



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRONICS & COMMUNICATION

FALL SEMESTER 2023 – 2024

ECE – 4003

EMBEDDED SYSTEM DESIGN

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LAB ASSESSMENT – 1

TIMERS & COUNTERS

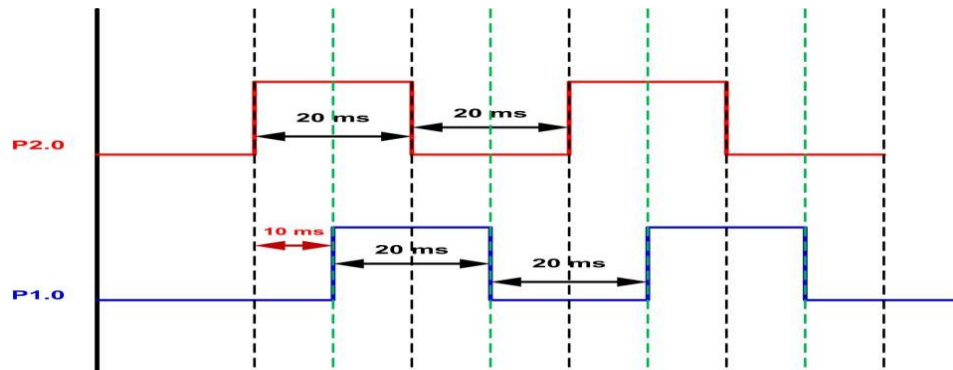
VINYAS A SHETTY

20BEC0780

L27+28

QUESTION 1:

Develop an 8051 ALP program to generate square waves as shown below. Examine the same using the KEIL IDE inbuilt Logic Analyzer.

**Calculation: -**

Delay for 10ms = $10\text{ms}/1.085\mu\text{s} = 9216$ $65535 - 9216 = 56320 = (\text{DC00})\text{h}$
 Delay for 20ms = $20\text{ms}/1.085\mu\text{s} = 18433$ $65535 - 18433 = 47102 = (\text{B7FF})\text{h}$

CODE:

```
//VINYAS A SHETTY
ORG 0000H
MOV TMOD, #01H; Timer 0 mode 1
CLR P1.0
CLR P2.0
ACALL DELAY2
HERE:CPL P2.0
ACALL DELAY1
CPL P1.0
ACALL DELAY1
SJMP HERE
DELAY2:MOV TH0, #0B7H; Delay for 20ms
MOV TL0, #0FFH
```

