COAL Lab Report – Abdul Hannan Khan

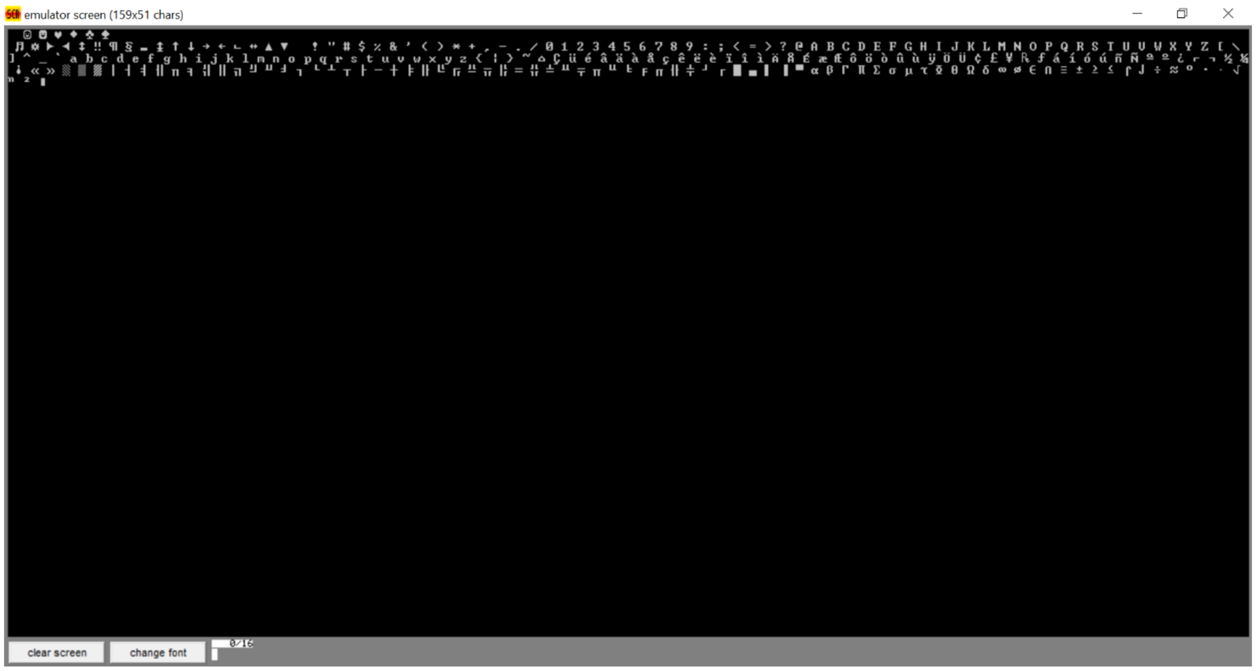
Lab 2:

Task 1: ascii_characters

Code:

```
.model small
.stack 100h
.data
.code

main proc
    mov ah, 2
    mov cx, 256
    mov dl, 0

print:
    int 21h

    mov bl, dl
    mov dl, 32
    int 21h
    mov dl, bl

    inc dl
    dec cx
    jnz print

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
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 ♫ ☼ ► ◄ ↕ ‼ ¶ § ▬ ↨ ↑ ↓ → ← ∟ ↔ ▲ ▼   ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \
] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~ ⌂ Ç ü é â ä à å ç ê ë è ï î ì Ä Å É æ Æ ô ö ò û ù ÿ Ö Ü ¢ £ ¥ ₧ ƒ á í ó ú ñ Ñ ª º ¿ ⌐ ¬ ½ ¼
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ⁿ ² ■
```
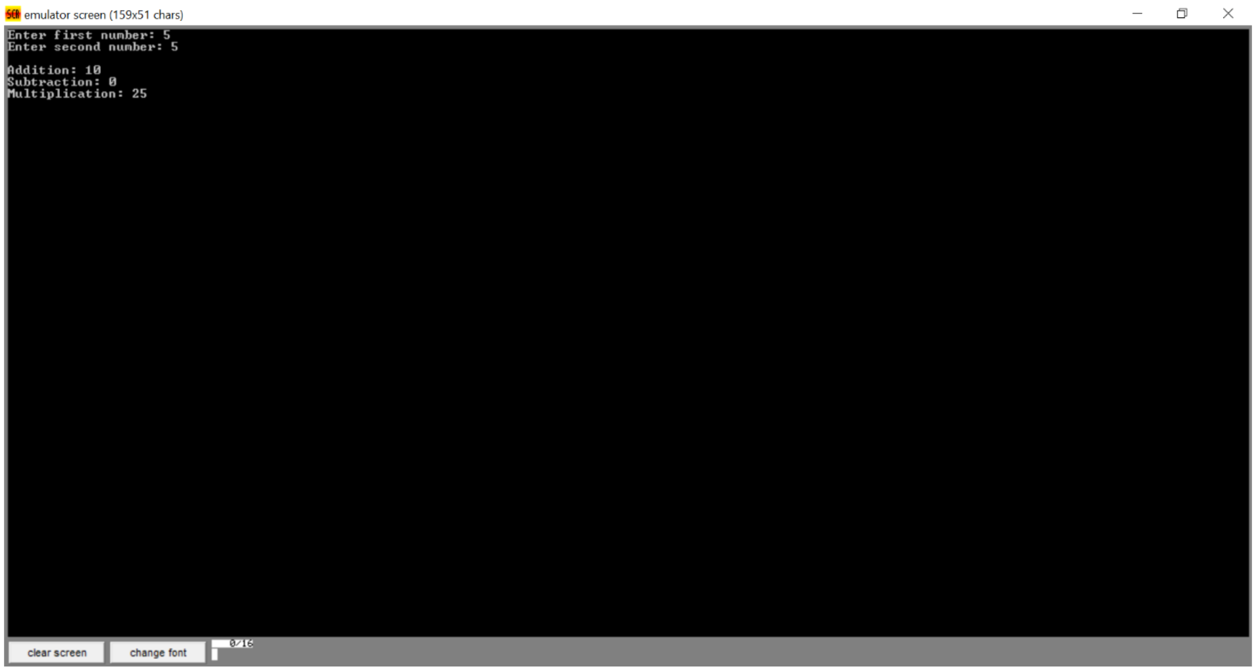

