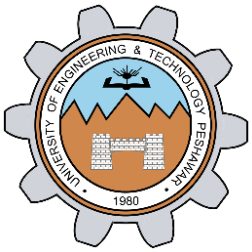
MICROPROCESSOR BASED SYSTEM DESIGN

TASK 4



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CSE307 MBSD

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Class Section: **B**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to:

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Sunday, May 9, 2021

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Task:

A. Generate a signal on pin P1.1 having frequency equal to 80 Hz with a duty cycle of 10%.
B. When a user presses a button at P1.2 then frequency changes to 40Hz with a 20% duty cycle.
C. When a user again presses the same button then frequency changes to 20Hz with a duty cycle of 40%.
D. When a user again presses the same button then frequency changes to 10Hz with a duty cycle of 80%.
E. Show it on oscilloscope.
F. Each time a user presses a button the signal toggles from case A to B, then B to C, then C to D and finally from D to A, on every subsequent button press.
G. Program only in C

Create all Delays using timers.

Problem Analysis:

Case A: To generate a signal of frequency 80Hz we need a time period of 1/80 s

So T = 1/f = 1/80 = 0.0125s

T = 12.5 ms

As Duty Cycle is 10%, so

P1.1 →ON (1.25 ms)

P1.1 →OFF(11.25 ms)

Delay using Timers:

1.25ms = 1250us

65535(FFFF in hex)-1250 = 64285(FB1D)

11.25ms = 11250us

65535-11250 = 54285(D40D)

Case B: To generate a signal of frequency 40Hz we need a time period of 1/40 s

So T = 1/f = 1/40 = 0.025s

T = 25 ms

As Duty Cycle is 20%, so

P1.1 →ON (5 ms)

P1.1 →OFF(20 ms)

Delay using Timers:

5ms = 5000us

65535-5000 = 60535(EC77)

20ms = 20000us

65535-20000 = 45535(B1DF)

Case C: To generate a signal of frequency 20Hz we need a time period of 1/20 s

So T = 1/f = 1/20 = 0.05s

T = 50 ms

As Duty Cycle is 40%, so

P1.1 →ON (20 ms)

P1.1 →OFF(30 ms)

Delay using Timers:

20ms = 20000us

65535-20000 = 45535(B1DF)

30ms = 30000us

65535-30000 = 35535(8ACF)

Case D: To generate a signal of frequency 10Hz we need a time period of 1/10 s

So T = 1/f = 1/10 = 0.10s

T = 100 ms

As Duty Cycle is 80%, so

P1.1 →ON (80 ms)

P1.1 →OFF(20 ms)

Delay using Timers:

80ms = 80000us

65.535ms is the max delay we can create, so to attain a delay of 80ms, we should create a delay of 40ms and run it 2 times.

40ms = 40000us

65535-40000 = 25535(63BF)

20ms = 20000us

65535-20000 = 45535(B1DF)

Code:

```
#include <reg51.h>
#include <stdio.h>

sbit Signal = P1^1;
sbit Input = P1^2;
int check = 0;
int i;

void Timer0(int XX, int YY)
{
  TMOD = 0x01;       //Timer o, Mode 1
  TH0 = XX;          //High 8 bits
  TL0 = YY;          //Low 8 bits
  TR0 = 1;           //Start the Timer
  while(TF0 ==  0);  //Check Timer Flag
  TR0 = 0;           //Stop Timer
```

