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

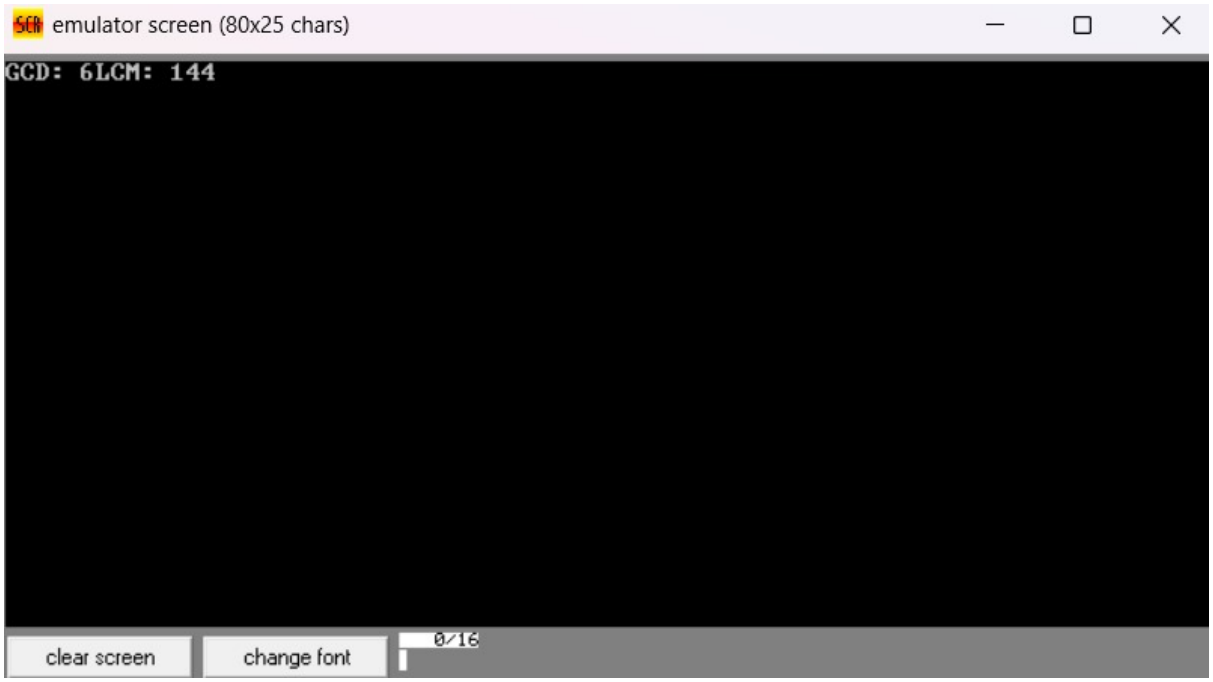
print_digits:
    pop dx          ; Pop digit from stack
    add dl, '0'       ; Convert to ASCII
    mov ah, 02h       ; DOS function to display character
```

```
    int 21h         ; Display digit
    loop print_digits  ; Repeat for all digits

    ret
display_result endp

end main
```

→output



(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

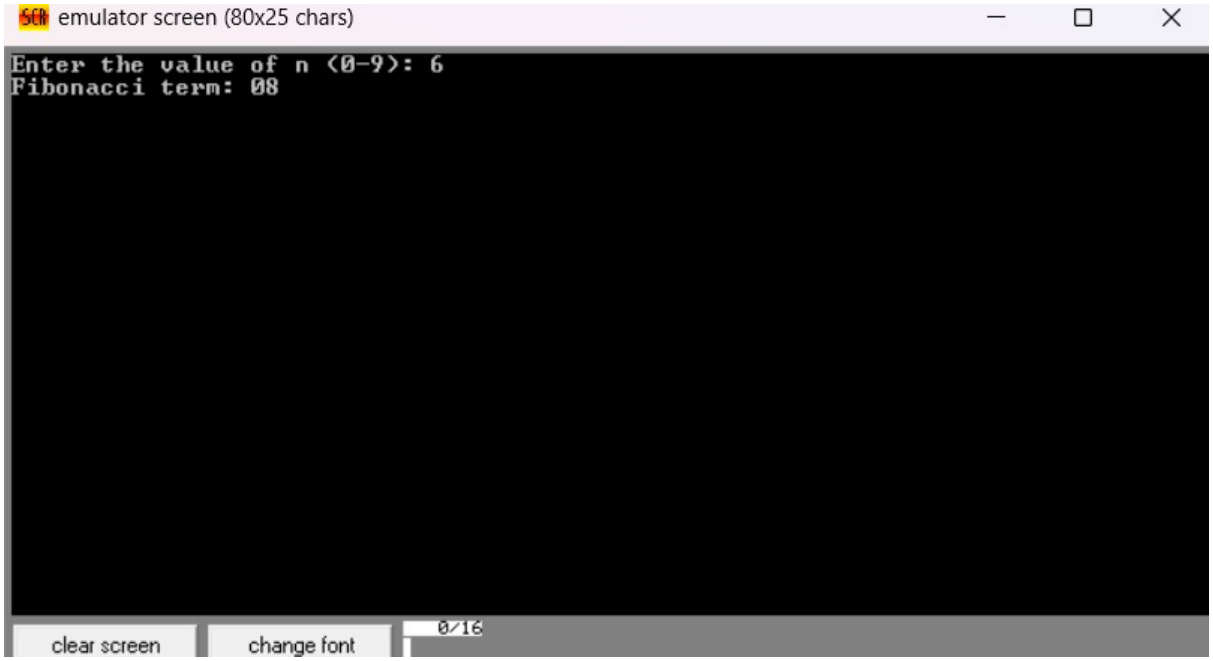
display_final:
    ; Display the result
    lea dx, result
    mov ah, 09h
    int 21h

    ; 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
```



