University of Engineering and Technology, Peshawar

Department of Computer Systems Engineering.

Course : CSE-303 Microprocessor Based System Design

Zainab Khalid	**19** PWCSE **1743**
Section	A
Batch	21 (Spring_2022)
Submitted to	Dr, Bilal Habib

TASK 4:

Design a system, where the Software in C will generate, a signal of
A. 0.5KHz with a duty cycle of 25% on P2.0 pin.
B. Whenever a user presses a button at (P3.2), the signal toggles to 1KHz with a duty cycle of 50%.
C. Again, pressing the same button will generate a signal of 2KHz with a duty cycle of 75%.
A third time button press will result in the generation of case A and so on.

- **Draw the schematic diagram showing clearly the button circuit and oscilloscope.**
- **Draw the timing diagram with cursors clearly showing the time period with appropriate units.**
- **Assuming oscillator clock of 24MHz is used.**
- **Use timer interrupt.**

Part # A

Frequency=24MHz

Generate signal of frequency = 0.5K Hz.
duty cycle=25%

Time period is,
t=1/f , t=1/0.5K , t=2ms

Duty cycle = [(uptime) / (total time)] * 100

uptime=[(duty cycle / 100)] *(total time)
uptime= (25 / 100) *2ms
uptime= 0.5ms
uptime=2*500usec=1000
(1000)10=(3E8)16
UP_DELAY= ffff-3E8
=(FC17)16

so off-time=total time - uptime
off-time=(2-0.5)ms
off-time=1.5msec
off-time=2*1500usec=3000us
(3000)10=(BB8)16
UP_DELAY= ffff-BB8
=(F447)16

Part # B

Generate signal of frequency = 1KHz.
duty cycle=50%

Time period is,
t=1/f , t=1/1K , t=1ms

Duty cycle = [(uptime) / (total time)] * 100

uptime=[(duty cycle / 100)] *total time
uptime= (50 / 100) *1ms
uptime= 0.5ms
uptime= 2*500usec =1000us
(1000)10=(3E8)16
UP_DELAY= ffff-3E8
=(FC17)16

so off-time=total time - uptime
off-time=(1-0.5)ms
off-time=0.5ms
off-time=2*500us=1000us
(1000)10=(3E8)16
UP_DELAY= ffff-3E8
=(FC17)16

```
}
```

Part # C

Generate signal of frequency = 2KHz.
duty cycle=75%

Time period is,
t=1/f ,   t=1/2K , t=0.5ms

Duty cycle = [(uptime) / (total time)] * 100

uptime=[(duty cycle / 100)] *total time
uptime= (75 / 100) *0.5ms
uptime= 0.375ms =375us
uptime= 2*375us=750us

(750)10=(2EE)16
UP_DELAY= ffff-2EE
=(FD11)16

so off-time=total time - uptime
off-time=(0.5-0.375) ms
off-time=0.125ms=125us
off-time=2*125us=250us
(250)10=(FA)16
UP_DELAY= ffff-FA
=(FF05)16

CODE:

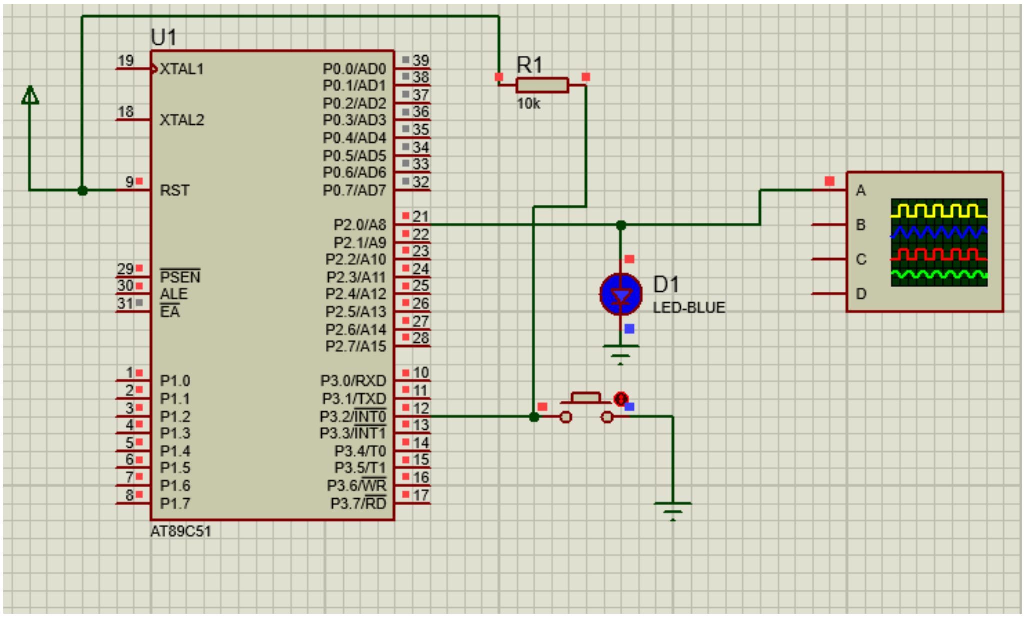
```
#include<reg51.h>
#include<stdio.h>
sbit interrupt_button =P3^2;      //externalinterrupt at pin 12
sbit led=P2^0;
int count=0;
void start_timer(void)
{
            TR0=1;              //starting timer 0
}
void ext_int_0(void)interrupt 0   //ISR for external interrupt0 INT0 when button is pressed
{
            count=count+1;
}
```

```
void timer_int(void)interrupt 3   //        ISR for roll over condition
{
        switch(count%3)
        {
                case 0:
                        if(led==1)
                        {
                                led=0;
                                TH0=0xF4;
                                TL0=0x44;
                        }
                        else
                        {
                                led=1;
                                TH0=0xFC;
                                TL0=0x17;
                        }
                        break;
                case 1:
                        if(led==1)
                        {
                                led=0;
                                TH0=0xFC;
                                TL0=0x17;
                        }
                        else
                        {
                                led=1;
                                TH0=0xFC;
                                TL0=0x17;
                        }
                        break;
                case 2:
                        if(led==1)
                        {
                                led=0;
                                TH0=0xFB;
                                TL0=0x1D;
                        }
                        else
                        {
                                led=1;
                                TH0=0xFD;
                                TL0=0x11;
```