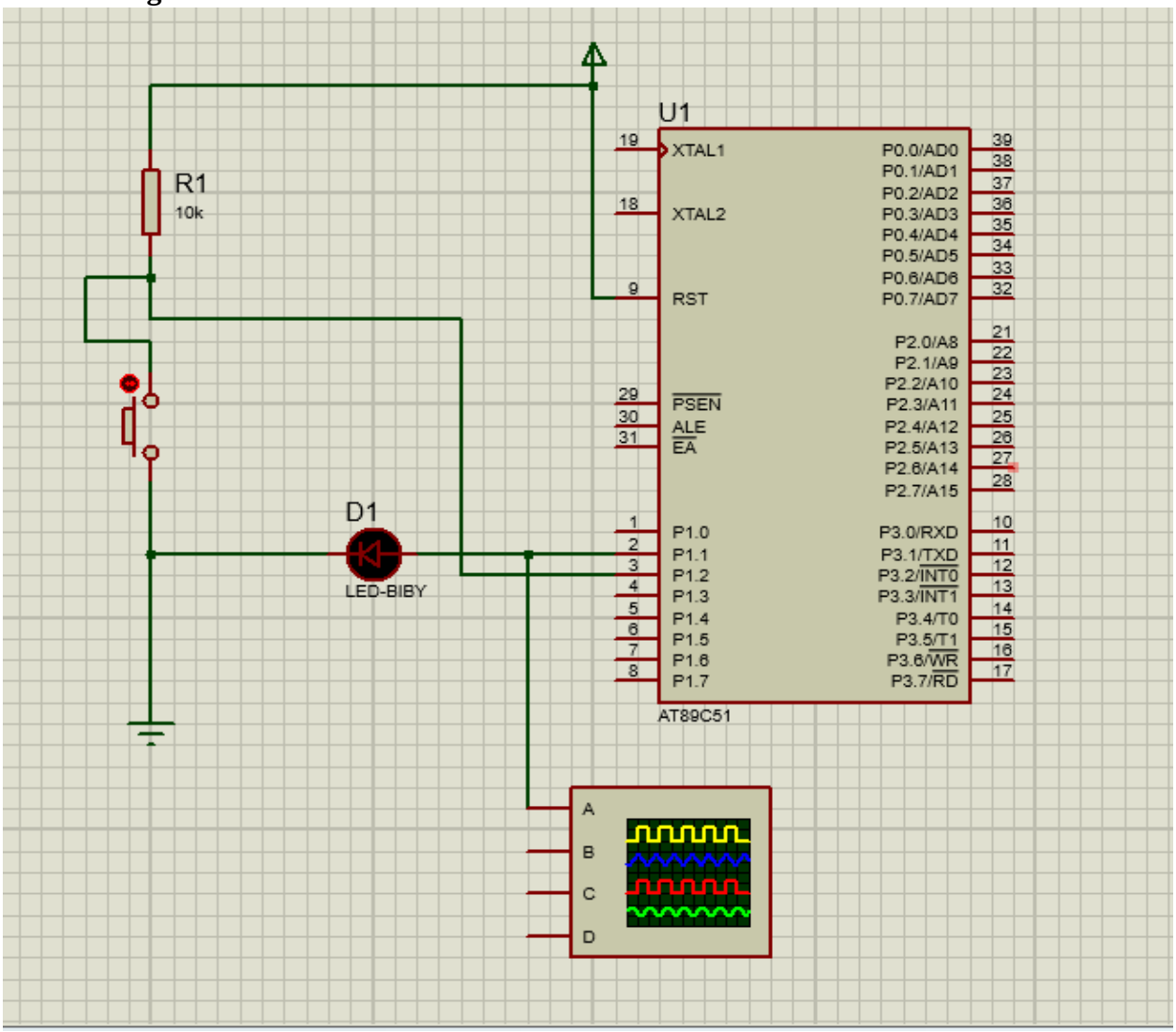
```
  TF0 = 0;                //Reset Timer Flag
}

void main(void)
 {
   Input = 1;             //Configure for input
  while (1)
  {
    if(Input==0)          //Button Pressed
          check++;

    switch(check%4)
    {
          case 0:
            Signal = 1;
            Timer0(0xFB,0x1D);              //Delay of 1.25ms
            Signal = 0;
            Timer0(0xD4,0x0D);              //Delay of 11.25ms
             break;
          case 1:
            Signal = 1;
            Timer0(0xEC,0x77);              //Delay of 5ms
            Signal = 0;
            Timer0(0xB1,0xDF);              //Delay of 20ms
             break;
          case 2:
            Signal = 1;
            Timer0(0xB1,0xDF);              //Delay of 20ms
            Signal = 0;
            Timer0(0x8A,0xCF);              //Delay of 30ms
             break;
          case 3:
           Signal = 1;
            for(i=0;i<2;i++)                //40ms x 2 = 80ms
              Timer0(0x63,0xBF);            //Delay of 40ms
            Signal = 0;
            Timer0(0xB1,0xDF);              //Delay of 20ms
             break;
    }
  }
 }
```

