University of Engineering and Technology, Peshawar

Department of Computer Systems Engineering.

Course : CSE-303 Microprocessor Based System Design

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Section		A
Batch		21 (Spring_2022)
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Task 03

A. Generate a signal on pin P1.1 having frequency equal to 10 Hz with a duty cycle of 10%.

B. When a user presses a button at P1.2 then frequency changes to 20Hz with a 20% duty cycle.

C. When a user again presses the same button then frequency changes to 40Hz with a duty cycle of 40%.

D. When a user again presses the same button then frequency changes to 80Hz 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 delay using Timer.

Part # A

Generate signal of frequency = 80 Hz.
duty cycle=10%

Time period is,
t=1/f , t=1/10 , t=0.1sec=100msec

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

uptime=[(duty cycle / 100)] *total time
uptime= (10 / 100) *100ms
uptime= 10ms
uptime=10,000usec
(10,000)10=(2710)16
UP_DELAY= ffff-2710
=(D8EF)16

so off-time=total time - uptime
off-time=(100-10)ms
off-time=90msec
off-time=90,000usec
(90,000)10=(15F90)16
UP_DELAY= ffff-15F90
=(D8EF)16

Part # B

Generate signal of frequency = 20Hz.
duty cycle=20%

Time period is,
t=1/f , t=1/200 , t=50ms

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

uptime=[(duty cycle / 100)] *total time
uptime= (20 / 100) *50ms
uptime= 10ms
uptime= 10000usec
(10,000)10=(2710)16
UP_DELAY= ffff-2710
=(D8EF)16

so off-time=total time - uptime

off-time=(50-10)ms
off-time=40ms
off-time=40,000microsec
(40,000)10=(9C40)16
UP_DELAY= ffff-9C40
=(63BF)16

Part # C

Generate signal of frequency = 40 Hz.
duty cycle=40%

Time period is,
t=1/f , t=1/40 , t=25ms

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

uptime=[(duty cycle / 100)] *total time
uptime= (40 / 100) *20ms
uptime= 10ms
uptime= 10,000microsec
(10,000)10=(2710)16
UP_DELAY= ffff-2710
=(D8EF)16

so off-time=total time - uptime
off-time=(25-10) ms
off-time=15ms
off-time=15,000microsec
(15,000)10=(3A98)16
UP_DELAY= ffff-3A98
=(C567)16

Part # D

Generate signal of frequency = 80 Hz.
duty cycle=80%

Time period is,
t=1/f , t=1/80 , t=12.5ms

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

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

uptime= (80 / 100) *12.5ms
uptime= 10ms
uptime=10,000usecond
(10,000)10=(2710)16
UP_DELAY= ffff-2710
=(D8EF)16

so off-time=total time - uptime
off-time=(12.5-10)ms
off-time=2.5ms
uptime= 25,00usec
(2,500)10=(9C4)16
UP_DELAY= ffff-9C4
=(F63B)16