ACALL TIMER

RET

DELAY1:MOV TH0, #0DCH; Delay for 10ms

MOV TL0, #00H

ACALL TIMER

RET

TIMER: SETB TR0; Start the timer 0

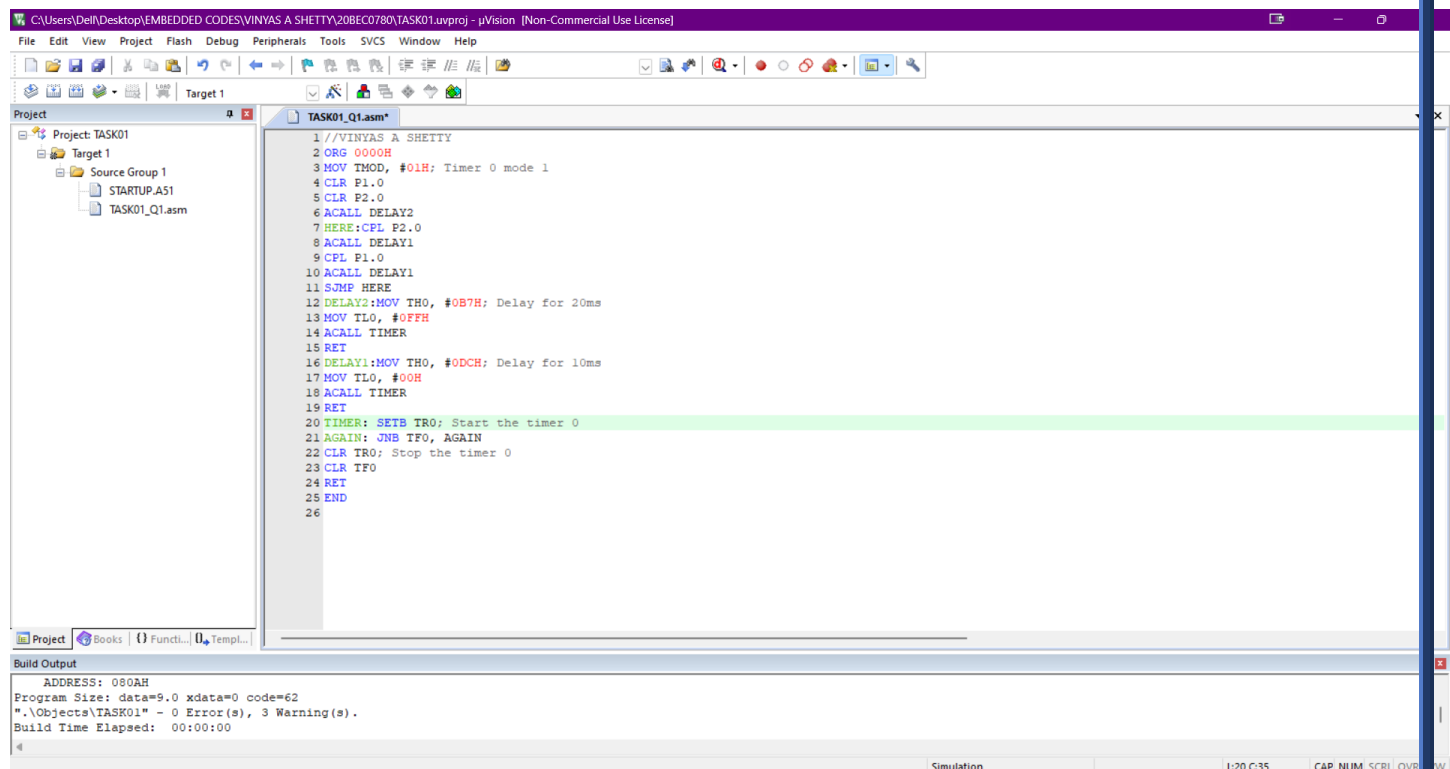
AGAIN: JNB TF0, AGAIN

CLR TR0; Stop the timer 0

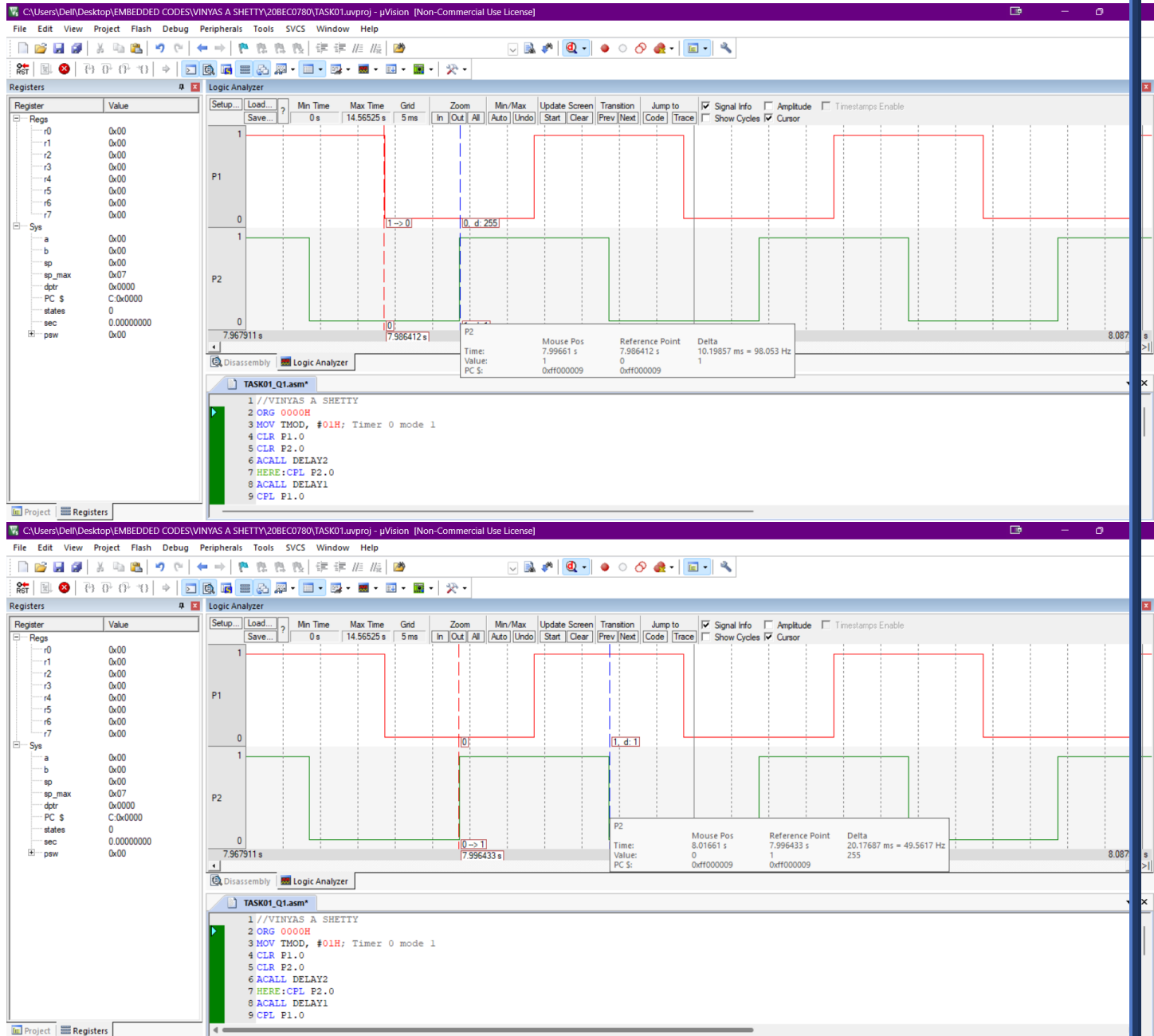
CLR TF0

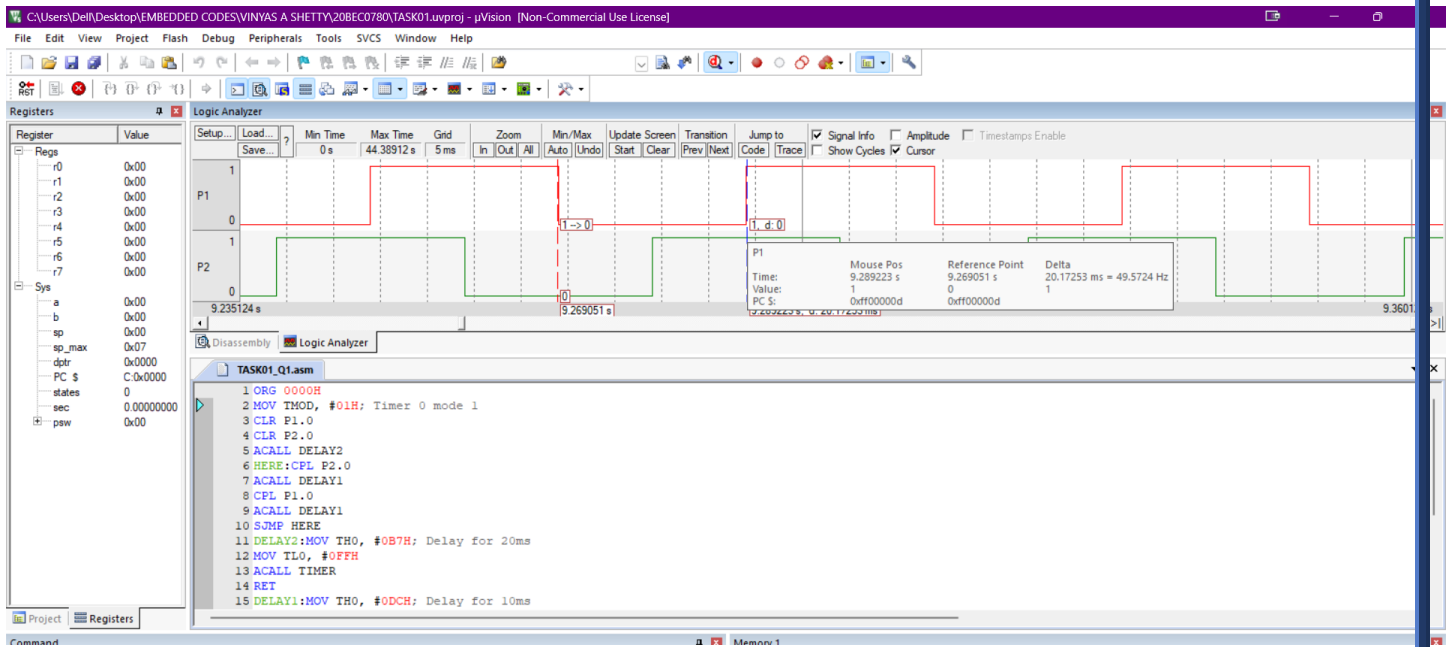
RET

END



SIMULATION RESULTS:





OBSERVATIONS:

By calculations we can get the value that is to be loaded to TH0 and TL0. After loading that value, we can observe a graph with frequency 50Hz, i.e. 20 millisecond ON and 20 millisecond OFF

QUESTION 2:

Write an ALP using 8051 to check the status of two switches connected to port P2.1 and P2.2. If any one of the switches is ON (logic 1) make the LED connected to port 2.7 to toggle for 250 microseconds. Repeat this continuously.

CODE:

```

1 //VINYAS A SHETTY
2 ORG 0000H
3 MOV TH0D, #20H
4 MOV TL0, #15
5 MOV A, #0
6 MOV P2, A
7 SETB P2.7
8 Y1:
9   JB P2.1, WAVE
10  JB P2.2, WAVE
11  JNB P2.1, ZERO
12  SJMP Y1
13 ZERO:
14   CLR P2.7
15   SJMP Y1
16 WAVE:
17   CPL P2.7
18   ACALL DELAY
19   SJMP Y1
20
21 DELAY:
22   SETB TR1
23   AGAIN: JNB TF1, AGAIN
24   CLR TR1
25   CLR TF1
26   RET
27 END

