Assignment-Lab-Task-11(AP22110011637)

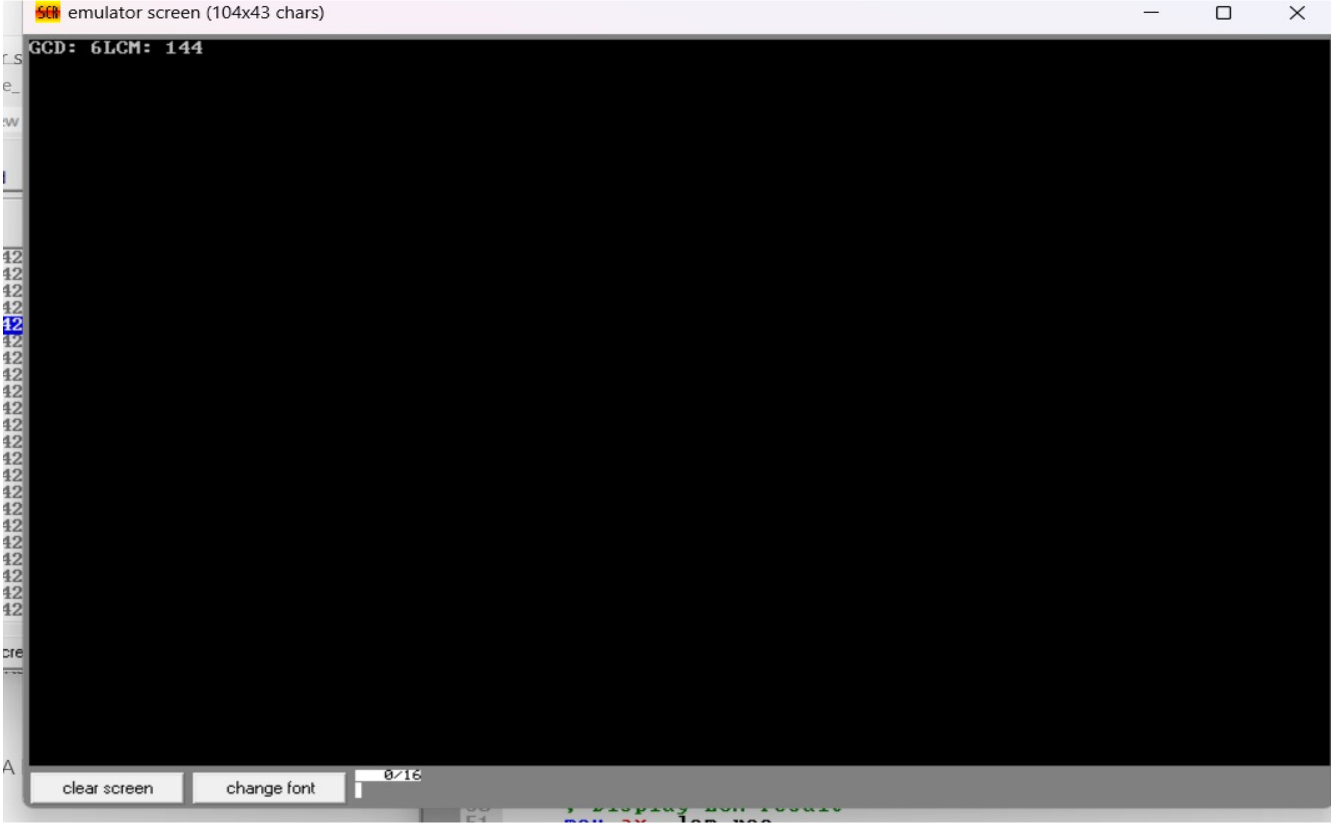
1. (a) Write a program in assembly language to find L.C.M of two single-digit numbers.

