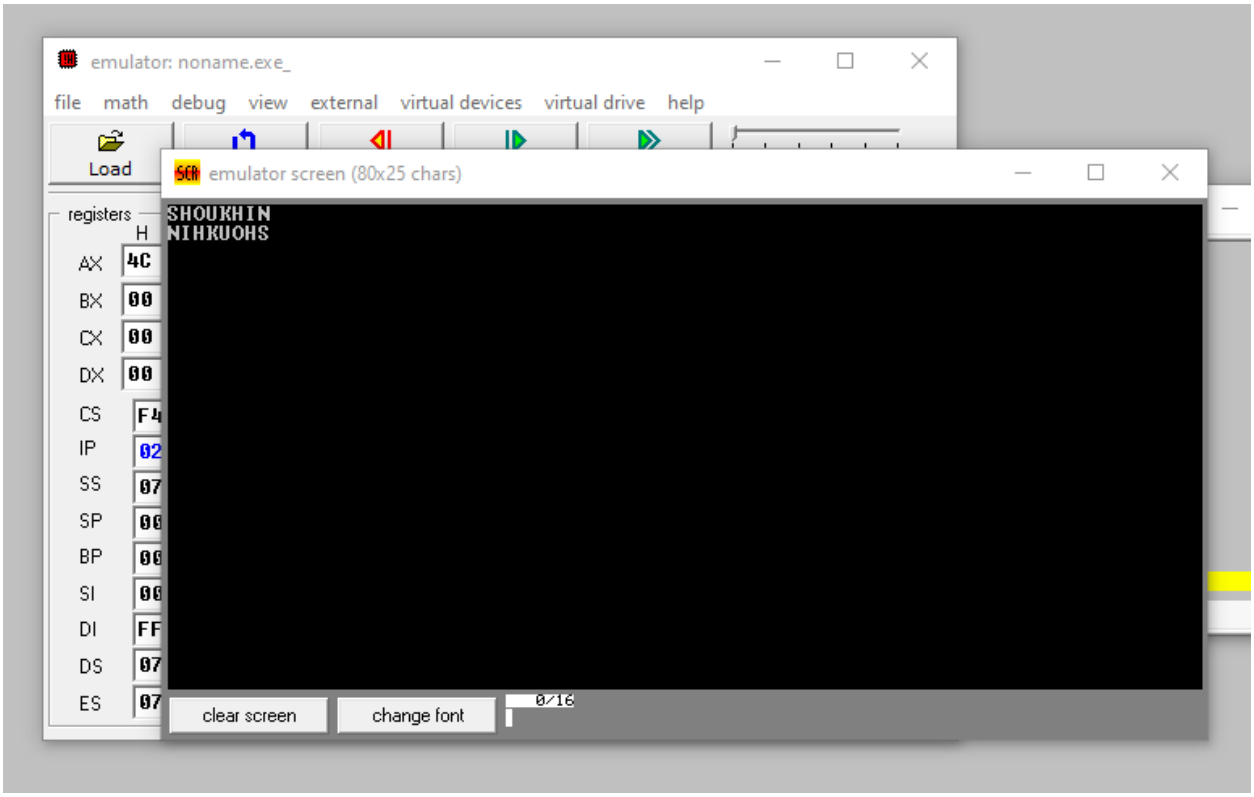
DUP instructions, an array is initialized by a common value.

Source code:

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG DB 50 DUP('?')