```

```
//VINYAS A SHETTY
```

```
ORG 0000H
```

```
MOV TMOD, #20H
```

```
MOV TH1, #19
```

```
MOV A, #0
```

```
MOV P2, A
```

```
SETB P2.7
```

```
YY:
```

```
    JB P2.1, WAVE
```

```
    JB P2.2, WAVE
```

```
    JNB P2.1, ZERO
```

```
    SJMP YY
```

```
ZERO:
```

```
    CLR P2.7
```

```
    SJMP YY
```

```
WAVE:
```

```
CPL P2.7
```

```
ACALL DELAY
```

```
SJMP YY
```

```
DELAY:
```

```
SETB TR1
```

```
AGAIN: JNB TF1, AGAIN
```

```
CLR TR1
```

```
CLR TF1
```

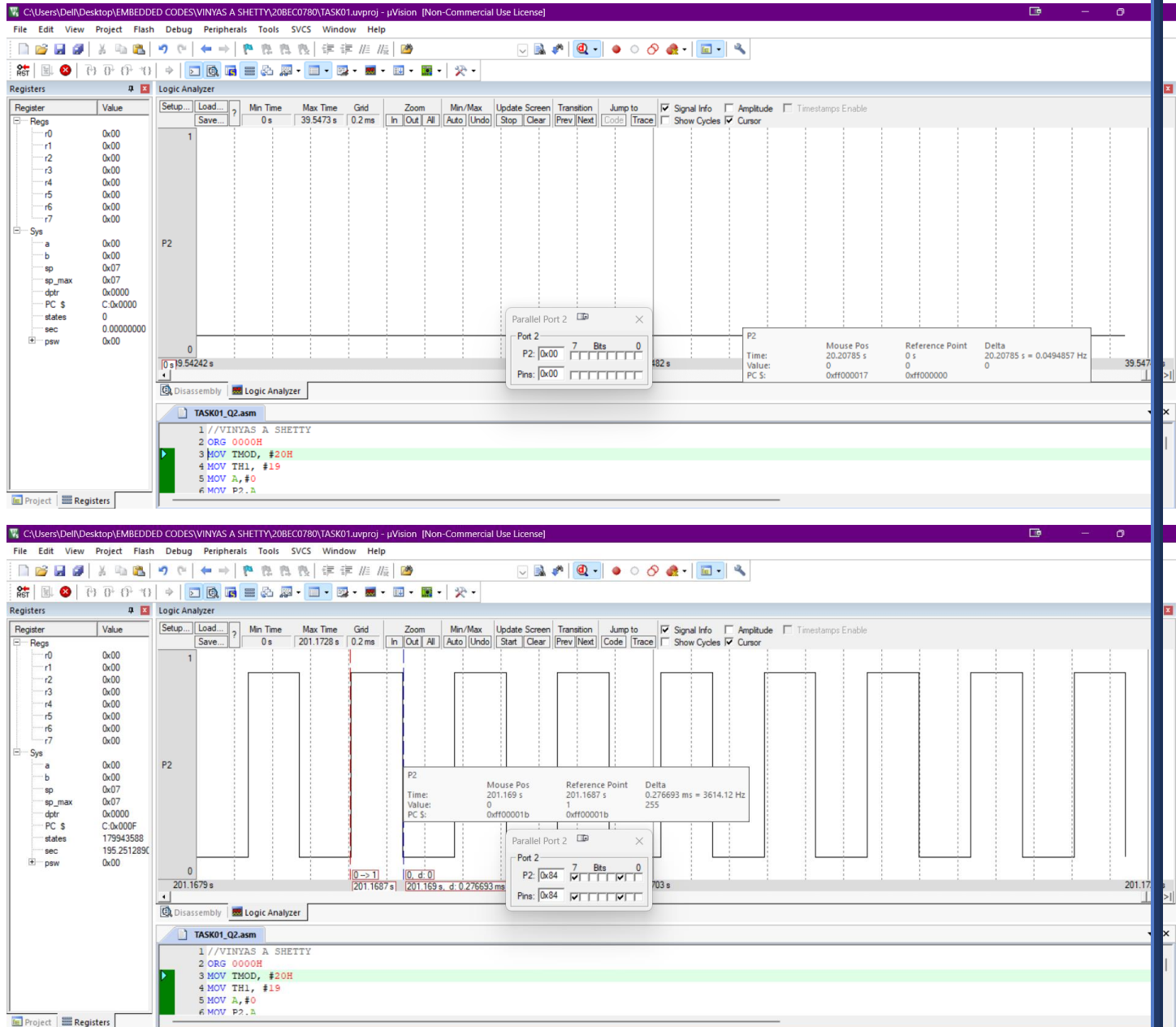
```
RET
```

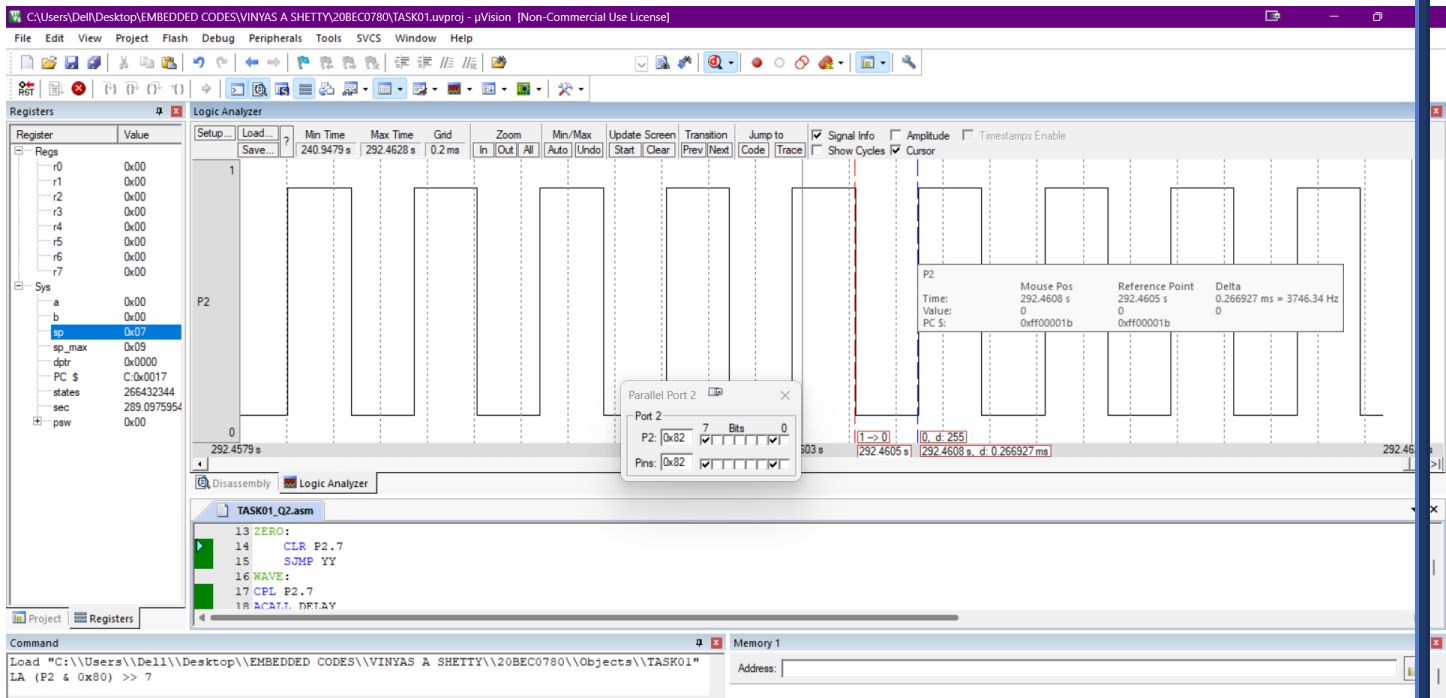
```
END
```

Calculation:

- Delay for 250us = $250\text{us}/1.085\text{us} = 230$
- $255-230=25 = (19)\text{H}$

SIMULATION RESULTS





OBSERVATION:

From the above results we can see that when the Pin P2.1 and P2.2 are turned off the LED that's connected to P2.7 is turned OFF. When either P2.1 or P2.2 are turned ON the LED starts blinking with a delay of 250u secs.

QUESTION 3:

Use Counter 1 in mode 2 and after 10 number of counts on TL1, generate a SQUARE waveform of 1 KHz on P1.2 by using Timer 0 in mode 1, show the counts in TL1 on port 2.

CODE:

```

1 //VINYAS A SHETTY
2 ORG 0000H
3 SETB P3.5
4 SETB P1.2
5 MOV TMOD, #61H
6 MOV TH1, #0F5H
7 SETB TR1
8 XX: JB TF1, WAVE
9 MOV A, TL1
10 MOV P2, A
11 CONE A, #0AH, XX
12 WAVE:
13 YY: MOV TH0, #0FEH
14 MOV TL0, #34H
15
16 CPL P1.2
17 SETB TR0
18 AGAIN: JNB TF0, AGAIN
19 CLR TF0
20 CLR TR0
21 SJMP YY
22 END

