CO326 - Pre Lab
Parallel Communication

PART 01: DRAW THE CIRCUIT DIAGRAM THAT INCLUDES A 7-SEGMENT DISPLAY AND THE DATA PORT OF THE PARALLEL PORT.
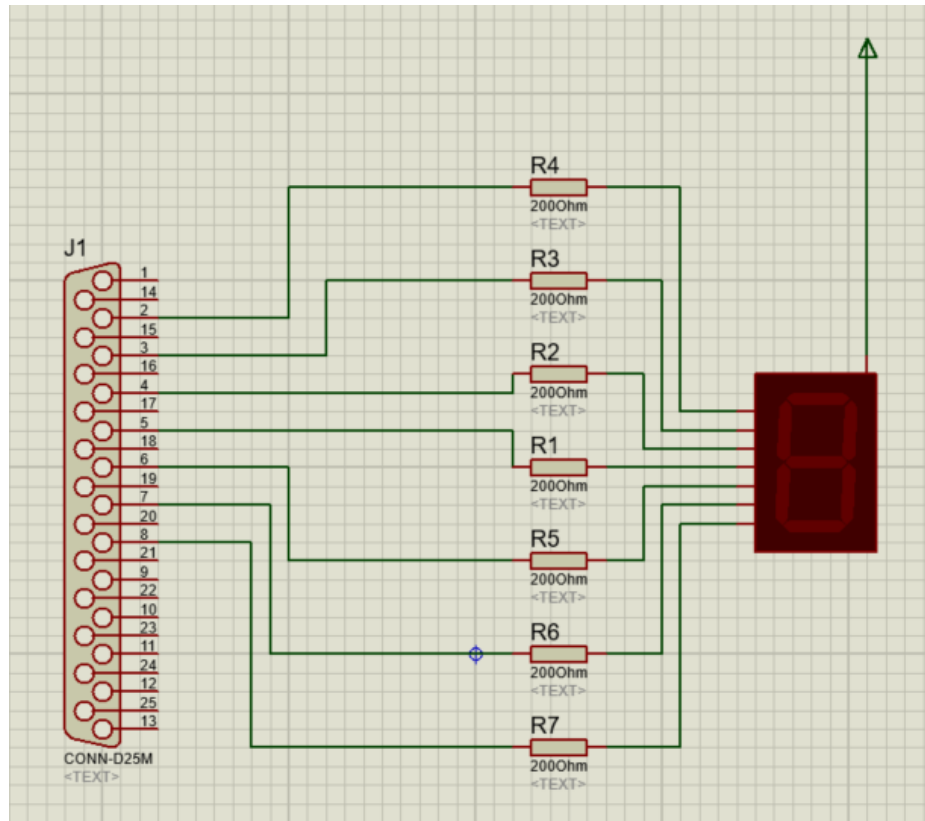

FIGURE 1 :   Seven Segment Display Connection to the Parallel Port

CALCULATE THE RESISTANCE OF THE RESISTORS THAT NEED TO BE CONNECTED

$$Resistance = \frac{V_{Supply} - V_{LED}}{I_{LED}}$$

$$= \frac{5v - 2v}{15mA}$$

$$= 200 \ Ohms$$

Resistance : The value of the Resistance required to apply segment

V_{supply} : The Supply Voltage to the anode of the segment

V_{LED} : Forward Voltage of the LED (2v for RED LED)

I_{LED} : Maximum Current able to follow through the LED (15mA)

2. WRITE A PROGRAM TO LIGHT UP EACH SEGMENT OF SSD ONE BY ONE

```c
1   #include <stdio.h>
2   #include <stdlib.h>
3   #include <unistd.h>
4   #include <sys/io.h>
5   #define DATA_PORT 0x378 /* parallel port base address */
6   #define STATUS_PORT DATA_PORT+1
7   #define CONTROL_PORT DATA_PORT+2
8
9   unsigned char data;
10  void main(){
11
12      if (ioperm(DATA_PORT, 1, 1)){
13          fprintf(stderr, "Access denied to %x\n", DATA_PORT), exit(1);
14      }
15      if (ioperm(STATUS_PORT, 1, 1)){
16          fprintf(stderr, "Access denied to %x\n", STATUS_PORT), exit(1);
17      }
18
19      // lit the D0 port a in the seven segment
20      outb(0b11111110, DATA_PORT);
21      // lit the D1 port b in the seven segment
22      outb(0b11111101, DATA_PORT);
23      // lit the D2 port c in the seven segment
24      outb(0b11111011, DATA_PORT);
25      // lit the D3 port d in the seven segment
26      outb(0b11110111, DATA_PORT);
27      // lit the D4 port e in the seven segment
28      outb(0b11101111, DATA_PORT);
29      // lit the D5 port f in the seven segment
30      outb(0b11011111, DATA_PORT);
31      // lit the D6 port g in the seven segment
32      outb(0b10111111, DATA_PORT);
33
34  }
```