Task 2: arithmetic_operations

Code:

```
.model small
.stack 100h
.data
    msg1 db 'Enter first number: $'
    msg2 db 13, 10, 'Enter second number: $'
    addMsg db 13, 10, 'Addition: $'
    subMsg db 13, 10, 'Subtraction: $'
    mulMsg db 13, 10, 'Multiplication: $'
    newline db 13, 10, '$'
    num1 db ?
    num2 db ?
    result db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg1
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num1, al

    mov ah, 9
    lea dx, msg2
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num2, al

    mov ah, 9
    lea dx, newline
    int 21h

    call Addition
    call Subtraction
    call Multiplication

    mov ah, 4ch
    int 21h
main endp

Addition proc
    mov ah, 9
    lea dx, addMsg
    int 21h

    mov al, num1
    add al, num2
    mov result, al

    call DisplayNumber
    ret
Addition endp

Subtraction proc
    mov ah, 9
    lea dx, subMsg
    int 21h

    mov al, num1
    cmp al, num2
    jl negative_result

    sub al, num2
    mov result, al
    call DisplayNumber
    jmp subtraction_done

negative_result:
    mov dl, '-'
    mov ah, 2
    int 21h

    mov al, num2
    sub al, num1
    mov result, al
    call DisplayNumber
subtraction_done:
    ret
Subtraction endp

Multiplication proc
    mov ah, 9
    lea dx, mulMsg
    int 21h

    mov al, num1
    mul num2
    mov result, al

    call DisplayNumber
    ret
Multiplication endp

DisplayNumber proc
```

```
    mov al, result
    mov ah, 0
    mov bl, 10
    div bl

    mov bh, ah

    cmp al, 0
    je skipFirstDigit
    mov dl, al
    add dl, 30h
    mov ah, 2
    int 21h

skipFirstDigit:
    mov dl, bh
    add dl, 30h
    mov ah, 2
    int 21h
    ret
DisplayNumber endp

end main
```

Output:



```
Enter first number: 5
Enter second number: 5

Addition: 10
Subtraction: 0
Multiplication: 25
```

Task 3: multiplication_table

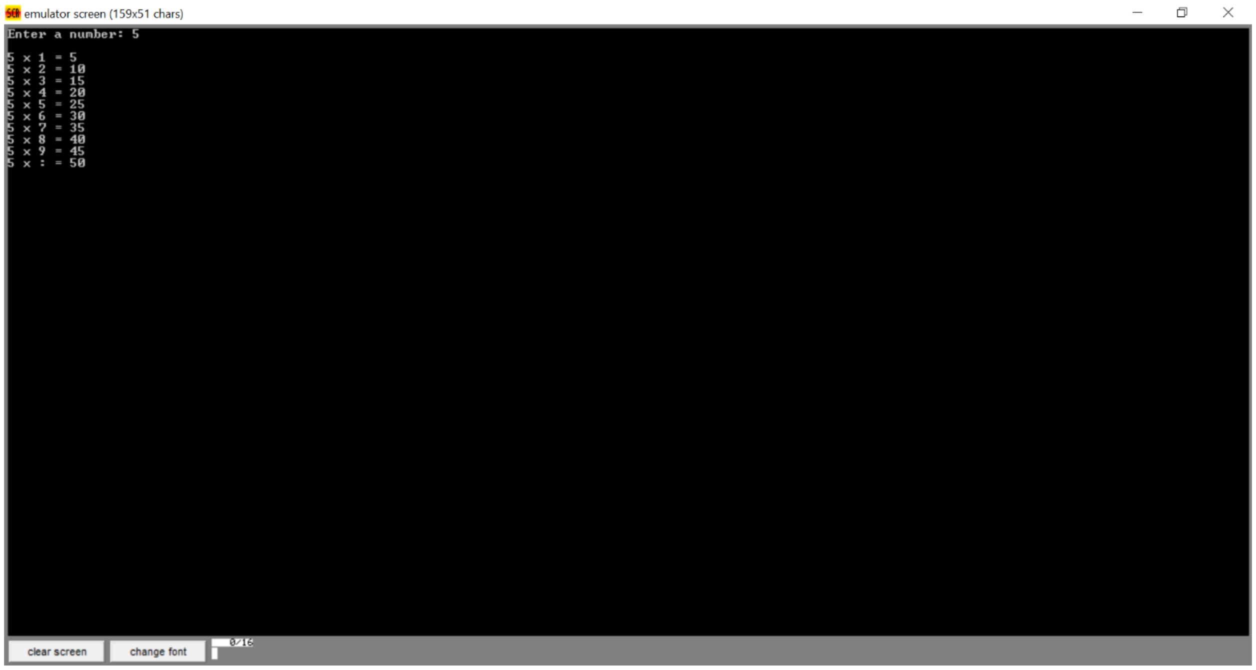
Code:

```
.model small
.stack 100h
.data
    msg db 'Enter a number: $'
    newline db 13, 10, '$'
    num db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num, al

    mov ah, 9
    lea dx, newline
    int 21h

    mov cl, 1

printTable:
    mov ah, 2
    mov dl, 13
    int 21h
    mov dl, 10
```

```
int 21h

mov dl, num
add dl, 30h
int 21h

mov dl, ' '
int 21h
mov dl, 'x'
int 21h
mov dl, ' '
int 21h

mov dl, cl
add dl, 30h
int 21h

mov dl, ' '
int 21h
mov dl, '='
int 21h
mov dl, ' '
int 21h

mov al, num
mov bl, cl
mul bl

mov bl, 10
div bl

mov bh, ah

cmp al, 0
je skip_tens
```

```
    mov dl, al
    add dl, 30h
    mov ah, 2
    int 21h

skip_tens:
    mov dl, bh
    add dl, 30h
    mov ah, 2
    int 21h

    inc cl
    cmp cl, 10
    jbe printTable

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
Enter a number: 5

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
5 x 4 = 20
5 x 5 = 25
5 x 6 = 30
5 x 7 = 35
5 x 8 = 40
5 x 9 = 45
5 x : = 50
```