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

→ 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
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```
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

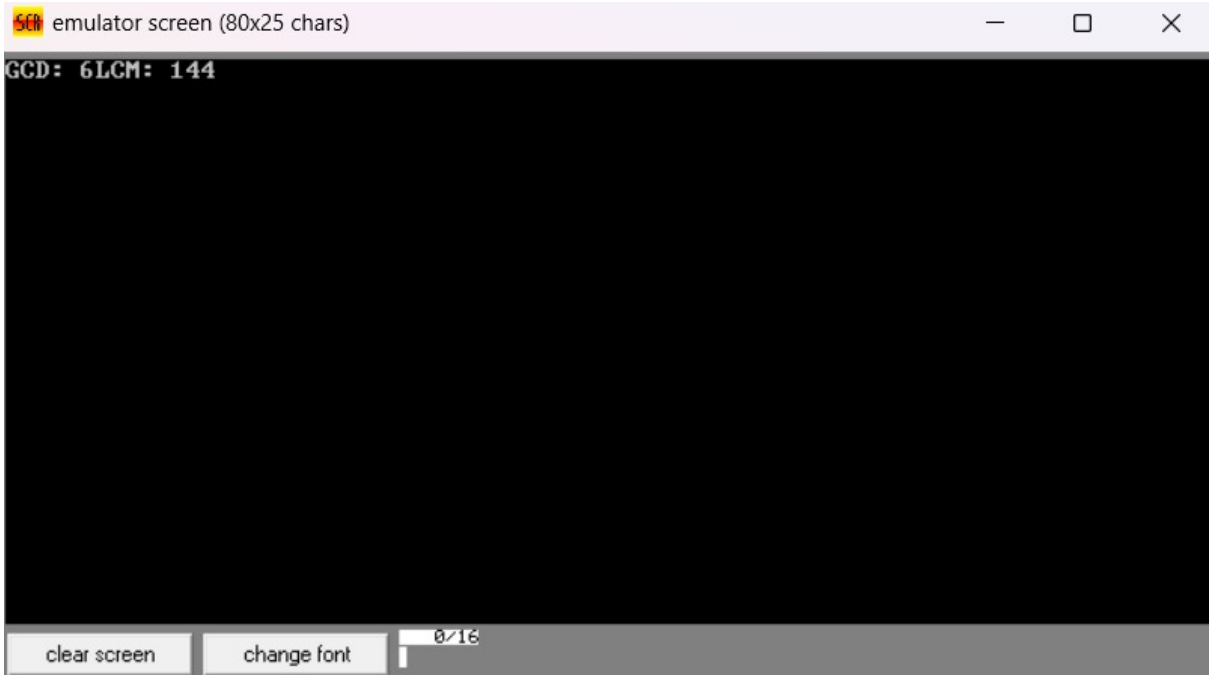
convert_loop:
    xor dx, dx       ; Clear DX for division
    div bx          ; Divide AX by 10, remainder in DX (last digit)
    push dx          ; Push remainder onto stack
    inc cx          ; Increment digit counter
    cmp ax, 0        ; Check if quotient is 0
    jne convert_loop   ; If not,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


emulator screen (80x25 chars)
GCD: 6LCM: 144
clear screen
change font
0/16