INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR

Department of Electronics and Communication Engineering

Academic Session: July to December 2024 (Odd Semester)

Embedded System Design LAB (ECL-322)

V Semester ECE-IoT

Date:25/09/2024

Experiment No. 7

Name of Student: JJATEEN GUNDESHA

Registration No.: BT22ECI002

Aim: Write an assembly language program to find the largest and the smallest number from the array of 10 numbers.

Requirements: Keil

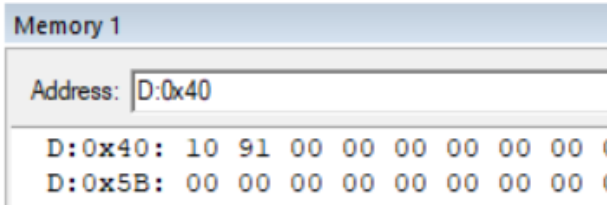
Program Code:

```
ORG 00H
MOV RO, #30H
MOV 30H,#12H
MOV 31H, #34H
MOV 32H,#56H
MOV 33H,#78H
MOV 34H,#23H
MOV 35H, #45H
MOV 36H,#67H
MOV 37H, #89H
MOV 38H,#10H
MOV 39H, #91H
MOV R7, #0AH
MOV A, GRO
MOV R4, A
MOV R5,A
MAIN:
MOV R6,#09H
UP:
INC R0
MOV A, @R0
```

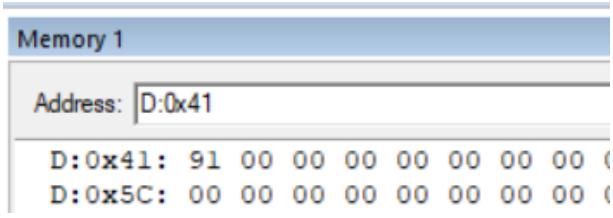
```
MOV R2,A
CLR C
SUBB A, R4
  JNC CHECK_SMALLEST
MOV A,R2
MOV R4, A
CHECK SMALLEST:
MOV A,R2
CLR C
SUBB A, R5
JC NEXT
MOV A,R2
MOV R5, A
NEXT:
DJNZ R6, UP
DJNZ R7, MAIN
MOV 40H, R4

MOV 41H, R5
END
```

Output:



SMALLEST NUMBER AT THE LOCATION 40H



LARGEST NUMBER AT THE LOCATION 41H

Result/ Conclusion:

The program efficiently finds the smallest and the largest number from the given array of 10 numbers.

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Date:25/09/2024

Experiment No. 8

Name of Student: JJATEEN GUNDESHA

Registration No.: BT22ECI002

Aim: Write an assembly language program to find the determinant of 2x2 matrix.

Requirements: Keil

Program Code:

```
ORG 00H

MOV 30H,#03H
MOV 31H,#02H
MOV 32H,#01H
MOV 33H,#04H

MOV A,30H
MOV B,33H
MUL AB
MOV 40H,A
MOV 41H,B

MOV A,31H
```

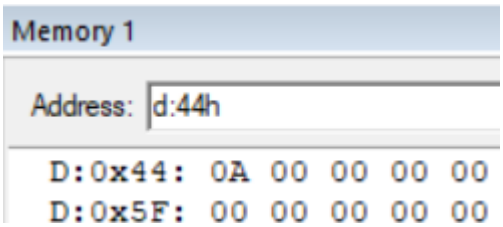
```
MOV B,32H
MUL AB
MOV 42H,A
MOV 43H,B

MOV A,40H
CLR  C
SUBB A,42H
MOV 44H,A

MOV  A,41H
SUBB A,43H
MOV 45H,A

END
```

Output:



Result/ Conclusion:

The program efficiently finds the determinant of 2x2 matrix.

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR

Department of Electronics and Communication Engineering

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Date:16/10/2024

Experiment No. 9(A)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: Blink LED with time delay of 50ms.

Requirements: Keil

Program Code:

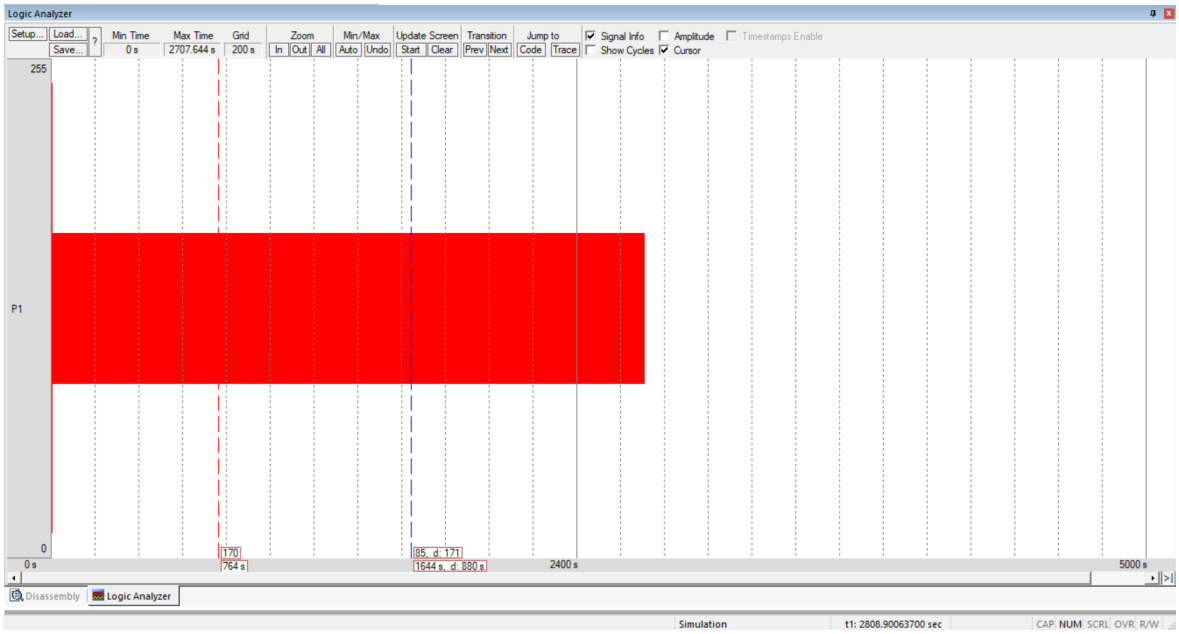
```
ORG 0000H
SJMP START

ORG 0030H
START: MOV P1, #00H          ; Declaring Port-1 as outputRPT:
MOV A, #55H          ; Load accumulator with 55H
   MOV P1, A    ; Output to Port 1
   ACALL Delay    ; Call delay
   CPL A        ; Complement the accumulator
   MOV P1, A    ; Output to Port 1
   ACALL Delay    ; Call delay
   SJMP RPT     ; Infinite loop

ORG 0100H
Delay: MOV R0, #0FFH  ; Adjust R0 for longer delay (e.g., 255)
```

```
loop2: MOV R1, #0FFH  ; Adjust R1 for longer delay
loop1: DJNZ R1, loop1 ; Inner loop
DJNZ R0, loop2 ; Outer loop
RET
    END
```

Output:



Result/ Conclusion:

The LED will blink continuously with a 50ms delay between each state change.

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Date:16/10/2024

Experiment No. 9(B)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: Generate a square wave delay of time period 1sec atport-1 using Timer-1 in mode-1.