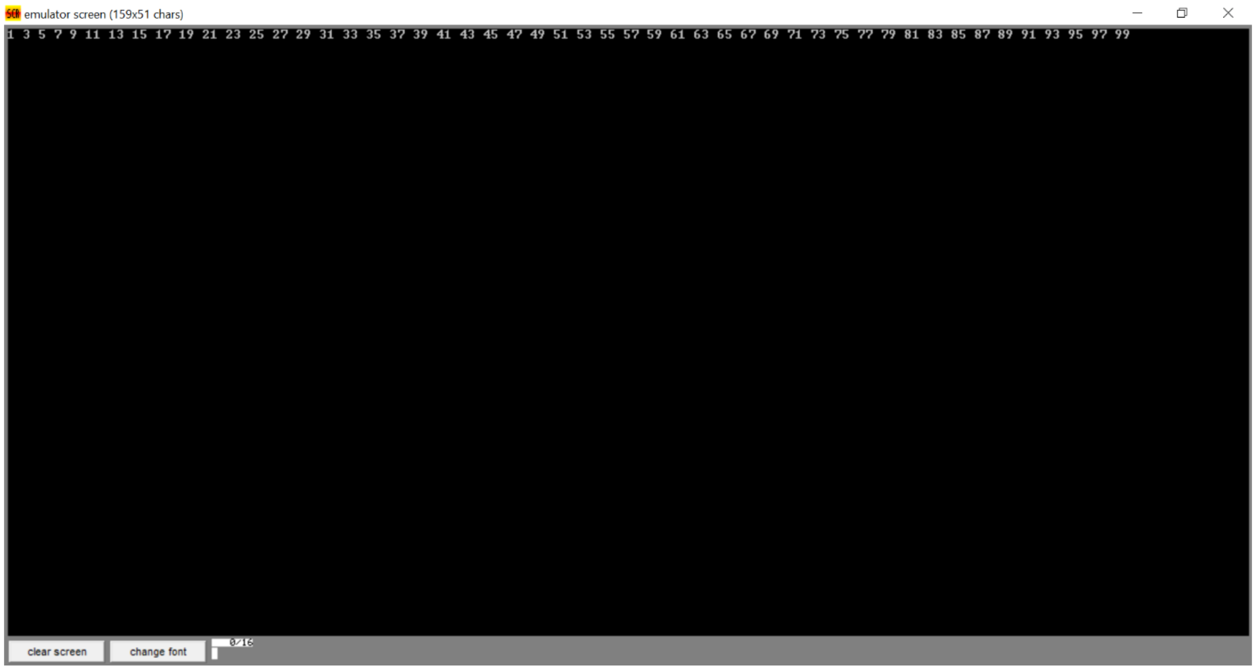
Lab 3:

Task 1: odd_numbers

Code:

```
.model small
.stack 100h
.data
    newline db 13, 10, '$'
.code
main proc
    mov ax, @data
    mov ds, ax

    mov cx, 1

print_odd:
    mov ax, cx
    mov bl, 2
    div bl

    cmp ah, 0
    je skip_print

    mov ax, cx
    mov bl, 10
    div bl

    mov bh, ah

    cmp al, 0
    je print_single
    mov dl, al
    add dl, 30h
    mov ah, 2
    int 21h

print_single:
    mov dl, bh
    add dl, 30h
    mov ah, 2
    int 21h

    mov dl, ' '
    int 21h

skip_print:
    inc cx
    cmp cx, 100
    jle print_odd

    mov ah, 9
    lea dx, newline
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



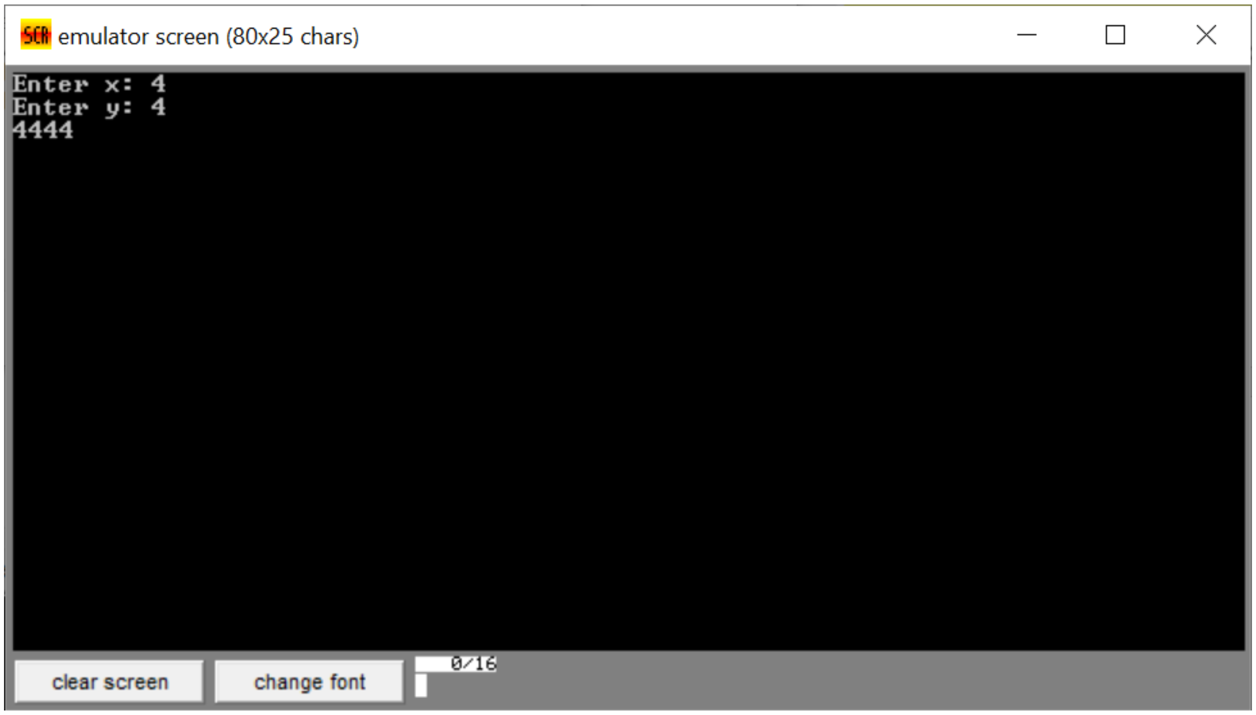
```
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99
```

Task 2: condition_loop

Code:

```
.model small
.stack 100h
.data
    msg1 db 'Enter x: $'
    msg2 db 13, 10, 'Enter y: $'
    newline db 13, 10, '$'
    zero db '0$'
    x db ?
    y db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg1
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov x, al

    mov ah, 9
    lea dx, msg2
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov y, al
    mov ah, 9
    lea dx, newline
    int 21h

    mov al, x
    cmp al, 4
    jg else_part

    mov al, y
    cmp al, 9
    jg else_part

    mov cl, 0

loop_start:
    cmp cl, x
    jge end_loop

    mov dl, x
    add dl, 30h
    mov ah, 2
    int 21h

    inc cl
    jmp loop_start

else_part:
    mov ah, 9
    lea dx, zero
    int 21h

end_loop:
    mov ah, 9
    lea dx, newline
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