Code:

```
.model small
.stack 100h
.data
    num1 db  48        ; First number (single byte)
    num2 db 18         ; Second number (single byte)
    gcd_res db 0       ; To store GCD result (single byte)
    lcm_res dw 0       ; To store LCM result (two bytes for larger result)
    msg_gcd db 'GCD: $'
    msg_lcm db 'LCM: $'

.code
main:
    mov ax, @data
    mov ds, ax         ; Initialize data segment

    ; Display message for GCD
    mov ah, 09h        ; DOS function to display string
    lea dx, msg_gcd
    int 21h

    ; Load num1 and num2 into AL and BL for GCD calculation
    mov al, num1
    mov bl, num2
    call gcd           ; Calculate GCD of num1 and num2
    mov gcd_res, al    ; Store GCD in gcd_res

    ; Display GCD result
    mov al, gcd_res
    call display_result

    ; Calculate LCM using (num1 * num2) / GCD
    mov al, num1       ; Load num1 into AL
    mov ah, 0          ; Clear AH for 16-bit multiplication
    mov dl, num2       ; Load num2 into DL
    mul dl             ; AX = num1 * num2 (result in AX)

    ; Divide AX by the GCD (stored in gcd_res)
    mov cl, gcd_res    ; Load GCD into CL
    div cl             ; AX = (num1 * num2) / GCD

    ; Store the result in lcm_res
    mov lcm_res, ax

    ; Display message for LCM
    mov ah, 09h        ; DOS function to display string
    lea dx, msg_lcm
    int 21h

    ; Display LCM result
    mov ax, lcm_res
    call display_result

    ; End the program
    mov ah, 4Ch
    int 21h

; Function to calculate GCD using the Euclidean algorithm
gcd proc
    cmp bl, 0
    je end_gcd         ; If BL = 0, GCD is in AL

gcd_loop:
    mov ah, 0
    div bl             ; Divide AL by BL, remainder in AH
    mov al, bl         ; Move BL to AL (new A)
    mov bl, ah         ; Move remainder to BL (new B)
    cmp bl, 0
    jne gcd_loop       ; Repeat until remainder (B) = 0

end_gcd:
    ret                ; Final GCD is in AL
gcd endp

; Function to display a number in AX as decimal
display_result proc
    mov bx, 10         ; Divisor for decimal conversion
    xor cx, cx         ; Clear CX to use as counter for digits

convert_loop:
    xor dx, dx         ; Clear DX for division
    div bx             ; Divide AX by 10, remainder in DX (last digit)
    push dx            ; Push remainder onto stack
    inc cx             ; Increment digit counter
    cmp ax, 0          ; Check if quotient is 0
    jne convert_loop   ; If not, continue dividing

print_digits:
    pop dx             ; Pop digit from stack
    add dl, '0'        ; Convert to ASCII
    mov ah, 02h        ; DOS function to display character
    int 21h            ; Display digit
    loop print_digits  ; Repeat for all digits

    ret
display_result endp
```

```
end main
```

Output:



```
GCD: 6LCM: 144
```

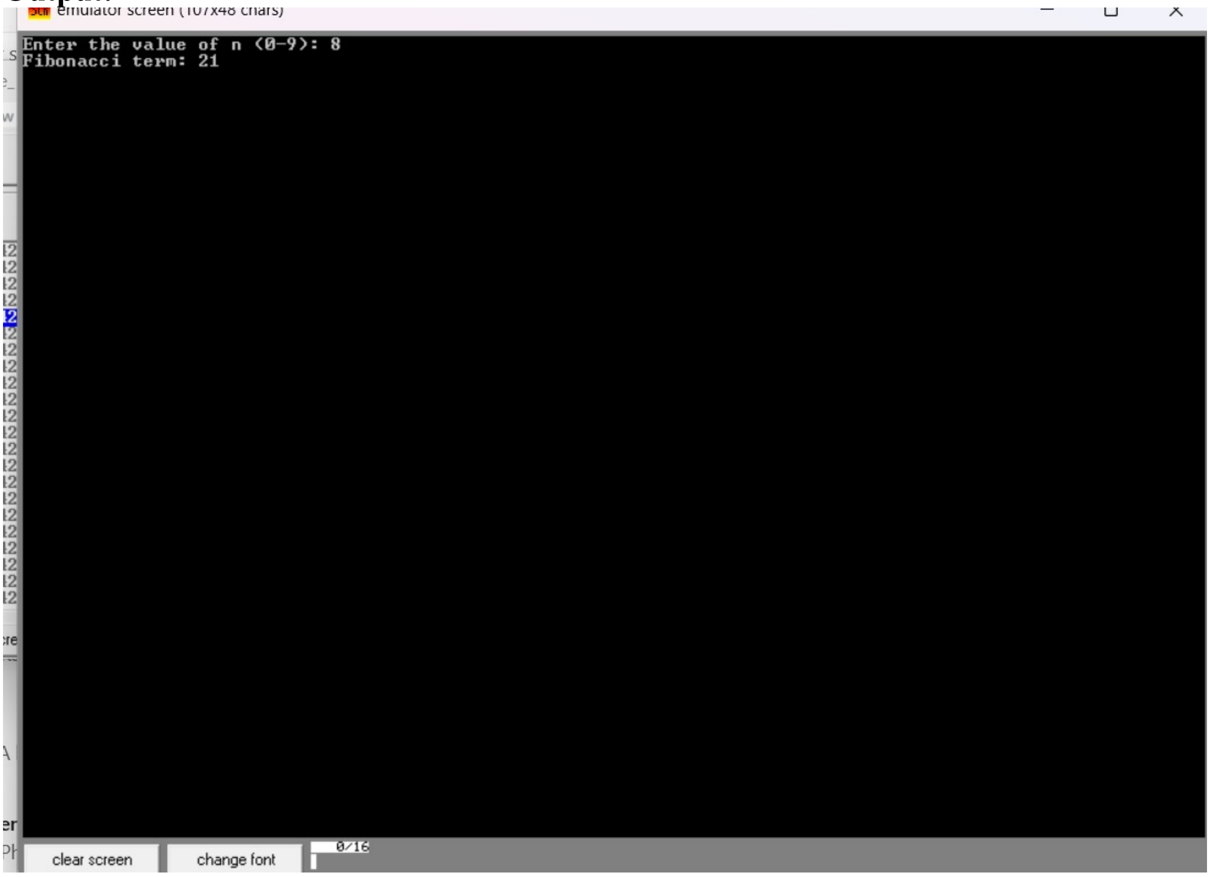
(b) Write an assembly language program to display the nth term of a fibonacci series. “n” must be a single digit number which may be taken from the user.

