Assignment: LCD Interfacing using I2C Expander (PCF8574)
(STM32)

Subject: ARM Microcontroller
Topic: LCD – I2C Based Interfacing (4-bit Mode)

Question – 1: Basic LCD Display

Objective
To understand LCD initialization and basic string display.

Problem Statement
Write a program to perform the following:

- Initialize 16x2 LCD in **4-bit mode** using I2C expander
- Display **"WELCOME"** on Line 1
- Display **"STM32 LCD"** on Line 2

Expected Output
Line 1: WELCOME
Line 2: STM32 LCD

Question – 2: Cursor Position Control

Objective
To understand LCD cursor positioning using DDRAM address.

Problem Statement
Write a program to:

- Display **"HELLO"** at **Line 1, Column 5**
- Display **"I2C MODE"** at **Line 2, Column 3**

Expected Output
Text appears at specified row and column positions.

Question – 3: LCD Scrolling Operation

Objective
To understand LCD display shift commands.

Problem Statement
Write a program to:

- Display **"EMBEDDED SYSTEM"** on Line 1
- Scroll the display **left 5 times**
- Then scroll the display **right 5 times**
- Add visible delay between each scroll

Expected Output
Text scrolls left and right smoothly on LCD.

Question – 4: Numeric Counter Display

Objective
To practice dynamic data display on LCD.

Problem Statement
Write a program to:

- Display numbers from **1 to 20**
- Print the number on **Line 2**
- Update the number every **500 ms**

Expected Output
Line 2 shows:
1 → 2 → 3 → … → 20

Constraints

- Use I2C LCD with PCF8574
- Use 4-bit LCD mode
- Mandatory functions:
  - `lcd_init()`
  - `lcd_send_cmd()`
  - `lcd_send_data()`
  - `lcd_send_nibble()`