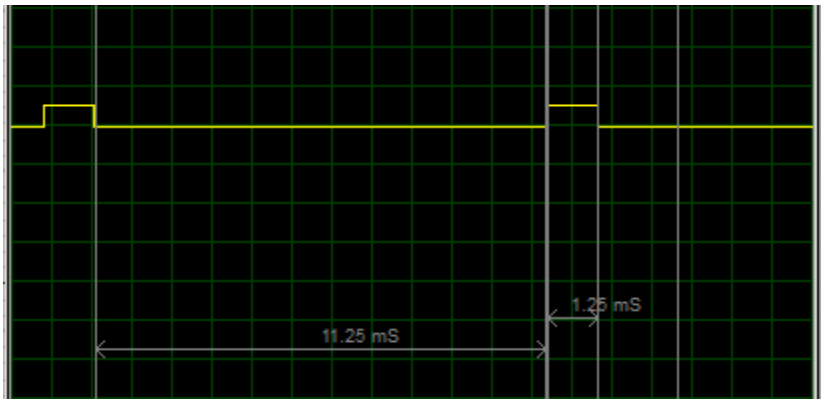
Output / Graphs / Plots / Results:

Circuit Diagram:

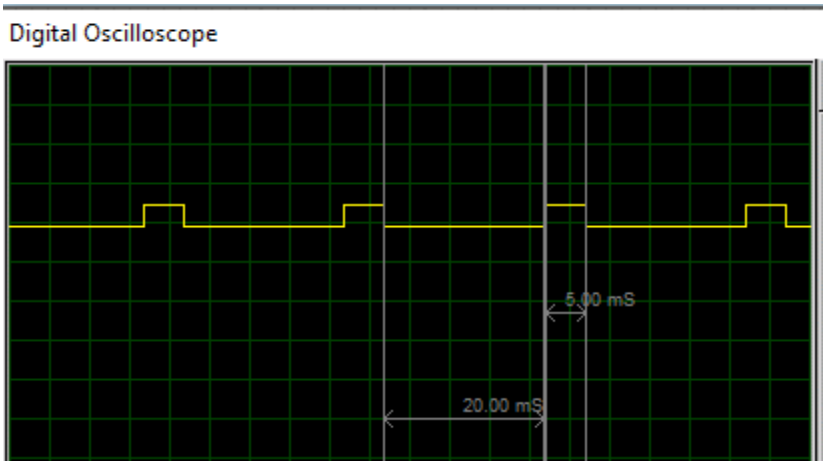


Oscilloscope Verification:

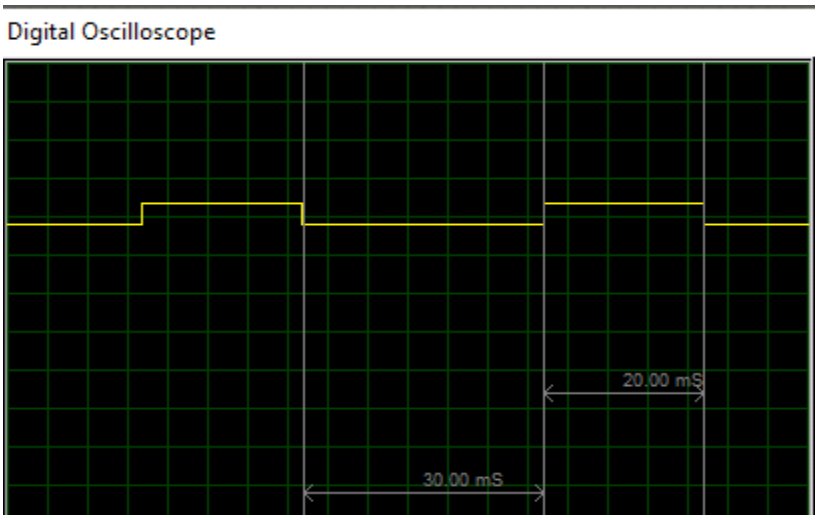
Case A (Without Pressing the Button):



Case B (After Pressing the Button):



Case C (Pressing the Button for the 2nd Time):



Case D (Pressing the Button for the 3rd Time):