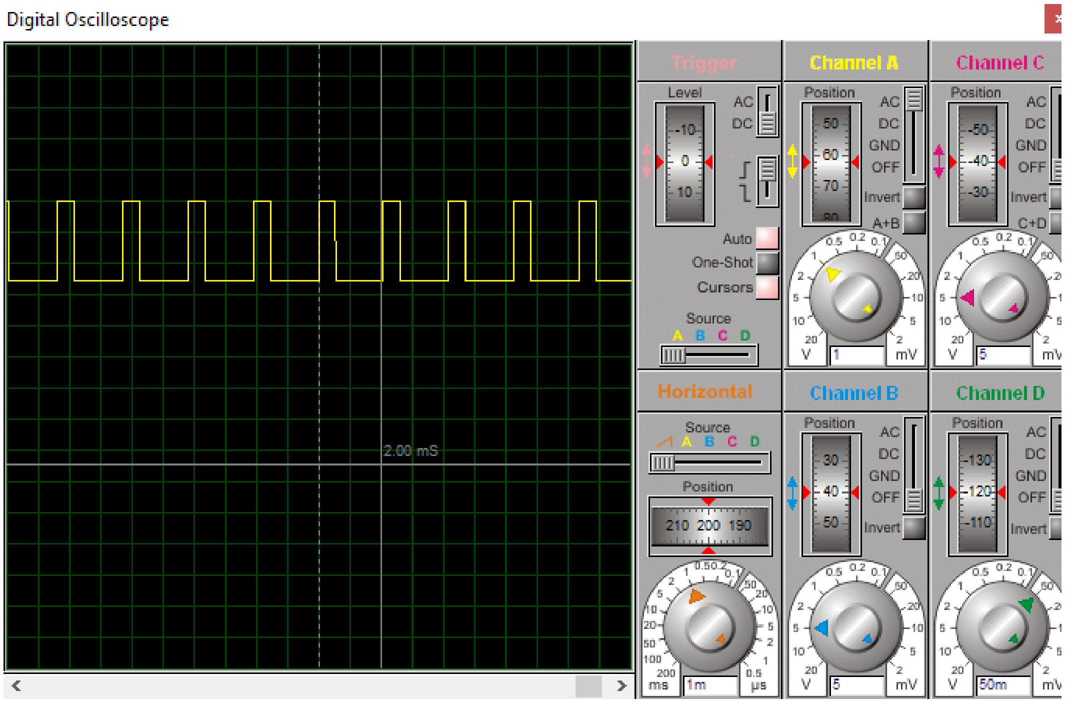
```
            }
            break;
        }
    }
void init_timer(void)
{
    TMOD=0x01; //mod 1 timer
    TH0=0xFC;
    TL0=0x17;
    IE=0x83; //timer 0 overflowinterrupt and externalinterrupt 0
    INT0=1; //externalinterrupt at pin 3.2
}
void main(void)
{
    led=1;
    interrupt_button=1; //configure INT0 pin as an input
    init_timer();
    start_timer();

    while(1)
    {
    }
}
```