```



```
//VINYAS A SHETTY
ORG 0000H

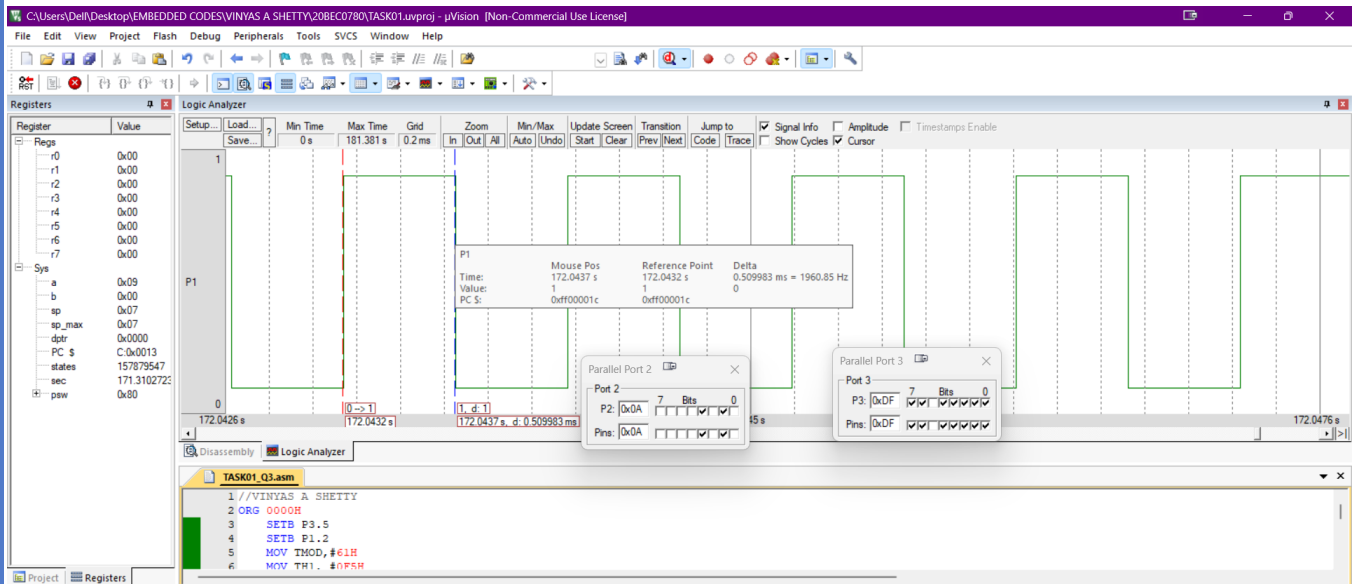
    SETB P3.5
    SETB P1.2
    MOV TMOD,#61H
    MOV TH1, #0F5H
    SETB TR1
    XX:JB TF1,WAVE
    MOV A,TL1
    MOV P2,A
    CJNE A,#0AH,XX
    WAVE:
    YY:MOV TH0,#0FEH
    MOV TL0,#34H

    CPL P1.2
    SETB TR0
    AGAIN: JNB TF0,AGAIN
    CLR TF0
    CLR TR0
    SJMP YY
    END
```

Calculation:

- Given 1khz required so time period = $1/1000=1\text{ms}$
- Required delay= $1\text{ms}/2=0.5\text{ms}$
- Delay for 0.5ms = $0.5\text{ms}/1.085\text{us}=460$
- $65535-460=65075=(\text{FE34})_{\text{h}}$

SIMULATION RESULTS:



OBSERVATIONS:

From the above results we can conclude that when the accumulator reaches the value 10(0AH) the timer starts working and till then the timer will be set to 1

LAB QUESTIONS:

QUESTION 1

Write an ALP to generate a square wave of 500Hz in Timer0

CODE:

The screenshot shows the µVision IDE interface. The Project window displays the structure of the project, including the assembly code for TASK01_LAB1.asm.

Project Structure:

- Project: TASK01
 - Target 1
 - Source Group 1
 - STARTUP.A51
 - TASK01_LAB1.asm