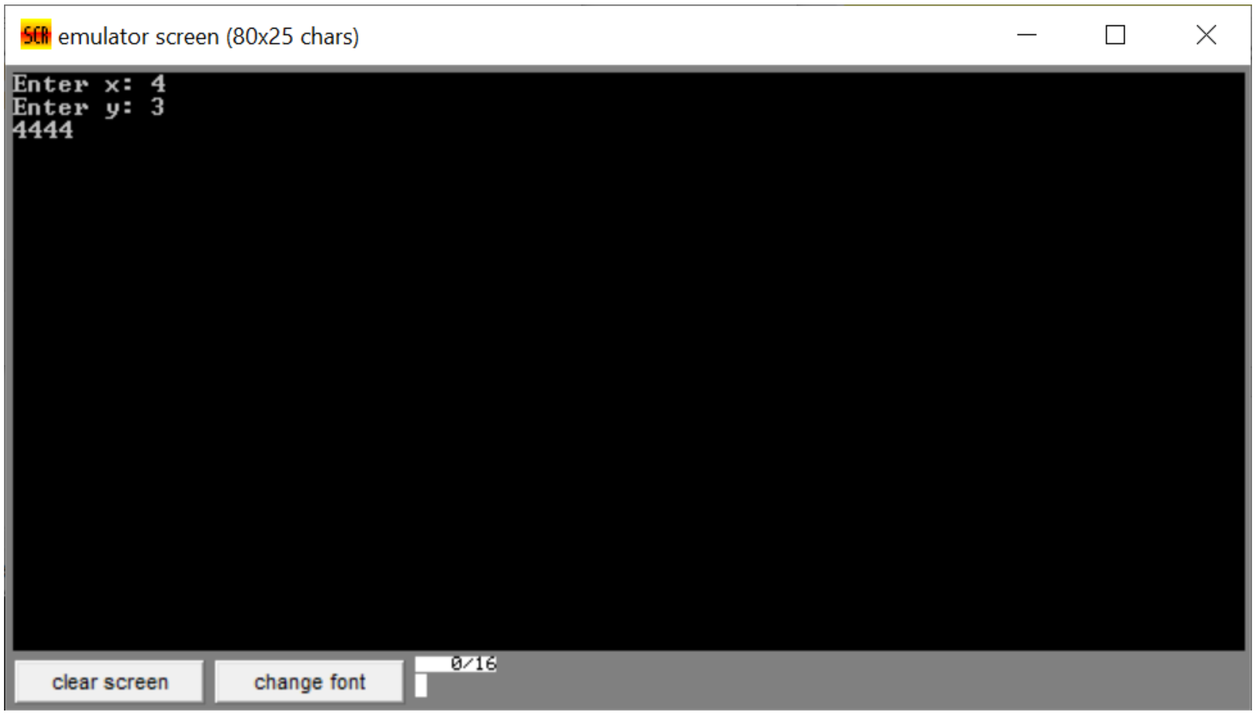
```
Enter x: 4
Enter y: 4
4444
```

Task 3: largest_number

Code:

```
.model small
.stack 100h
.data
    msg1 db 'Enter x: $'
    msg2 db 13, 10, 'Enter y: $'
    newline db 13, 10, '$'
    zero db '0$'
    x db ?
    y db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg1
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov x, al

    mov ah, 9
    lea dx, msg2
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov y, al
    mov ah, 9
    lea dx, newline
    int 21h

    mov al, x
    cmp al, 4
    jg else_part

    mov al, y
    cmp al, 9
    jg else_part

    mov cl, 0

loop_start:
    cmp cl, x
    jge end_loop

    mov dl, x
    add dl, 30h
    mov ah, 2
    int 21h

    inc cl
    jmp loop_start

else_part:
    mov ah, 9
    lea dx, zero
    int 21h

end_loop:
    mov ah, 9
    lea dx, newline
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
Enter x: 4
Enter y: 3
4444
```

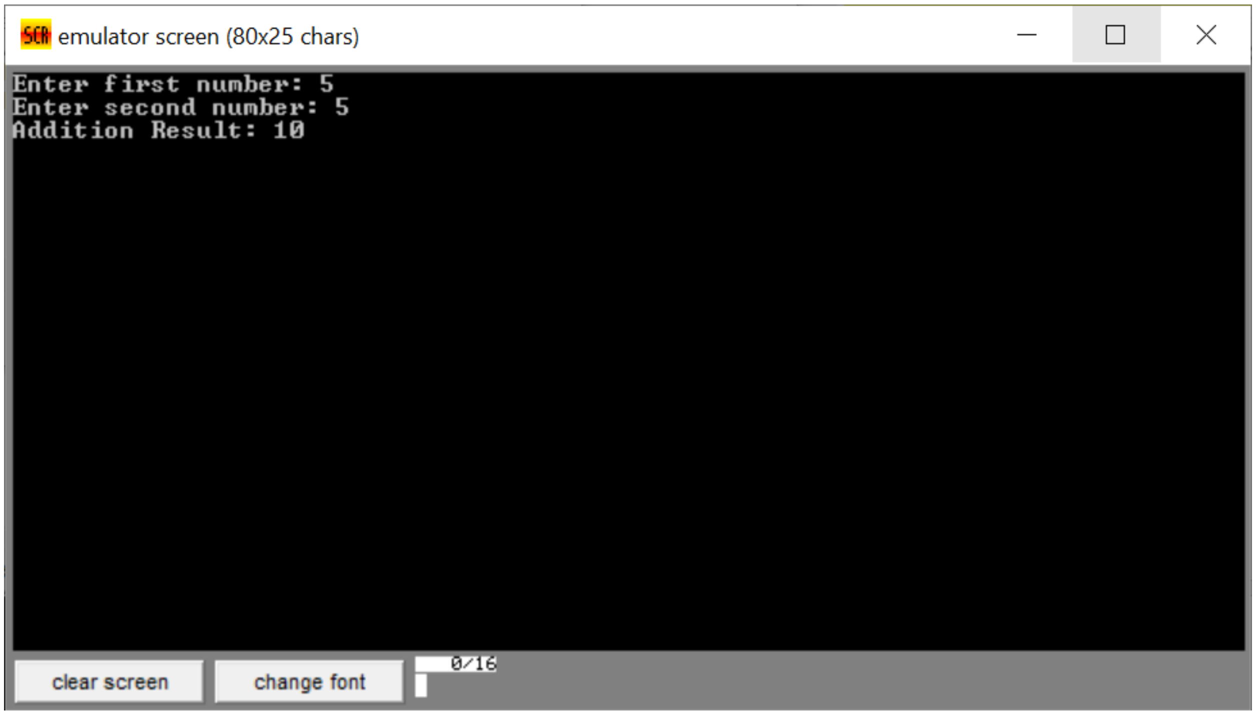
Lab 4:

Task 1: addition

Code:

```
.model small
.stack 100h
.data
    msg1 db 'Enter first number: $'
    msg2 db 13, 10, 'Enter second number: $'
    resultMsg db 13, 10, 'Addition Result: $'
    newline db 13, 10, '$'
    num1 db ?
    num2 db ?
    result db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg1
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num1, al

    mov ah, 9
    lea dx, msg2
    int 21h
    mov ah, 1
    int 21h
    sub al, 30h
    mov num2, al

    mov ah, 9
    lea dx, resultMsg
    int 21h

    mov al, num1
    add al, num2
    mov result, al

    mov al, result
    mov ah, 0
    mov bl, 10
    div bl

    mov bh, ah

    cmp al, 0
    je single_digit

    mov dl, al
    add dl, 30h
    mov ah, 2
    int 21h

single_digit:
    mov dl, bh
    add dl, 30h
    mov ah, 2
    int 21h

    mov ah, 9
    lea dx, newline
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



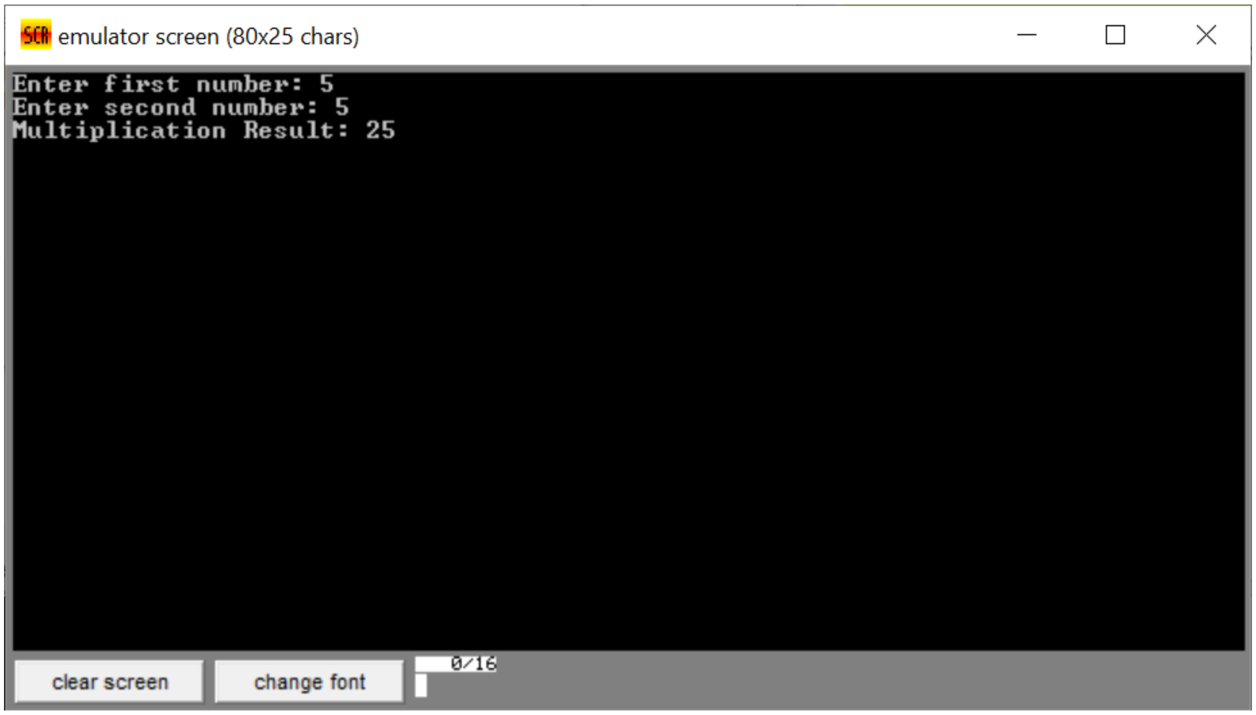
```
Enter first number: 5
Enter second number: 5
Addition Result: 10
```

Task 2: multiplication

Code:

```
.model small
.stack 100h
.data
    msg1 db 'Enter first number: $'
    msg2 db 13, 10, 'Enter second number: $'
    resultMsg db 13, 10, 'Multiplication Result:
$'
    newline db 13, 10, '$'
    num1 db ?
    num2 db ?
    result db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ah, 9
    lea dx, msg1
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num1, al

    mov ah, 9
    lea dx, msg2
    int 21h

    mov ah, 1
    int 21h
    sub al, 30h
    mov num2, al

    mov ah, 9
    lea dx, resultMsg
    int 21h

    mov al, num1
    mul num2
    mov result, al

    mov al, result
    mov ah, 0
    mov bl, 10
    div bl

    mov bh, ah

    cmp al, 0
    je single_digit

    mov dl, al
    add dl, 30h
    mov ah, 2
    int 21h

single_digit:
    mov dl, bh
    add dl, 30h
    mov ah, 2
    int 21h

    mov ah, 9
    lea dx, newline
    int 21h
    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
Enter first number: 5
Enter second number: 5
Multiplication Result: 25
```

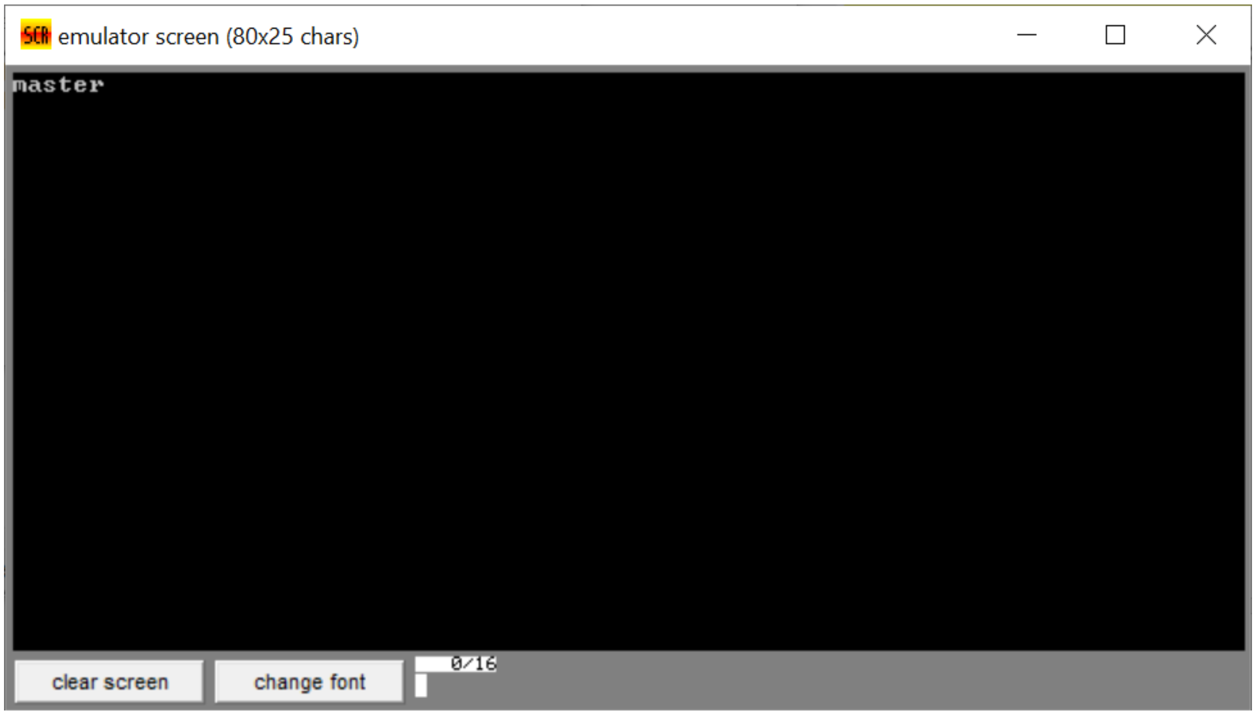
Lab 6:

Task 1: case_converter

Code:

```
.model small
.stack 100h
.data
    msg db 'MASTER$'
.code
main proc
    mov ax, @data
    mov ds, ax
    lea si, msg
    mov cx, 6

label:
    mov al, [si]
    OR al, 00100000b
    mov dl, al
    mov ah, 2
    int 21h
    inc si
    loop label

