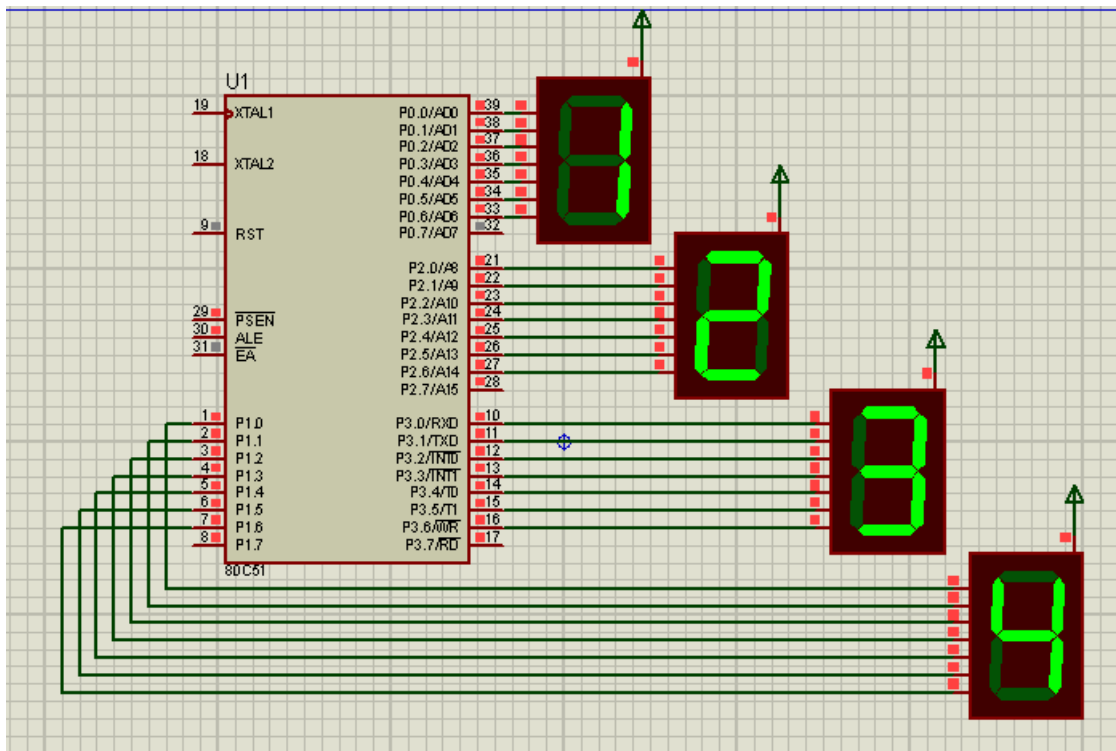## Problem 4

In this problem we will use all 4 ports to derive 4 seven segment display.

The code will display the numbers 1234 and blink them with a delay of 1 second.

Section 1 Variables

```
 7  ;================================================================
 8  ; VARIABLES
 9  S1 EQU P0
10  S2 EQU P2
11  S3 EQU P3
12  S4 EQU P1
13
14  ONE EQU 11111001B
15  TWO EQU 10100100B
16  THREE EQU 10110000B
17  FOUR EQU 10011001B
18  ;================================================================
```

First, we define the S1,S2,S3,S4 which are the ports that are connected to 7-segments

2nd, we define the required code to be sent to the 7-segment to display the numbers 1, 2, 3, 4

For common anode 7-segment display, to make a segment ON , we must put '0' volt at segment pin- so;

To display 3 --> we will make all segments ON except segment 'e' and 'f'

Hence all output will be 0 except 'e', 'f' = 1

From the connection in the schematic, the relation between port pins and segments is

Port pin   →   7 6 5 4 3 2 1 0

Segment   →   - g f e d c b a

Display '3'   →   0 1 1 0 0 0 0 0--> as in line 16

We use the same delay function to blink the display every 1 second.

To blank the display we send '1' to all segments as indicated by the code in lines 43 to 46

```
35  LOOP:
36      MOV S1,#ONE
37      MOV S2,#TWO
38      MOV S3,#THREE
39      MOV S4,#FOUR
40
41      MOV R4,#1
42      CALL DELAY
43      MOV S1,#0FFH
44      MOV S2,#0FFH
45      MOV S3,#0FFH
46      MOV S4,#0FFH
47      MOV R4,#1
48      CALL DELAY
49      JMP LOOP
```

Version2

In this version we use common cathode 7-segment as shown
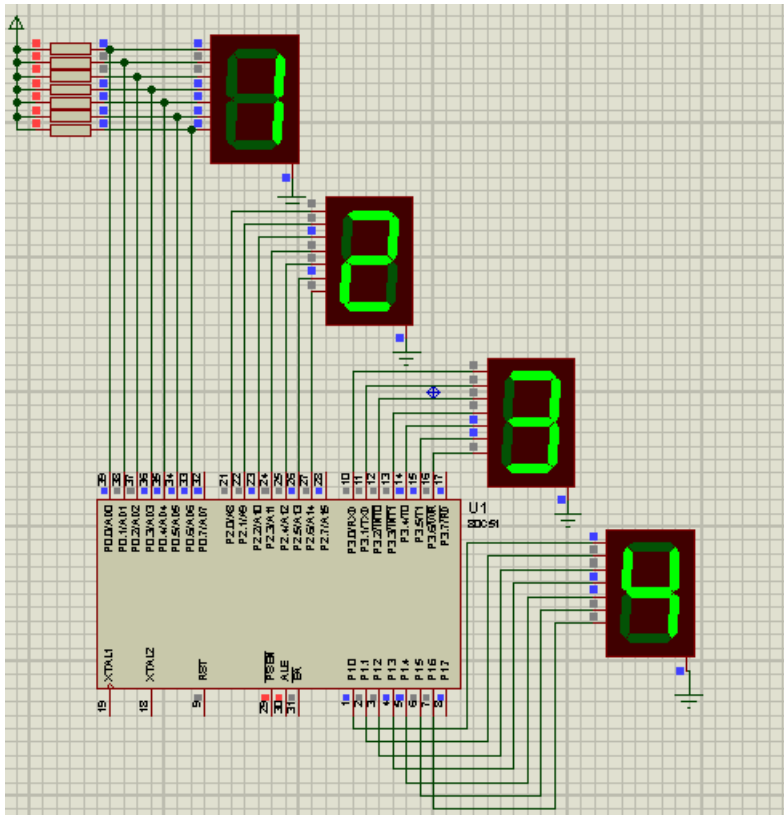
Since P0 has no pull-up resistors, we add it externally.
Also since we use common cathode, we use the same code as in version
1 with inverted output as shown by the code.

```
35   LOOP:
36       MOV S1,#(255-ONE)
37       MOV S2,#(255-TWO)
38       MOV S3,#(255-THREE)
39       MOV S4,#(255-FOUR)
40
41       MOV R4,#1
42       CALL DELAY
43       MOV S1,#00H
44       MOV S2,#00H
45       MOV S3,#00H
46       MOV S4,#00H
47       MOV R4,#1
48       CALL DELAY
49       JMP LOOP
```

As indicated in lines 36 to 39, we invert the value of the 7-segment
code by subtracting it from 255. 255 → 11111111 in binary, and for

original output of 11111001, if we subtract it from 11111111, we will get

```
      11111111
  -   11111001
  ────────────────────
      00000110 → inverted version of (11111001)
```