.CODE
MAIN PROC
    MOV AX,@DATA
    MOV DS,AX
    MOV BX,0
    LEA SI,MSG
    MOV AH,1
    INT 21H
    INPUT:
    INC BX
    CMP AL,0DH
    JE OUTPUT
    MOV MSG[SI],AL
```

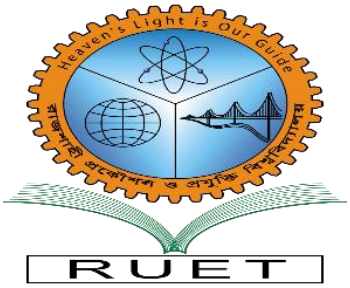
```
    ADD SI,1
    INT 21H
    JMP INPUT
    OUTPUT:
    MOV MSG[SI],'$'
    MOV AH,2
    MOV DL,0AH
    INT 21H
    MOV DL,0DH
    INT 21H
    LEA SI,MSG
    MOV BX,0
    JMP OUTPUT1
        OUTPUT1:
    CMP [SI],20H
    JE PRINT
    CMP [SI],24H
    JE PRINT
    INC BX
    INC SI
    JMP OUTPUT1
    PRINT:
    MOV CX,BX
    LEA DI,SI
    DEC DI
    PRINT1:
    MOV AH,2
    MOV DL,[DI]
    INT 21H
    DEC DI
    LOOP PRINT1
    CMP [SI],24H
    JE EXIT
    MOV BX,0
    INC SI
    MOV AH,2
    MOV DL,20H
    INT 21H
    JMP OUTPUT1
    EXIT:
    MOV AH,4CH
    INT 21H
    MAIN ENDP
END MAIN
```

Output:



Discussion :

This program gives write output according to the given input. Knowledge of Loop,jmp and stack is needed to solve this problem. Without using $ sign, the program will display a wrong answer.Here (SI) is used to address the array source index.



Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 05

Problem Name: Write a program that lets the user enter time in seconds, up to 65535 and outputs the time as hours, minutes and seconds

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-5

Problem Description:

Write a program that lets the user enter time in seconds, up to 65535 and outputs the time as hours, minutes and seconds

Theory:

For unsigned division, DIV instruction is used. IDIV is used for signed division.

Unsigned divide AX by divisor BL with result stored in AL = Quotient, AH = Remainder.Unsigned divide DX:AX by divisor BX, with result stored in AX = Quotient, DX = Remainder.

If the divisor is much smaller than the dividend, the divide overflow will occur.

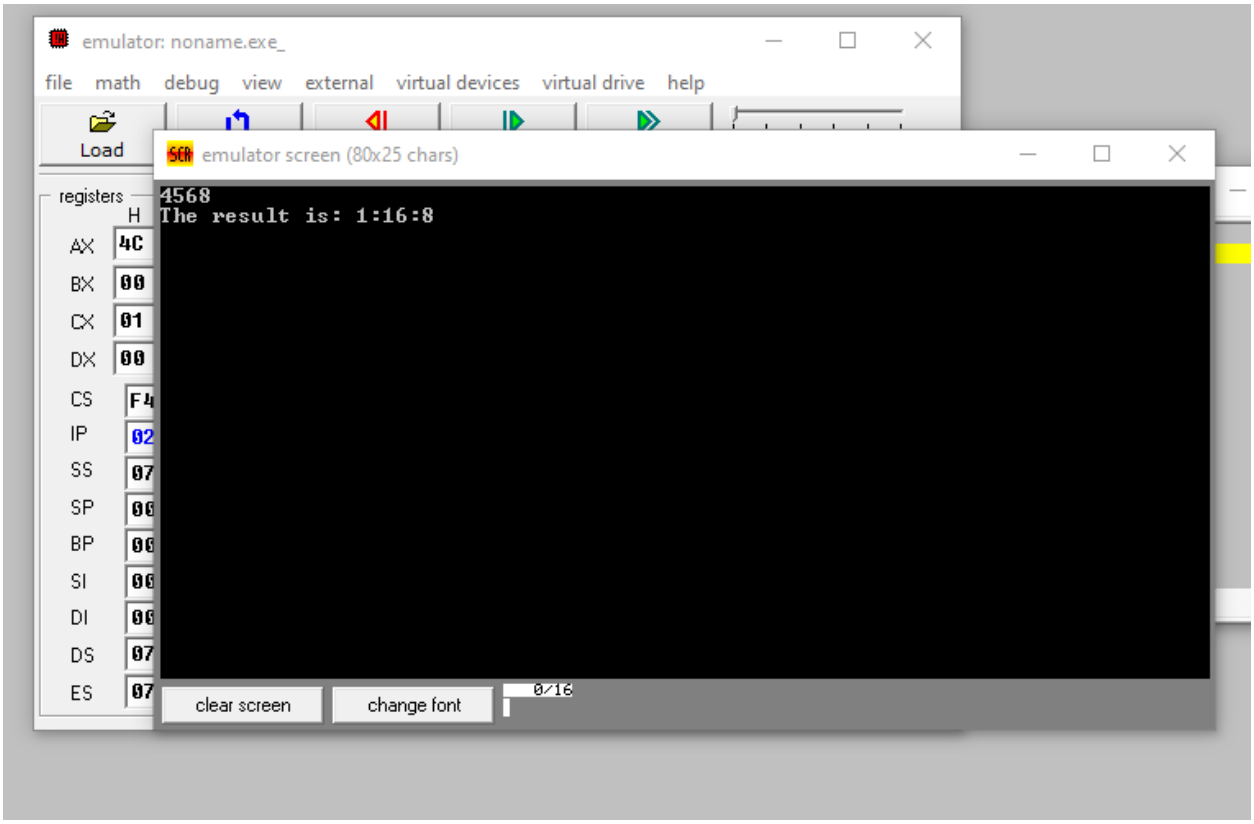
Source code:

```
.MODEL SMALL
.STACK 100H
.DATA