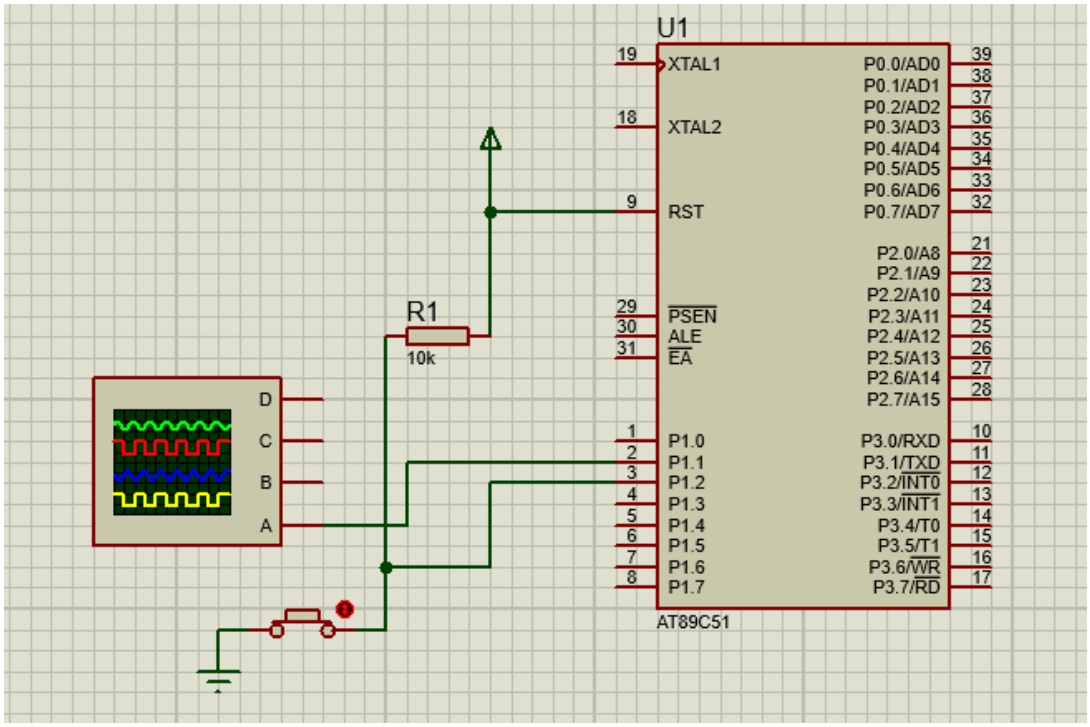
Code:

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

sbit delay=P1^1;
sbit toggle=P1^2;
int counter=0;
unsigned int a=0;
void  start_timer0(void)
{
  TR0=1;
}
void timer0(void)interrupt 1
{
  if(counter==0)
  {
    if(delay==0 && a==0)
    {
          delay=1;
          TH0=0xD8;
          TL0=0xEF;
    }
    else
    {
          a++;
```

```
            delay=0;
            if(a==9)
            {
              a=0;
            }
            TH0=0xD8;
            TL0=0xEF;
    }
  }
  else if(counter==1)
  {