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
master
```

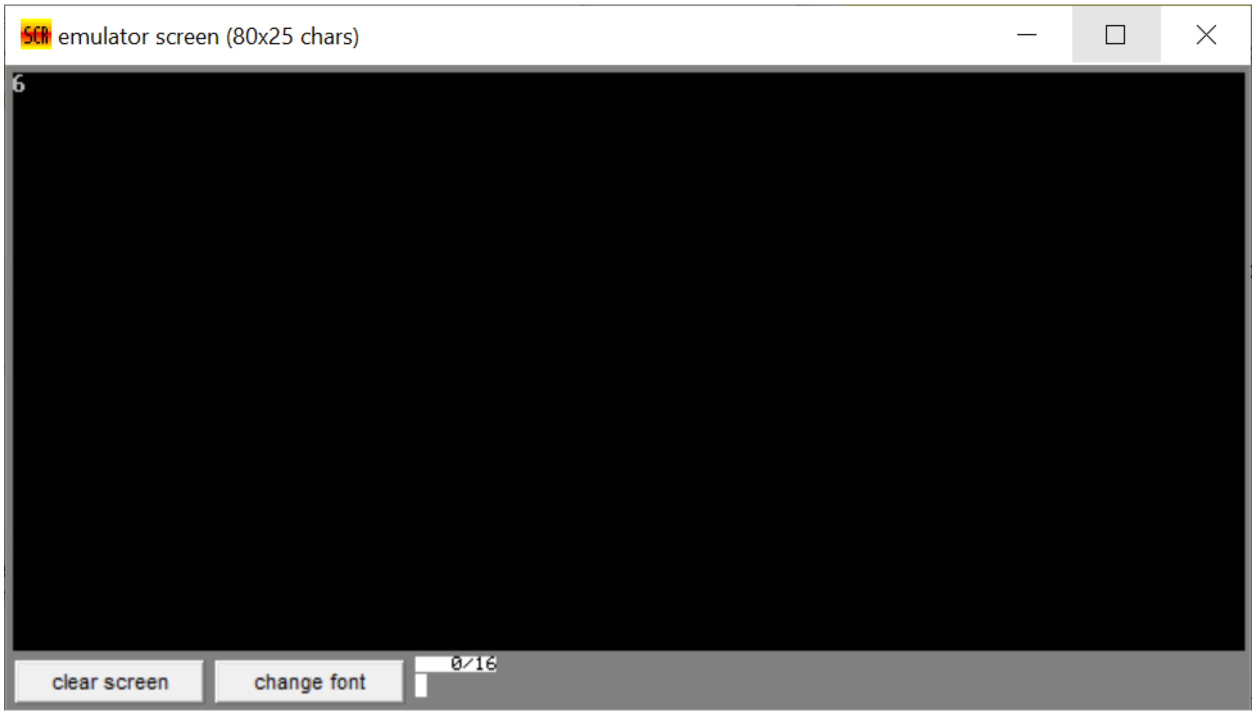
Lab 7:

Task 1: extract_month_bits

Code:

```
.model small
.stack 100h
.data
    month db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov dx, 266Ah
    mov ax, dx
    shr ax, 5
    and al, 00001111b
    mov month, al

    add month, al

    add month, 30h
    mov dl, month
    mov ah, 2
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



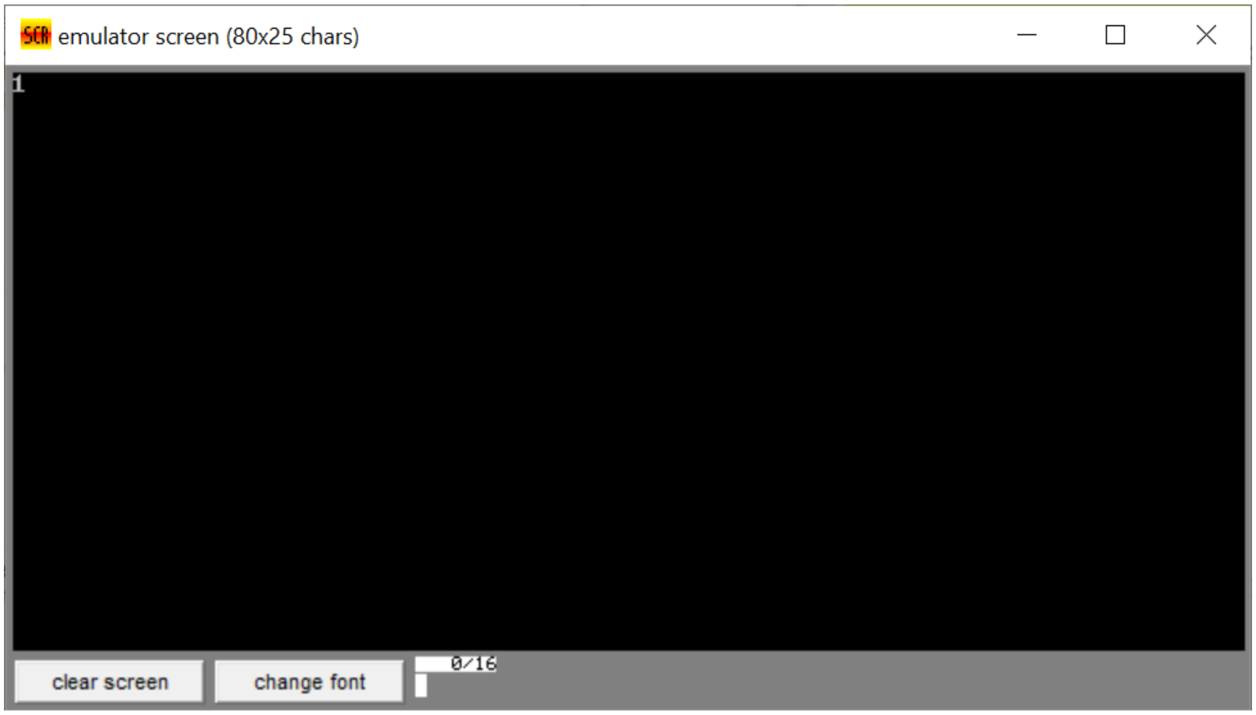
```
6
```

Task 2: month_extracter

Code:

```
.model smapp
.stack 100h
.data
    date dw 2A2Ah
    month db ?
.code
main proc
    mov ax, @data
    mov ds, ax

    mov ax, date
    and ax, 01E0h
    mov cl, 5
    shr ax, cl
    mov month, al

    add month, 30h
    mov dl, month
    mov ah, 2
    int 21h

    mov ah, 4ch
    int 21h
main endp
end main
```

Output:



```
1
```