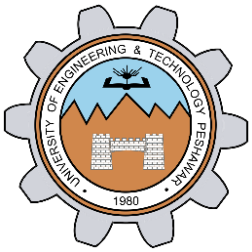
MICROPROCESSOR BASED SYSTEM DESIGN

TASK 5



Spring 2021

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:

Dr. Bilal Habib

Saturday, May 22, 2021

Department of Computer Systems Engineering

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Task:

At a BRT entry point in Peshawar, there is only one lane of busses to enter from GT-road. We have connected a sensor which sends a signal (high-to-low edge) to our embedded system whenever a bus passes through the entry-point and enters the Metro lane. Use an 89C51 to count the number of busses passed though the entry point in one minute. As soon the one-minute time is over, it is indicated by turning ON a led at P3.1 pin, send the final value of count to Port-2 and finally goes into an infinite loop, doing nothing.

- Draw schematic along with timing diagram. Oscillator frequency is 12MHz.
- Entry of bus can be simulated using a button press.
- Use timers for creating a delay of 1 min.

Hint: Use timer interrupt. Feel free to use C or Assembly.

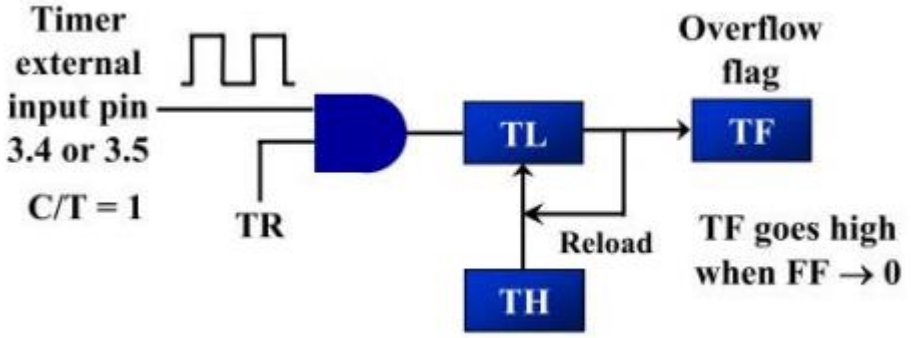
Problem Analysis:

We need a delay of 1 minute = 60 sec
1 sec = 1000msec
60 sec = 60000msec
65.535ms is the max delay we can create, so to attain a delay of 60000ms, we should create a delay of 60ms and run it 1000 times.

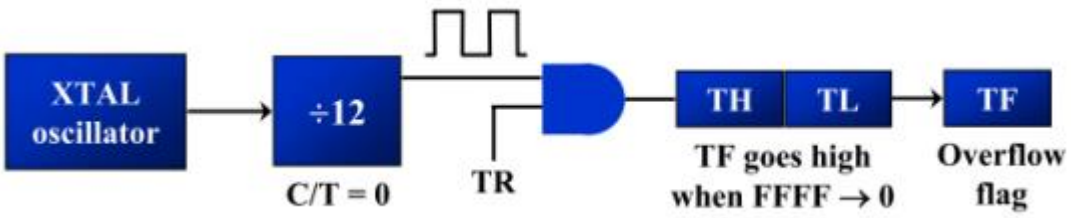
	Timer1				Timer0				
Gate	C/T	M1	M0		Gate	C/T	M1	M0	
0	0	0	1		0	1	1	0	(Hex= 16)

Timer 1: Used as Timer with mode 1
Timer 0: Used as Counter with mode 2

Timer 0 (Used as Counter in Mode 2):



Timer 1 (Used as timer in Mode 1):



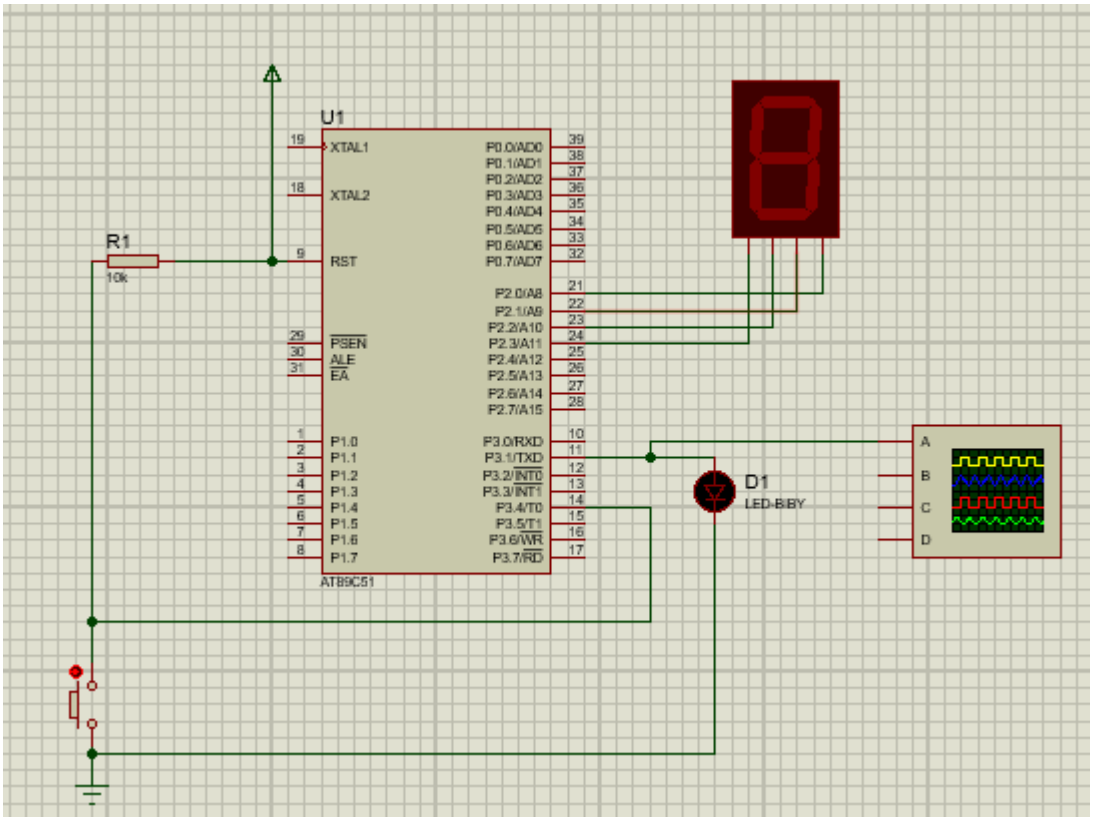
Code:

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

sbit Input = P3^4;      //Input for Counter 0
sbit Led = P3^1;        //Output Led
int x;

void StartTimer()
{
  TR1 = 1;      //Start Timer 1
  TR0 = 1;      //Start Counter 0
}

void timer1() interrupt 1       //Called after each 60ms delay
{
    x++;
    //The if Comparison also takes some machine cycles so we check for 967 instead of 1000 to
match a delay of 1 minute
    if(x==967)//delay of 1 minute = 60000ms reached
    {
            Led = 1;    //Turn Led on after 1 minute
            P2 = TL0;   //Send the Counter Value to Port 2
            while(1)    //Go in infinite loop
            {
            }
    }
    //Reset the timer 1 values
    TH1 = 0x15;
    TL1 = 0x9F;
}

void initTimer()
{
    TMOD = 0x16;            //Timer 1 mode 1 and Counter 0 mode 2
    //Delay of 60ms
    TH1 = 0x15;
    TL1 = 0x9F;
    IE = 0x88;          //Enable TF Enterrupt for Timer1
   TH0 = 0;             //Start Counter from 0
    Input = 1;          //Set for Input
}
void main(void)
 {
   Led = 0;     //Turn Off the Led
    P2 = 0;     //Turn Off the Port 2
```

```
 initTimer();
StartTimer();
while (1)
{
 }
}
```

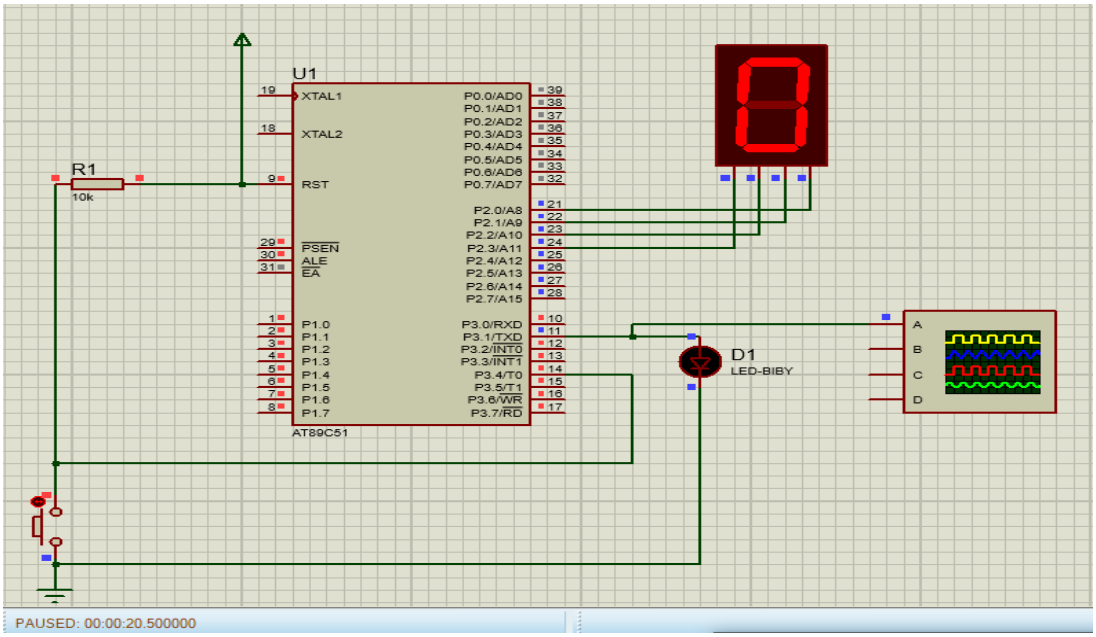
Output / Graphs / Plots / Results:

Schematic:

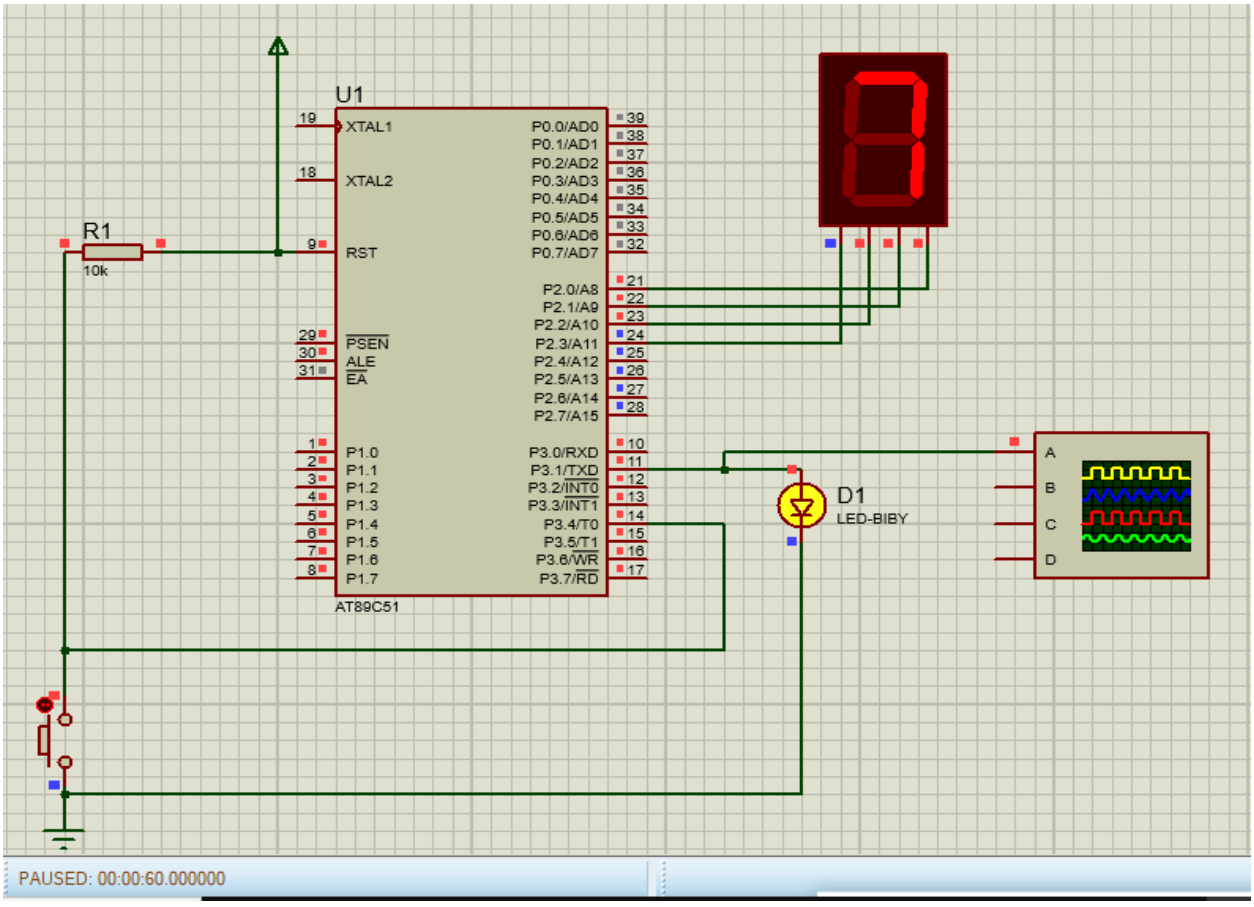


Output at 20sec (Button pressed 7 times):

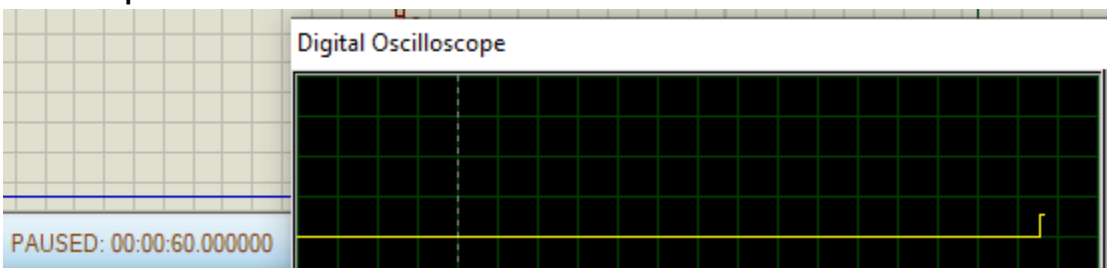
Although the button is pressed 7 times, the result would not show now according to the given task. The result will only appear after 60 seconds.



Output at 60sec (Button pressed 7 times):



Oscilloscope Verification:



As we can see, the Led is turned on exactly after 60 seconds.