    if(delay==1)
    {
            TH0=0x63;
            TL0=0xBF;
    }
    else{
             TH0=0xD8;
            TL0=0xEF;
    }
    delay=~delay;
  }
  else if(counter==2)
  {
    if(delay==1)
    {
            TH0=0xC5;
            TL0=0x67;
    }
    else {
            TH0=0xD8;
            TL0=0xEF;
    }
    delay=~delay;
  }
   else if(counter==3)
  {
    if(delay==1)
    {
            TH0=0xF6;
            TL0=0x3B;
    }
    else {
            TH0=0xD8;
```

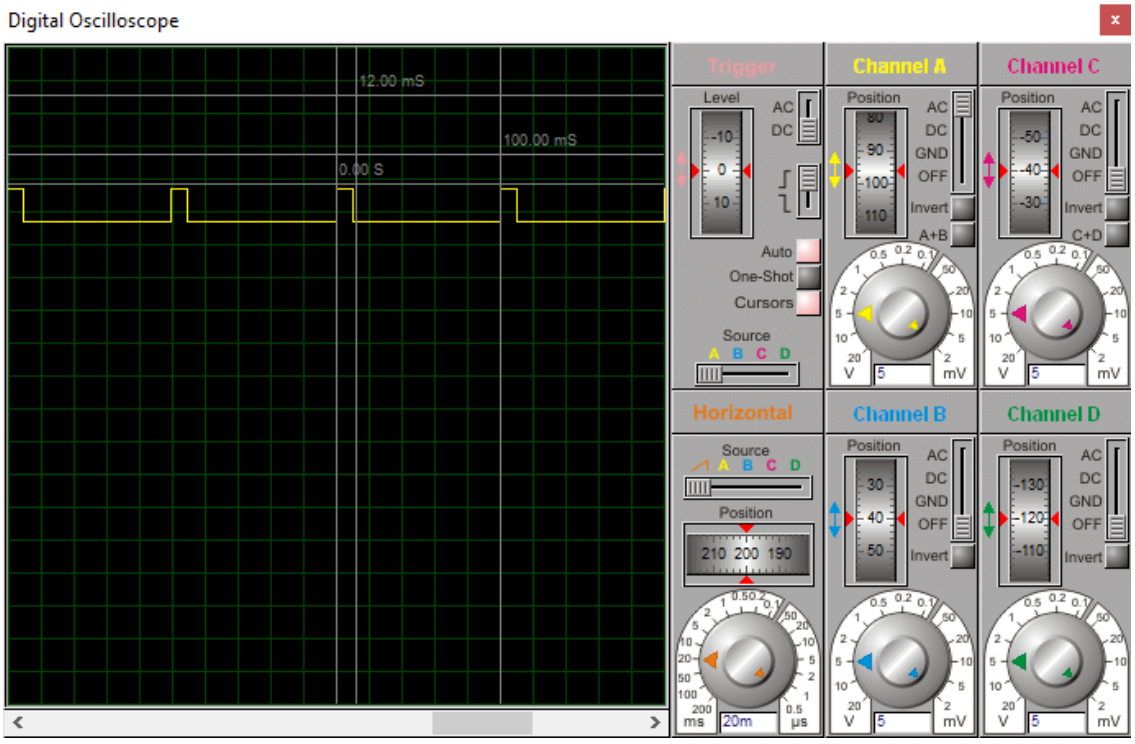
```
            TL0=0xEF;
      }
      delay=~delay;
   }
}