   MSG DB 0AH,0DH,'The result is : $'
.CODE
MAIN PROC
    MOV AX,@DATA
    MOV DS,AX
    CALL INDEC
    MOV DX,0
    MOV BX,3600
    DIV BX
    PUSH AX
    PUSH DX
    MOV AH,9
    LEA DX,MSG
    INT 21H
```

```
    POP DX
    POP AX
    CALL OUTDEC
    PUSH DX
    MOV AH,2
    MOV DL,':'
    INT 21H
    POP AX
    MOV BX,60
    MOV DX,0
    DIV BX
    CALL OUTDEC
    PUSH DX
    MOV AH,2
    MOV DL,':'
    INT 21H
    POP AX
    CALL OUTDEC
    MOV AH,4CH
    INT 21H
    MAIN ENDP
INDEC PROC
    PUSH BX
    PUSH CX
    PUSH DX
    BEGIN:
    XOR BX,BX
    XOR CX,CX
    MOV AH,1
    INT 21H
    CMP AL,'-'
    JE MINUS
    CMP AL,'+'
    JE PLUS
    JMP REPEAT2
    MINUS:
    MOV CX,1
    PLUS:
    INT 21H
    REPEAT2:
    CMP AL,'0'
    JNGE NOT_DIGIT

        CMP AL,'9'
    JNLE NOT_DIGIT
    AND AX,000FH
    PUSH AX
    MOV AX,10
    MUL BX
    POP BX
    ADD BX,AX
    MOV AH,1
    INT 21H
    CMP AL,0DH
    JNE REPEAT2
    MOV AX,BX
    OR CX,CX
```

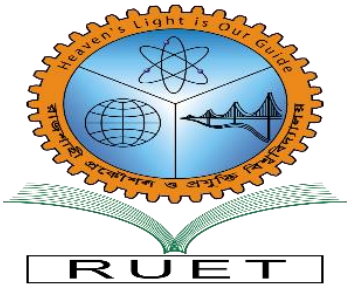
```
    JE EXIT
    NEG AX
    EXIT:
    POP DX
    POP CX
    POP BX
    RET
    NOT_DIGIT:
    MOV AH,2
    MOV DL,0DH
    INT 21H
    MOV DL,0AH
    INT 21H
    JMP BEGIN
INDEC ENDP
OUTDEC PROC
    PUSH AX
    PUSH BX
    PUSH CX
    PUSH DX
    OR AX,AX
    JGE END_IF1
    PUSH AX
    MOV DL,'-'
    MOV AH,2
    INT 21H
    POP AX
    NEG AX
    END_IF1:
    XOR CX,CX
    MOV BX,10D
    REPEAT1:
    XOR DX,DX
    DIV BX
    PUSH DX
    INC CX
    OR AX,AX
    JNE REPEAT1
    MOV AH,2
    PRINT:
    POP DX
    OR DL,30H
    INT 21H
    LOOP PRINT
    POP DX
    POP CX
    POP BX
    POP AX
    RET
OUTDEC ENDP
END MAIN
```

Output:



Conclusion:

In this program, if the input is a non-digit, the program will skip the line and take a new input. But for a negative number, it will display a wrong answer. We can solve this problem just like non-digit input. INDEC and OUTDEC procedure is used for input and output.