Disassembly (TASK01_LAB1.asm):

```

1 //VINYAS A SHETTY
2 ORG 0000H
3 MOV TMOD, #01H
4 HERE: MOV TLO, #66H
5 MOV TH0, #0FCH
6 CPL P1.0
7 ACALL DELAY
8 SJMP HERE
9 DELAY: SETB TR0
10 AGAIN: JNB TFO, AGAIN
11 CLR TR0
12 CLR TFO
13 RET
14 END
15

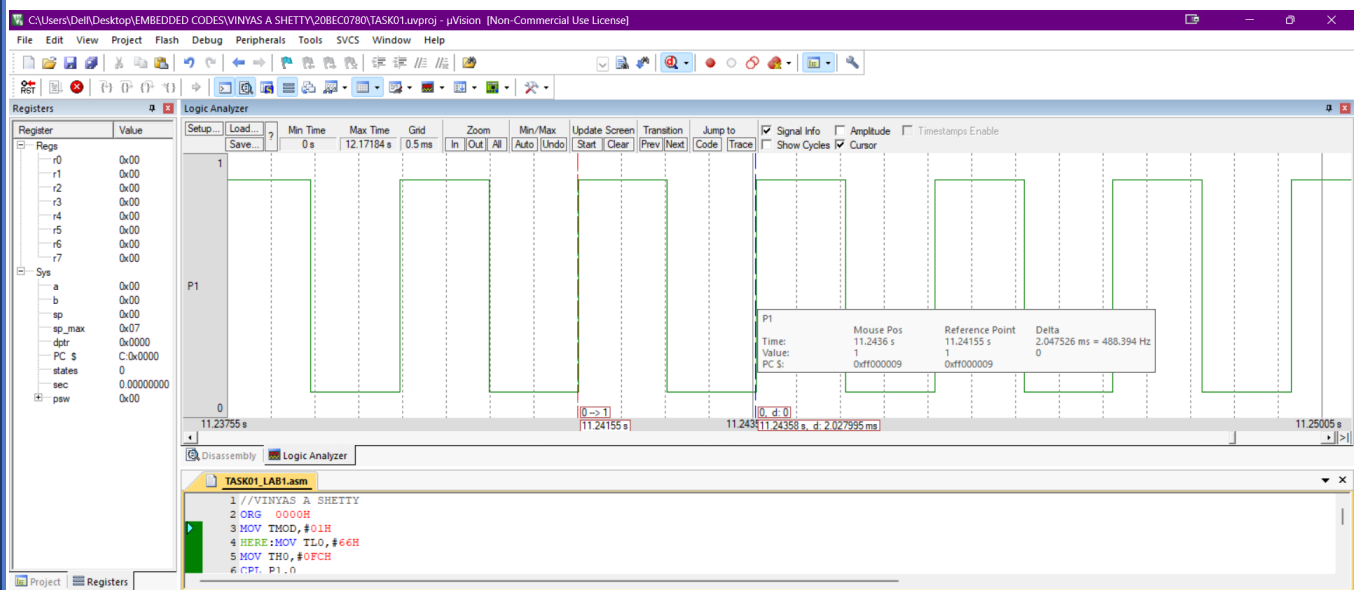
```

```

//VINYAS A SHETTY
ORG 0000H
MOV TMOD,#01H
HERE:MOV TL0,#66H
MOV TH0,#0FCH
CPL P1.0
ACALL DELAY
SJMP HERE
DELAY:SETB TR0
AGAIN:JNB TF0,AGAIN
CLR TR0
CLR TF0
RET
END

```

SIMULATION RESULTS:



OBSERVATIONS:

A square wave of 500Hz that is 1ms is generated at Port 1.0 using timer 0 mode 1

QUESTION 2:

Write an ALP to generate a square wave of frequency of 1Khz at any pin of port 1.

CODE:

```

1 //VINYAS A SHETTY
2 ORG 0000H
3 MOV TMOD,#10H
4 HERE:MOV TL1,#33H
5 MOV TH1,#0FEH
6 CPL P1.0
7 ACALL DELAY
8 SJMP HERE
9 DELAY:SETB TR1
10 AGAIN:JNB TF1,AGAIN
11 CLR TR1
12 CLR TF1
13 RET
14 END

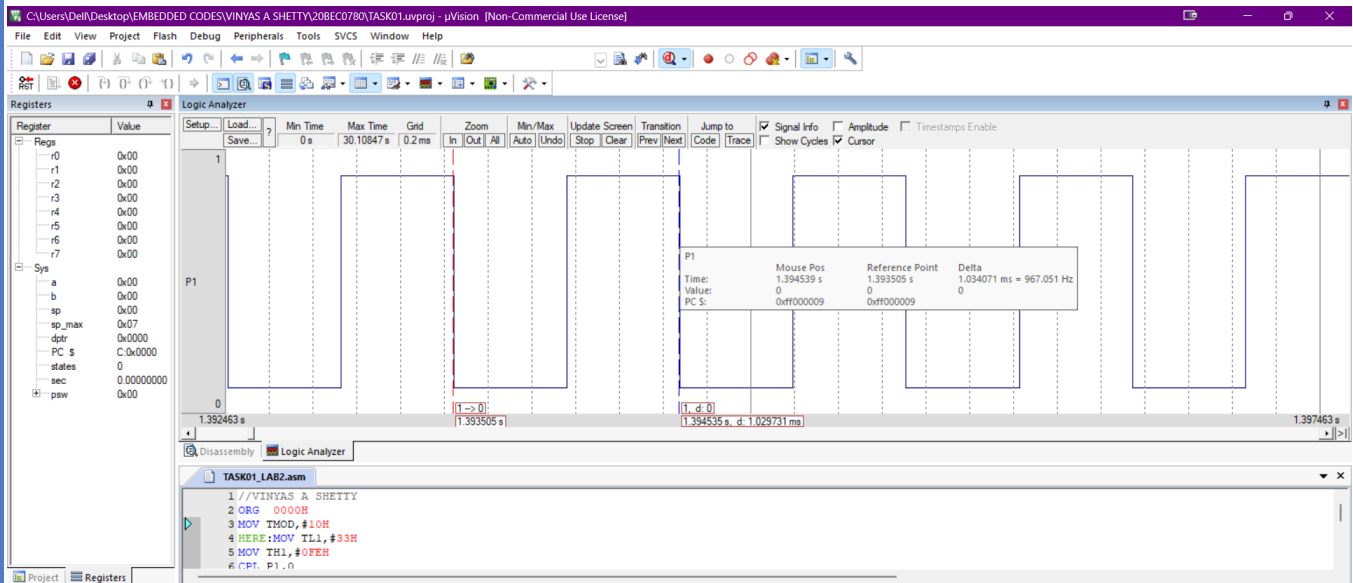
```

```

//VINYAS A SHETTY
ORG 0000H
MOV TMOD,#10H
HERE:MOV TL1,#33H
MOV TH1,#0FEH
CPL P1.0
ACALL DELAY
SJMP HERE
DELAY:SETB TR1
AGAIN:JNB TF1,AGAIN
CLR TR1
CLR TF1
RET
END