void init_timer0(void){
   TMOD=0x01;
   TH0=0xFB;
   TL0=0x9A;
   IE=0x83;
}


void main(void)
 {
   // Write your code here
  init_timer0();
    start_timer0();
    while(1)
    {
      if(toggle==0)
      {
            if(counter<3)
              counter++;
            else if(counter==3)
              counter=0;
      }
    }
 }
```

Circuit diagram:

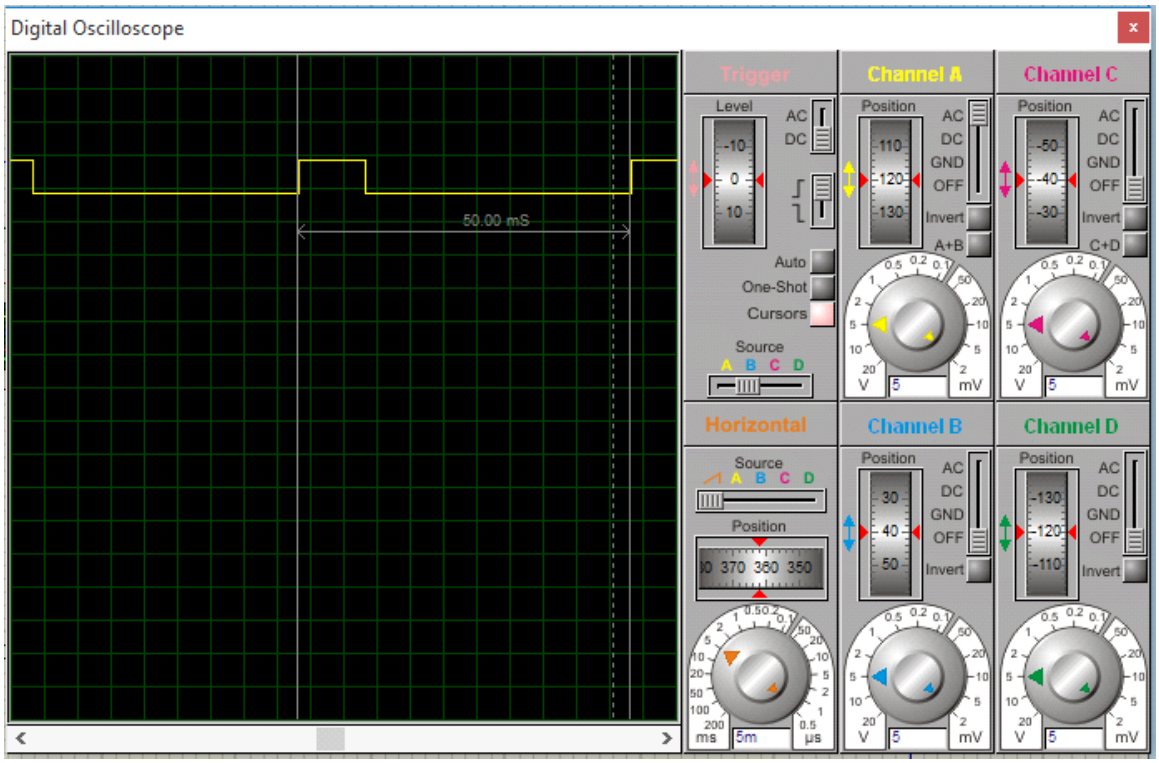


Output:

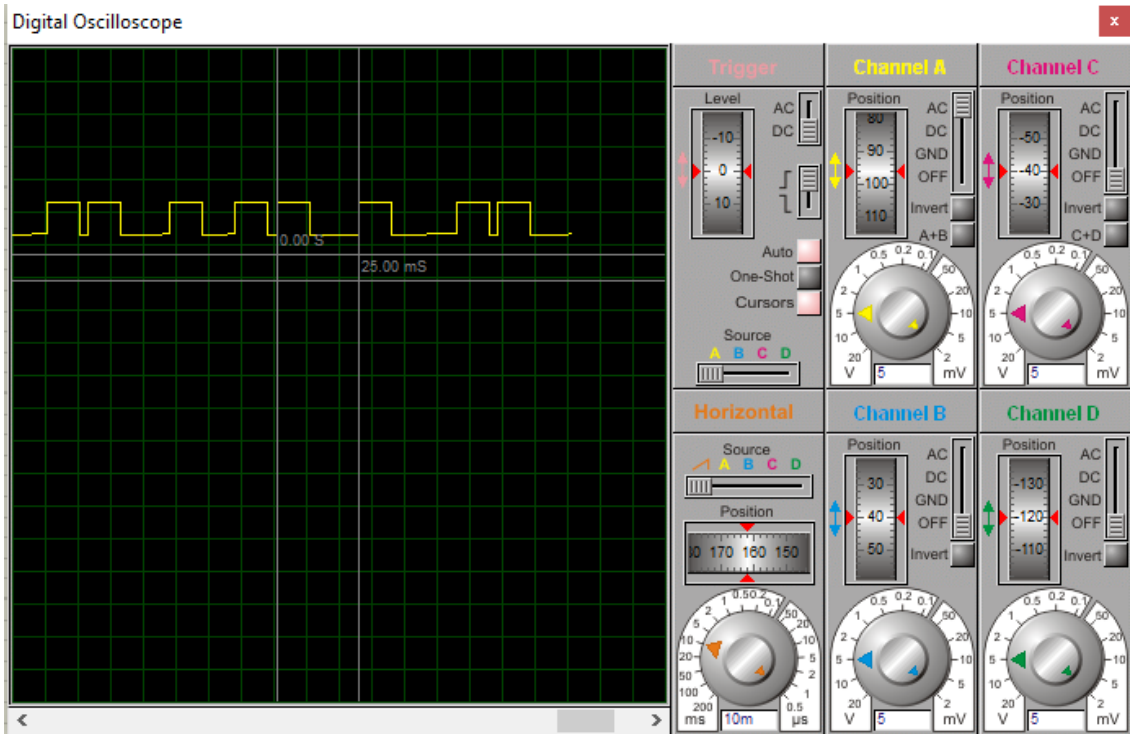
Delay=100ms



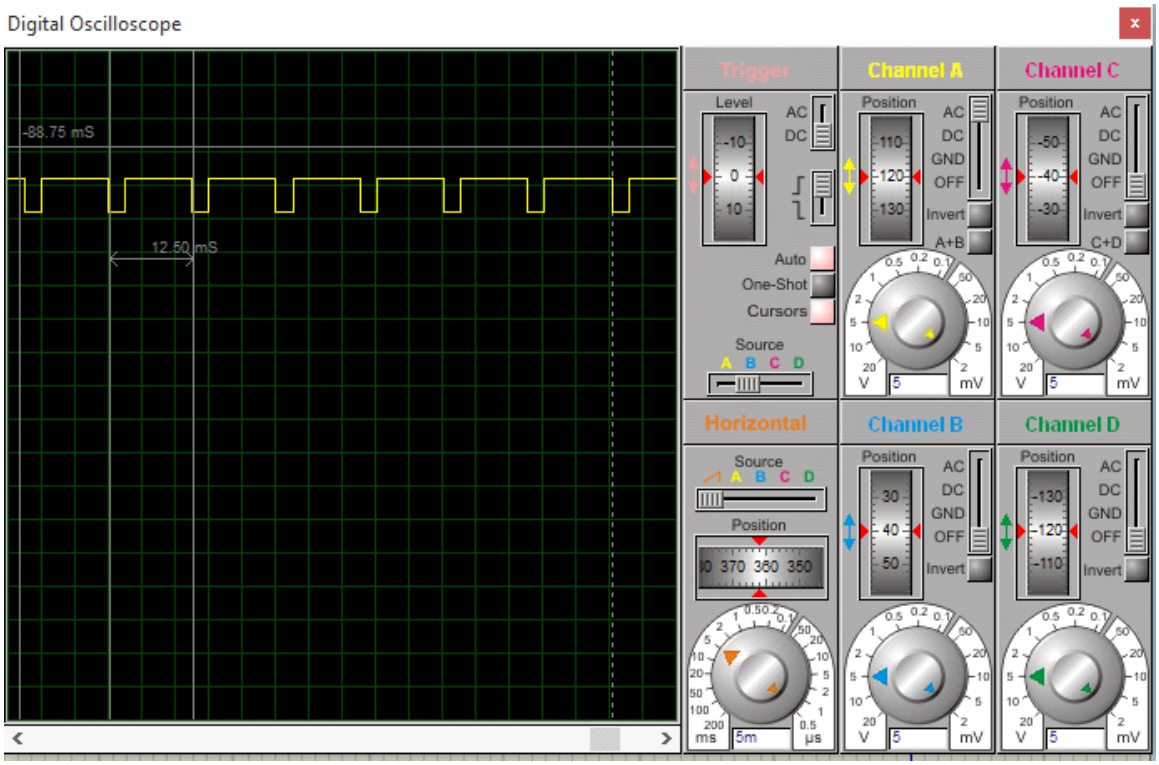
Delay=50ms


Digital Oscilloscope
50.00 mS
Trigger
Level
AC
DC
Auto
One-Shot
Cursors
Source
A B C D
Channel A
Position
AC
DC
GND
OFF
Invert
A+B
Channel C
C+D
Horizontal
Position
370 360 350
5m
µs
Channel B
Channel D
V
mV

Delay=25ms


Digital Oscilloscope
0.00 S
25.00 mS
Trigger
Level
AC
DC
Auto
One-Shot
Cursors
Source
A B C D
Channel A
Position
AC
DC
GND
OFF
Invert
A+B
Channel C
C+D
Horizontal
Position
170 160 150
10m
µs
Channel B
Channel D
V
mV

Delay=12ms


Digital Oscilloscope
-88.75 mS
12.50 mS
Trigger
Level
AC
DC
Auto
One-Shot
Cursors
Source
A B C D
Channel A
Position
AC
DC
GND
OFF
Invert
A+B
Channel C
C+D
Horizontal
370 360 350
5m
ms
µs
Channel B
Channel D
V
mV