Rajshahi Univarsity of Engineering and Technology

Course No: CSE-3110
Course Title: Sessional Based on CSE-3109

Lab No: 06

Problem Name: Write a program to sort an array in descending order and display numbers, capital letters, small letters in descending order on different line.

Submitted To:
Name: Sadia Zaman Mishu
Designation: Assistant Professor
Department: CSE, RUET

Submitted By:
Name: Md Al Amin Tokder
Roll: 1803078
Section: B
Department: CSE, RUET

Lab-6

Problem Description:

Write a program to sort an array in descending order and display numbers, capital letters, small letters in descending order on different line.

Theory:

An array is implemented at the assembly language level by a block of memory in which the variables of the array are stored, contiguously, one right after the other. When the length value stored as well, it's generally stored just before the beginning of the block, so that it can be easily found. SI register is used for addressing.

Here selection sort is used for sorting the array. Select procedure is created for selection sort. Besides, to display the result, output procedure is used.

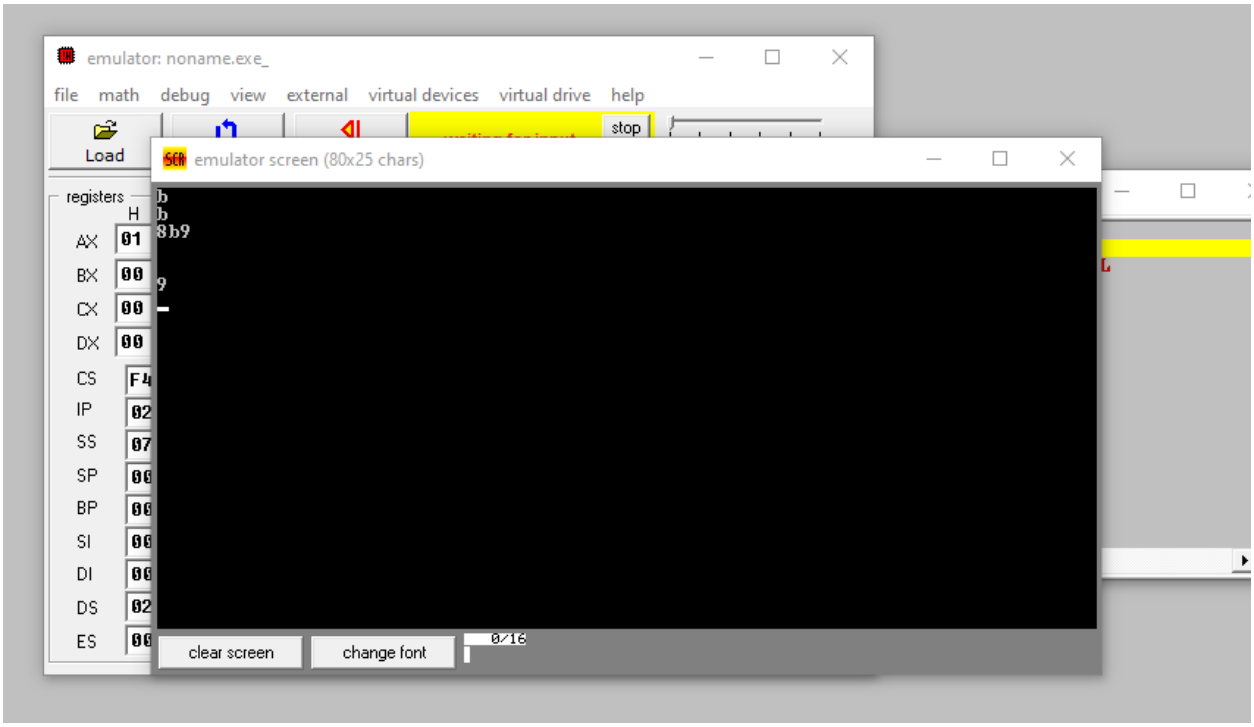
Source code:

```
.MODEL SMALL
.STACK 100H
.DATA
    A DB 50 DUP('?')