Code:

```
.model small
.stack 100h
.data
    msg db 'Enter the value of n (0-9): $'      ; Message to prompt user
    fib_res db ?                                ; To store nth Fibonacci term
    n db ?                                      ; User input (single-digit number)
    result_msg db 0Dh, 0Ah, 'Fibonacci term: $' ; Message to display result
    result db '00$', 0Dh, 0Ah                   ; Space to store result as string

.code
main:
    mov ax, @data
    mov ds, ax              ; Initialize data segment

    ; Display message to enter the value of n
    mov ah, 09h
    lea dx, msg
    int 21h
    ; Take single-digit input from user
    mov ah, 01h
    int 21h
    sub al, '0'             ; Convert ASCII to integer
    mov n, al                ; Store user input in 'n'

    ; Check if input is 0 or 1
    mov al, n
    cmp al, 0
    je fib_zero              ; If n = 0, set result to 0
    cmp al, 1
    je fib_one               ; If n = 1, set result to 1

    ; Initialize Fibonacci terms for calculation
    mov cl, al               ; Move n to CL for loop count
    mov al, 1                ; Set AL = 1 for F(1)
    mov bl, 0                ; Set BL = 0 for F(0)
    dec cl                  ; Adjust count to loop n-1 times

fib_loop:
    ; Calculate next term: F(n) = F(n-1) + F(n-2)
    mov ah, al               ; Store current F(n-1) in AH
    add al, bl              ; AL = F(n) = F(n-1) + F(n-2)
    mov bl, ah               ; Update F(n-2) to previous F(n-1)
    dec cl
    jnz fib_loop             ; Loop until CL becomes zero (reached nth term)

    ; Store the nth Fibonacci term in fib_res
    mov fib_res, al

display_result:
    ; Display result message
    mov ah, 09h
    lea dx, result_msg
    int 21h

    ; Convert result to ASCII and store in 'result' for correct display
    mov al, fib_res
    aam                     ; Split AL into AH (tens) and AL (units)
    add ah, '0'              ; Convert tens to ASCII
    add al, '0'             ; Convert units to ASCII
    mov result[0], ah         ; Store tens digit in result
    mov result[1], al        ; Store units digit in result
    jmp display_final

single_digit:
    add al, '0'             ; Convert single digit to ASCII
    mov result[0], al        ; Store single digit in result
    mov result[1], '$'       ; Add end-of-string marker
```

```
display_final:
    ; Display the result
    lea dx, result
    mov ah, 09h
    int 21h

    ; End the program
    mov ah, 4Ch
    int 21h

fib_zero:
    mov fib_res, 0          ; F(0) = 0
    jmp display_result

fib_one:
    mov fib_res, 1          ; F(1) = 1
```