FIGURE 2 : Code for light up each led in the segmentation

PART 02: DISPLAY 0-9 NUMBERS ON A SINGLE 7 SEGMENT DISPLAY . DIFFERENTIATE BETWEEN THE COMMON ANODE AND COMMON CATHODE 7-SEGMENT DISPLAY

Common Anode Seven Segment Display	Common Cathode Seven Segment Display
Seven of the anodes are connected together	Seven of the cathodes are connected together
It is required a logically lower value in order to lit the each LED	It is required a higher logic in order to lit the each LED
The Orientation of the LED placement is different	The orientation of the LEDs placement is different to each other common anode and cathode versions

2. WRITE A PROGRAM TO DISPLAY CHARACTERS FROM 0-9 IN AN INFINITE LOOP WITH A DELAY OF 1 SECOND BETWEEN EACH CHARACTER.

```c
1   #include <stdio.h>
2   #include <stdlib.h>
3   #include <unistd.h>
4   #include <sys/io.h>
5   #define DATA_PORT 0x378 /* parallel port base address */
6   #define STATUS_PORT DATA_PORT+1
7   #define CONTROL_PORT DATA_PORT+2
8
9   unsigned char data;
10  void main(){
11
12      if (ioperm(DATA_PORT, 1, 1)){
13          fprintf(stderr, "Access denied to %x\n", DATA_PORT), exit(1);
14      }
15      if (ioperm(STATUS_PORT, 1, 1)){
16          fprintf(stderr, "Access denied to %x\n", STATUS_PORT), exit(1);
17      }
18
19      while(1){
20          // lit the 0 value in the seven segment
21          outb(0b11000000, DATA_PORT);
22          __delay_ms(1000);
23          // lit the 1 value in the seven segment
24          outb(0b11111001, DATA_PORT);
25          __delay_ms(1000);
26          // lit the 2 value in the seven segment
27          outb(0b10100100, DATA_PORT);
28          __delay_ms(1000);
29          // lit the 3 value in the seven segment
30          outb(0b10110000, DATA_PORT);
31          __delay_ms(1000);
32          // lit the 4 value in the seven segment
33          outb(0b10011001, DATA_PORT);
34          __delay_ms(1000);
35          // lit the 5 value in the seven segment
36          outb(0b10010010, DATA_PORT);
37          __delay_ms(1000);
38          // lit the 6 value in the seven segment
39          outb(0b10000010, DATA_PORT);
40          __delay_ms(1000);
41          // lit the 7 value in the seven segment
42          outb(0b01111000, DATA_PORT);
43          __delay_ms(1000);
44          // lit the 8 value in the seven segment
45          outb(0b10000000, DATA_PORT);
46          __delay_ms(1000);
47          // lit the 9 value in the seven segment
48          outb(0b10011000, DATA_PORT);
49          __delay_ms(1000);
50      }
51
52  }
```

FIGURE 3 :   Source code for looped numbering from 1 - 9

PART 03: DISPLAY 0-9 NUMBERS ON A SINGLE 7 SEGMENT DISPLAY USING 74LS47 IC

1. DRAW THE CIRCUIT DIAGRAM THAT INCLUDES A 7-SEGMENT DISPLAY, 74LS47 IC, AND THE PARALLEL PORT. REFER TO THE DATASHEET OF THE 74LS47 IC TO FIND THE LEAST SIGNIFICANT BIT OF THE OUTPUT. (USE COMMON ANODE)
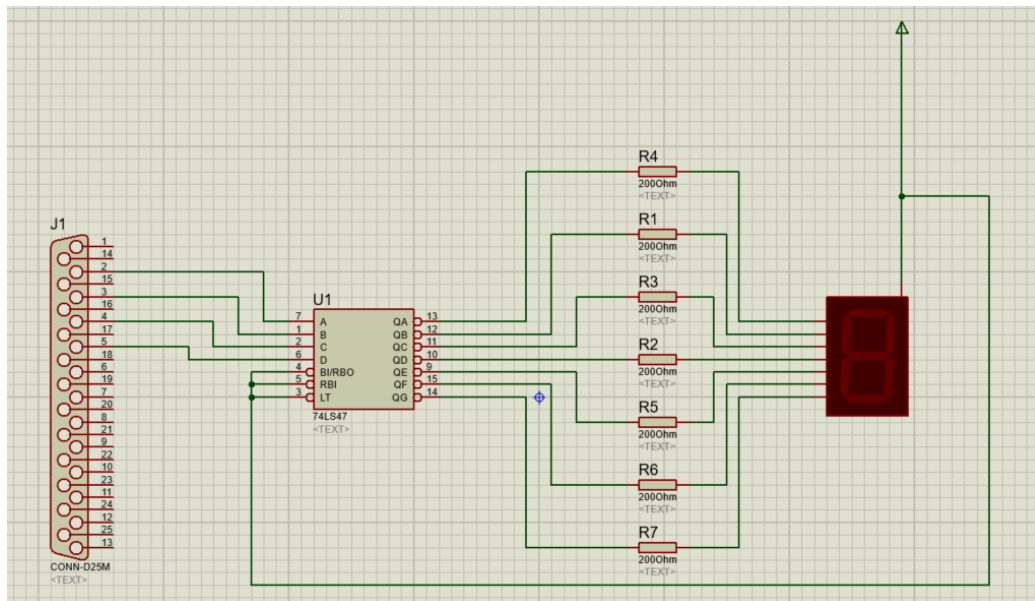