.CODE
MAIN PROC
    MOV AX, @DATA
    MOV DS,AX
    LEA SI,A
    MOV BX,0
    INPUT:
    MOV AH,1
    INT 21H
    MOV A[SI],AL
```

```
    INC SI
    INC BX
    CALL SELECT
    MOV AH,2
    MOV DL,0AH
    INT 21H
    MOV DL,0DH
    INT 21H
    CALL OUTPUT
    MOV AH,2
    MOV DL,0AH
    INT 21H
    MOV DL,0DH
    INT 21H
    JMP INPUT
    MOV AH,4CH
    INT 21H
    MAIN ENDP
SELECT PROC
    PUSH BX
    PUSH CX
    PUSH DX
    PUSH SI
    DEC BX
    JE END_SORT
    LEA SI,A
    JNL NEXT
    MOV DI,SI
    MOV AL,[DI]
    NEXT:
    LOOP FIND_BIG
    CALL SWAP
    DEC BX
    JNE SORT_LOOP
    END_SORT:
    POP SI
    POP DX
    POP CX
    POP BX
    RET
    SELECT ENDP
SWAP PROC
    PUSH AX
    MOV AL,[SI]
    XCHG AL,[DI]
    MOV [SI],AL
    POP AX
    RET
    SWAP ENDP
            MOV DX,SI
    SORT_LOOP:
    MOV SI,DX
    MOV CX,BX
    MOV DI,SI
    MOV AL,[DI]
    FIND_BIG:
    INC SI
```

```
    CMP [SI],AL
OUTPUT PROC
    LEA SI,A
    MOV CX,BX
    PRINT:
    MOV AH,2
    MOV DL,[SI]
    CMP DL,5BH
    JL PRI
    INT 21H
    ADD SI,1
    DEC CX
    CMP CX,0
    JE EXIT
    CMP CX,0
    JG PRINT
    PRI:
    MOV AH,2
    MOV DL,0AH
    INT 21H
    MOV DL,0DH
    INT 21H
    PRINT1:
    MOV AH,2
    MOV DL,[SI]
    CMP DL,3AH
    JL PRI1
    INT 21H
    ADD SI,1
    DEC CX
    CMP CX,0
    JE EXIT
    CMP CX,0
    JG PRINT1
    PRI1:
    MOV AH,2
    MOV DL,0AH
    INT 21H
    MOV DL,0DH
    INT 21H
    PRINT2:
    MOV AH,2
    MOV DL,[SI]
    INT 21H
    ADD SI,1
    DEC CX
    CMP CX,0
    JE EXIT
    CMP CX,0
    JG PRINT2
    EXIT:
    RET
    OUTPUT ENDP
END MAIN
```

Output:



Discussion :

The array is sorted on the base of ascii codes. In this program, selection sort is used for sorting the array in descending order. The array contains small letter, capital letter and digit .We can use another sorting technique for better performance .