Output:



```
Enter the value of n (0-9): 8
Fibonacci term: 21
```

2. Write an assembly language program to find the factorial of a given single-digit number.

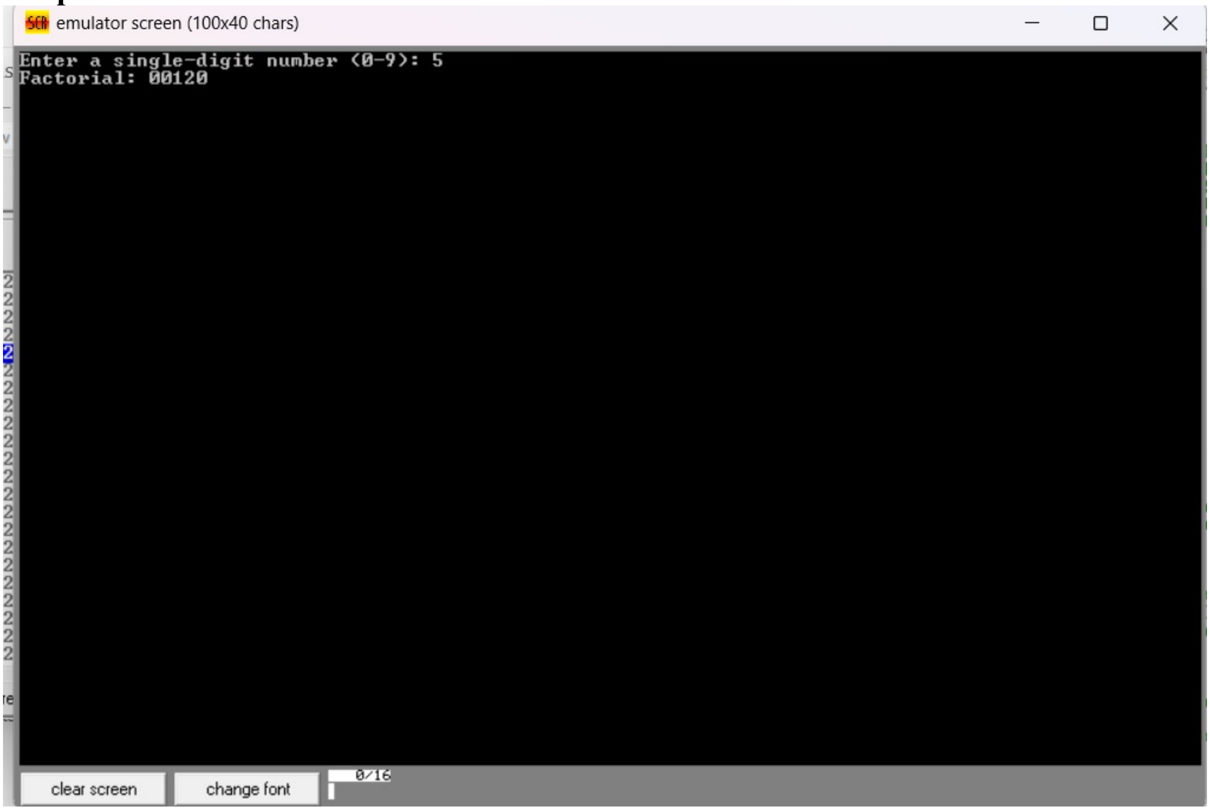
Code:

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

```
.DATA
    msg db 'Enter a single-digit number (0-9): $'    ; Prompt message for input
    result_msg db 0Dh, 0Ah, 'Factorial: $'          ; Message to display the result
    result db '00000$', 0Dh, 0Ah                   ; Space to store factorial result as a string
    num db ?                                       ; Variable to store the input number
    fact dw 1                                      ; Variable to store the factorial result

.CODE
main:
    ; Initialize data segment
    mov ax, @data
    mov ds, ax

    ; Display prompt message
    mov ah, 09h
    lea dx, msg
    int 21h

    ; Take single-digit input from user
    mov ah, 01h
    int 21h
    sub al, '0'                ; Convert ASCII to integer
    mov num, al                ; Store user input in 'num'

    ; Initialize factorial calculation
    mov al, num
    mov ah, 0                  ; Clear AH to extend AL to AX
    mov cx, ax                 ; Move AX to CX (counter)
    mov ax, 1                  ; Initialize AX to 1 (factorial result)

factorial_loop:
    cmp cx, 1                  ; Compare CX to 1
    je end_factorial_loop      ; If CX is 1, end the loop
    mul cx                     ; Multiply AX by CX
    loop factorial_loop        ; Decrement CX and repeat the loop

end_factorial_loop:
    ; Store the factorial result in 'fact'
    mov fact, ax

display_factorial:
    ; Display result message
    mov ah, 09h
    lea dx, result_msg
    int 21h

    ; Convert the factorial result to ASCII
    mov ax, fact
    mov cx, 10                 ; Prepare divisor (10) for unpacking digits
    lea di, result + 4         ; Start storing result from the end
```

```
convert_to_ascii:
    xor dx, dx                 ; Clear DX for division
    div cx                    ; AX = AX / 10, DX = remainder (last digit)
    add dl, '0'               ; Convert remainder to ASCII
    mov [di], dl               ; Store ASCII character in result
    dec di                    ; Move to the next character position
    cmp ax, 0                  ; Check if quotient is zero
    jne convert_to_ascii       ; Repeat if there are more digits

    ; Display the factorial result
    lea dx, result
    mov ah, 09h
    int 21h

    ; End the program
    mov ah, 4Ch
    int 21h

end main
```

Output:



```
Enter a single-digit number (0-9): 5
Factorial: 00120
```