F I G U R E 4 : Seven Segment Display connected to a parallel port via a 74LS47 IC

2. WRITE THE PROGRAM TO DISPLAY CHARACTERS FROM 0-9 IN AN INFINITE LOOP WITH A DELAY OF 1 SECOND BETWEEN EACH CHARACTER.

```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/io.h>
#define DATA_PORT 0x378 /* parallel port base address */
#define STATUS_PORT DATA_PORT+1
#define CONTROL_PORT DATA_PORT+2

unsigned char data;
void main(){

    if (ioperm(DATA_PORT, 1, 1)){
        fprintf(stderr, "Access denied to %x\n", DATA_PORT), exit(1);
    }
    if (ioperm(STATUS_PORT, 1, 1)){
        fprintf(stderr, "Access denied to %x\n", STATUS_PORT), exit(1);
    }

    while(1){
        // lit the 0 value in the seven segment
        outb(0b11110000, DATA_PORT);
        __delay_ms(1000);
        // lit the 1 value in the seven segment
        outb(0b11110001, DATA_PORT);
        __delay_ms(1000);
        // lit the 2 value in the seven segment
        outb(0b11110010, DATA_PORT);
        __delay_ms(1000);
        // lit the 3 value in the seven segment
        outb(0b11110011, DATA_PORT);
        __delay_ms(1000);
        // lit the 4 value in the seven segment
        outb(0b11110100, DATA_PORT);
        __delay_ms(1000);
        // lit the 5 value in the seven segment
        outb(0b11110101, DATA_PORT);
        __delay_ms(1000);
        // lit the 6 value in the seven segment
        outb(0b11110110, DATA_PORT);
        __delay_ms(1000);
        // lit the 7 value in the seven segment
        outb(0b11110111, DATA_PORT);
        __delay_ms(1000);
        // lit the 8 value in the seven segment
        outb(0b11111000, DATA_PORT);
        __delay_ms(1000);
        // lit the 9 value in the seven segment
        outb(0b11111001, DATA_PORT);
        __delay_ms(1000);

    }
}
```

FIGURE 5 : Source code for displaying LEDs in BCD manner

PART 04: CHANGE THE NUMBERS DISPLAYED IN THE SSD WITH A PUSH BUTTON . DRAW THE CIRCUIT DIAGRAM THAT INCLUDES A PUSH BUTTON TO TAKE INPUTS, A 7-SEGMENT DISPLAY, AND 74LS47 IC TO SHOW OUTPUTS AND THE PARALLEL PORT.
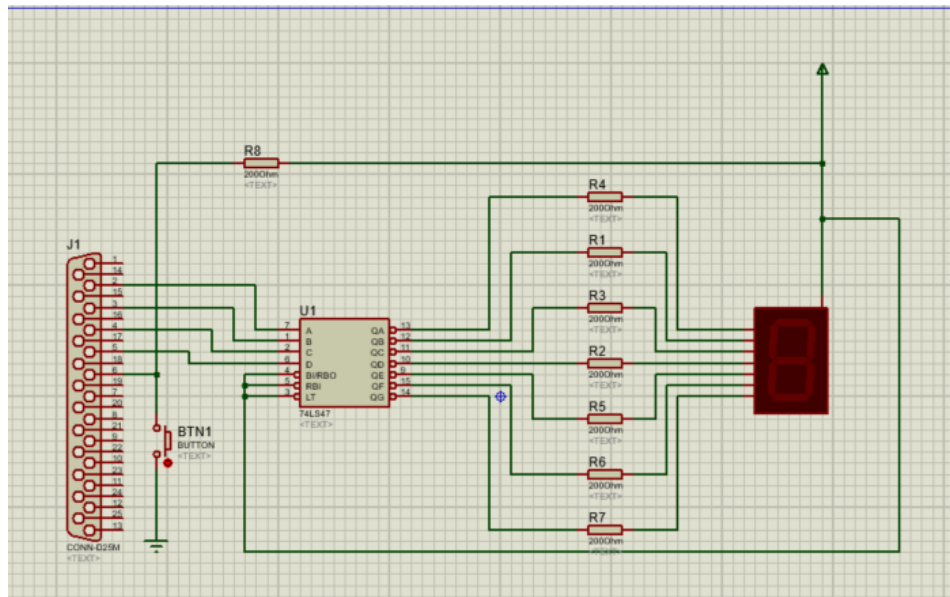

FIGURE 6 : Seven Segment Display connected to a parallel port via a 74LS47 IC With a Digital Input