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 ? ; First number (input by user)

num2 db ? ; Second number (input by user)

gcd\_res db 0 ; To store GCD result (single byte)

lcm\_res dw 0 ; To store LCM result (two bytes for larger result)

msg\_num1 db 'Enter first single-digit number: $'

msg\_num2 db 0Dh, 0Ah, 'Enter second single-digit number: $'

msg\_gcd db 0Dh, 0Ah, 'GCD: $'

msg\_lcm db 0Dh, 0Ah, 'LCM: $'

.CODE

main:

mov ax, @data

mov ds, ax ; Initialize data segment

; Prompt for first number

mov ah, 09h ; DOS function to display string

lea dx, msg\_num1

int 21h

; Read first number

mov ah, 01h ; DOS function to read a character

int 21h

sub al, '0' ; Convert ASCII to integer

mov num1, al ; Store first number in num1

; Prompt for second number

mov ah, 09h ; DOS function to display string

lea dx, msg\_num2

int 21h

; Read second number

mov ah, 01h ; DOS function to read a character

int 21h

sub al, '0' ; Convert ASCII to integer

mov num2, al ; Store second number in num2

; 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//**

**A computer screen shot of a black screen

Description automatically generated**

**(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

jmp display\_result

end main**//OUTPUT//**

**A screenshot of a computer

Description automatically generated**

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

**//CODE//**

.MODEL SMALL ; Define memory model (SMALL: single data and code segments)

.STACK 100H ; Define stack size (256 bytes)

.DATA

msg db 'Enter a single-digit number (0-9): $' ; Prompt message for user input

result\_msg db 0Dh, 0Ah, 'Factorial: $' ; Message to display before the result (carriage return and line feed)

result db '00000$', 0Dh, 0Ah ; Space to store the result (factorial result as a string)

num db ? ; Variable to store the user input (single digit)

fact dw 1 ; Variable to store the factorial result (initial value 1)

.CODE

main:

; Initialize data segment

mov ax, @data ; Load the address of the data segment into AX

mov ds, ax ; Move the value of AX into DS (data segment register)

; Display prompt message

mov ah, 09h ; Set AH to 09h (DOS function to display string)

lea dx, msg ; Load the effective address of 'msg' into DX

int 21h ; Interrupt to call DOS function (display string)

; Take single-digit input from user

mov ah, 01h ; Set AH to 01h (DOS function to read a character from input)

int 21h ; Interrupt to call DOS function (get character input)

sub al, '0' ; Convert ASCII value of the input ('0' is subtracted to get the numeric value)

mov num, al ; Store the converted value in 'num' variable (single-digit number)

; Initialize factorial calculation

mov al, num ; Move the input number (in 'num') into AL register

mov ah, 0 ; Clear AH to extend AL to AX (to prepare for multiplication)

mov cx, ax ; Move AX (the input number) into CX register (used as a counter for the loop)

mov ax, 1 ; Initialize AX to 1 (this will hold the factorial result)

factorial\_loop:

cmp cx, 1 ; Compare CX (counter) to 1

je end\_factorial\_loop ; If CX is 1, jump to the end of factorial loop

mul cx ; Multiply AX by CX (AX = AX \* CX, result stored in AX)

loop factorial\_loop ; Decrement CX and repeat the loop if CX is not zero

end\_factorial\_loop:

; Store the factorial result in 'fact'

mov fact, ax ; Store the final result of AX (factorial) in 'fact'

display\_factorial:

; Display result message

mov ah, 09h ; Set AH to 09h (DOS function to display string)

lea dx, result\_msg ; Load the effective address of result\_msg into DX

int 21h ; Interrupt to call DOS function (display string)

; Convert the factorial result to ASCII

mov ax, fact ; Load the factorial result from 'fact' into AX

mov cx, 10 ; Prepare divisor 10 for unpacking digits (decimal system)

lea di, result + 4 ; Load the address of the last position of the result string into DI

convert\_to\_ascii:

xor dx, dx ; Clear DX (DX will hold the remainder during division)

div cx ; Divide AX by CX (AX / 10) - quotient in AX, remainder in DX

add dl, '0' ; Convert the remainder (last digit) to ASCII by adding the ASCII code of '0'

mov [di], dl ; Store the ASCII character in the result string

dec di ; Move DI to the next character position (going backwards)

cmp ax, 0 ; Compare the quotient (AX) with 0

jne convert\_to\_ascii ; If quotient is not 0, repeat the conversion

; Display the factorial result

lea dx, result ; Load the address of the result string into DX

mov ah, 09h ; Set AH to 09h (DOS function to display string)

int 21h ; Interrupt to call DOS function (display string)

; End the program

mov ah, 4Ch ; Set AH to 4Ch (DOS function to terminate the program)

int 21h ; Interrupt to call DOS function (terminate the program)

end main

**//OUTPUT**

**A computer screen shot of a black screen

Description automatically generated**