```

SIMULATION RESULTS:



OBSERVATIONS:

A square wave of frequency 1Khz is generated at Port 1.0

QUESTION 3:

Write an ALP to count the values and read them in PORT 2.

CODE:

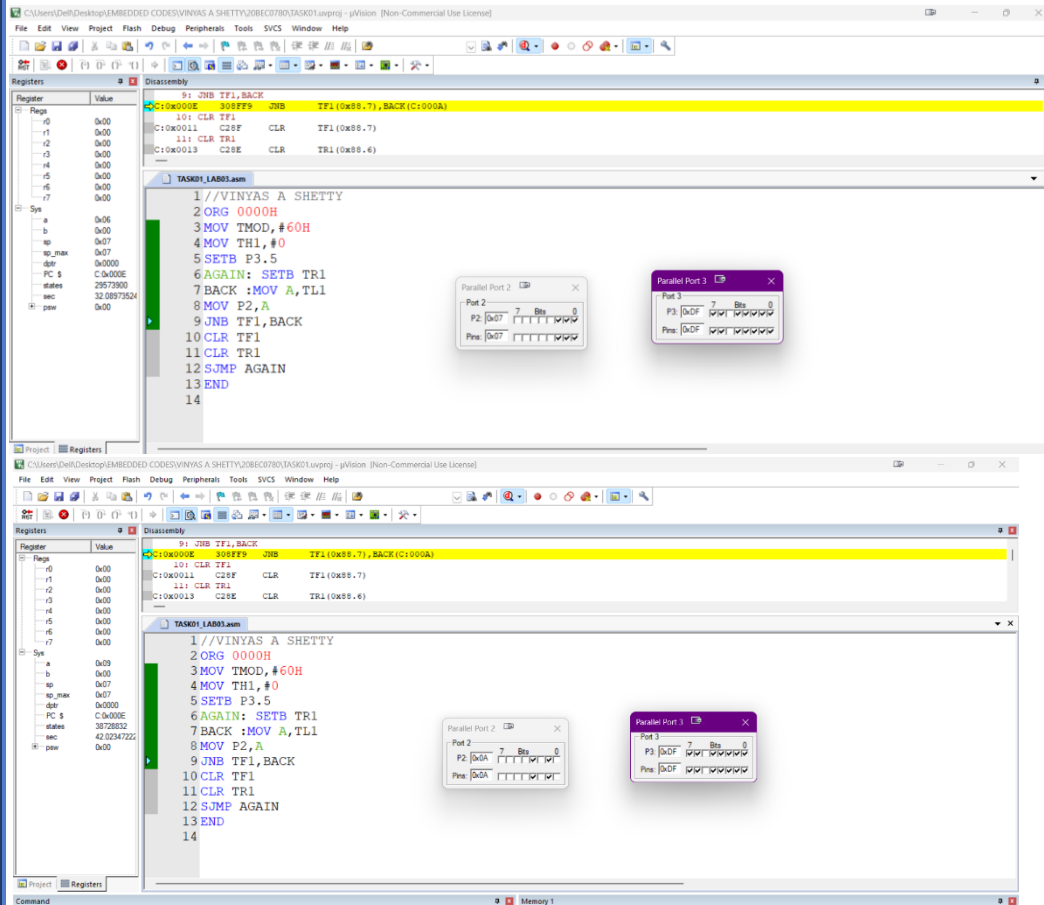
```

1 //VINYAS A SHETTY
2 ORG 0000H
3 MOV TMOD, #60H
4 MOV TH1, #0
5 SETB P3.5
6 AGAIN: SETB TR1
7 BACK :MOV A, TL1
8 MOV P2, A
9 JNB TF1, BACK
10 CLR TF1
11 CLR TR1
12 SJMP AGAIN
13 END
14

```

```
//VINYAS A SHETTY
ORG 0000H
MOV TMOD,#60H
MOV TH1,#0
SETB P3.5
AGAIN: SETB TR1
BACK :MOV A,TL1
MOV P2,A
JNB TF1,BACK
CLR TF1
CLR TR1
SJMP AGAIN
END
```

SIMULATION RESULTS:



OBSERVATIONS:

Whenever the pin 3.5 goes from HIGH to LOW the counter value that is TL1 is increased, as the TL1 is sent to Port 2 we observe the count value in port 2