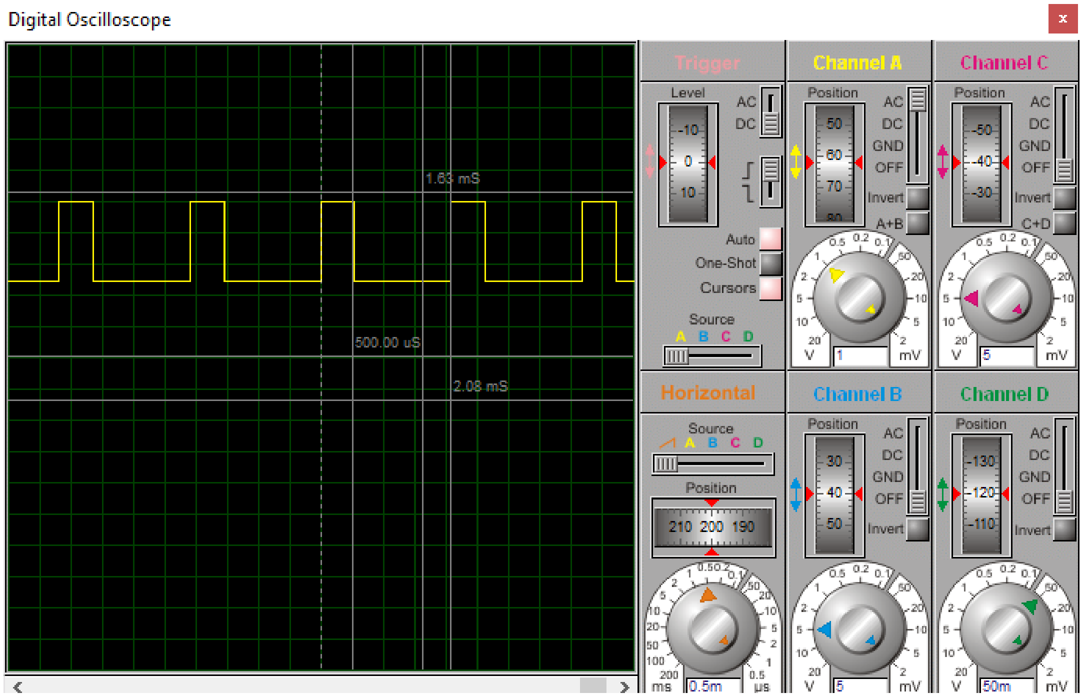
OUTPUT:

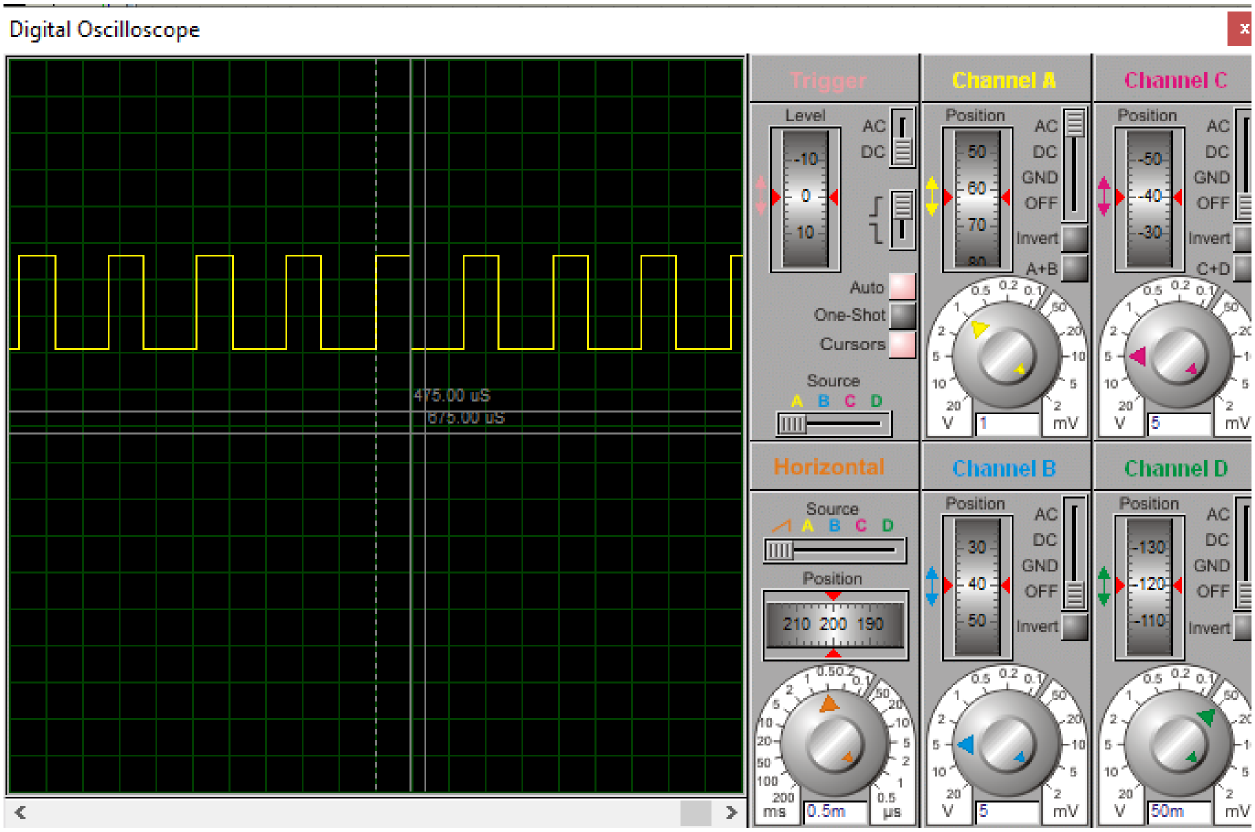


Digital Oscilloscope



Digital Oscilloscope





Digital Oscilloscope

475.00 uS

675.00 uS