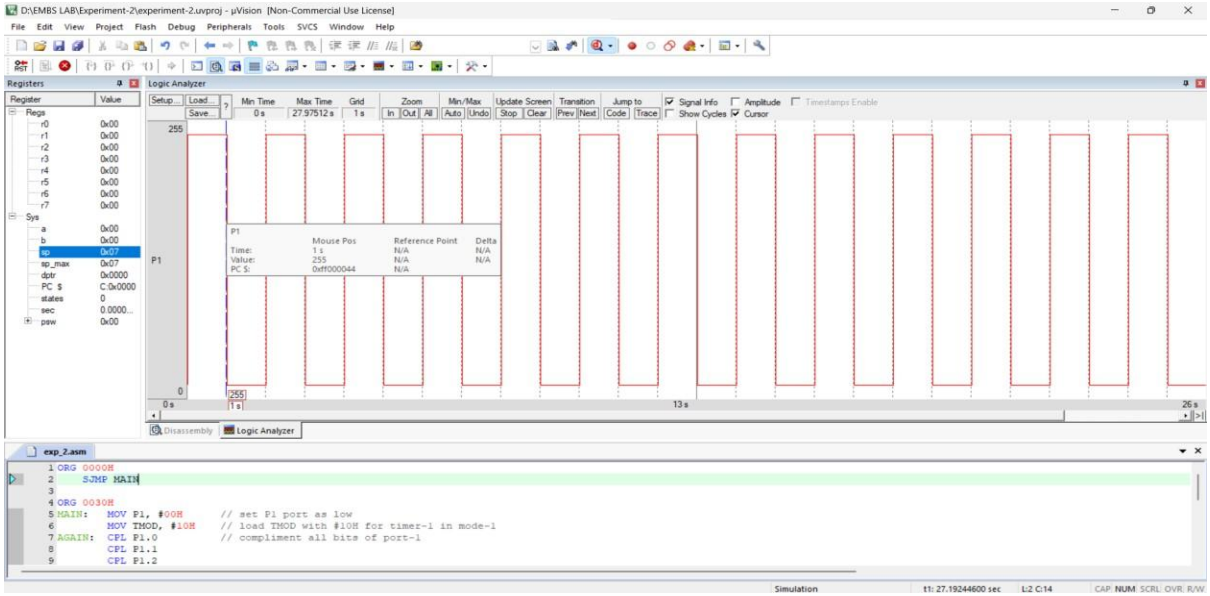
Requirements: Keil

Program Code:

```
ORG 0000H
        SJMP MAIN

ORG 0030H
MAIN: MOV P1, #00H      // set P1 port as low
MOV TMOD, #10H  // load TMOD with #10H for timer-1 in mode-1

AGAIN:  CPL P1.0    // compliment all bits of port-1
                CPL P1.1
                CPL P1.2
                CPL P1.3
                CPL P1.4
                CPL P1.5
                CPL P1.6
                CPL P1.7
```

```
MOV R0, #14H       // load register R0 with #14H(20 in decimal)
   RPT: MOV TH1, #3CH       // load TH1 with 3CH
                MOV TL1, #0B0H // load TL1 with B0H
                SETB TR1      // start timer-1
 CHECK:  JNB TF1, CHECK       // check till TF flag becomes high
  CLR TR1      // clear timer-1
                CLR TF1       // clear TF flag
                DJNZ R0, RPT  // repeat till R0 becomes zero

                SJMP AGAIN   // repeat again
                END
```

Output:



Result/ Conclusion:

The program generates a 1-second square wave on Port-1 using Timer-1 in mode-1.

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR

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Date:16/10/2024

Experiment No. 9(C)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: Generate square wave with 50% duty cycle withfrequency of 1khz on port-1 using timer-0 in mode-2.

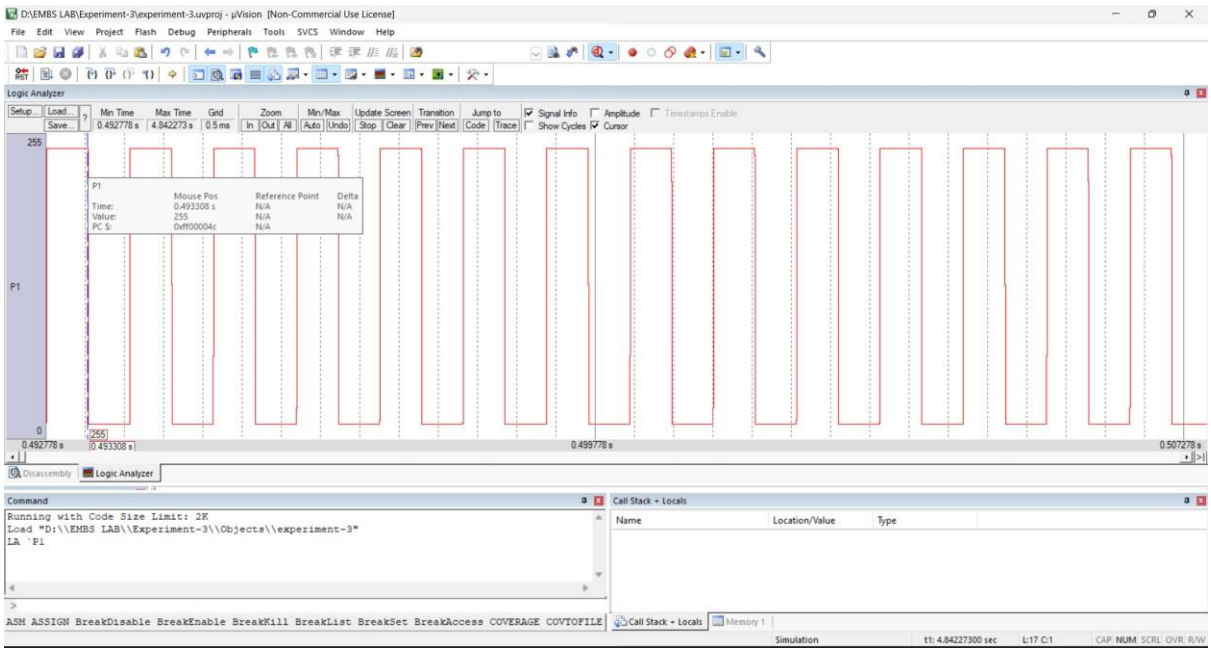
Requirements: Keil

Program Code:

```
ORG 0000H
        SJMP STARTORG 0030H
START:  MOV P1, #00H     // make port-1 low
        MOV TMOD, #02H          // load TMOD with #02H for timer-0 in mode-2
        MOV TH0, #00H // load TH0 with #00H
AGAIN:  CPL P1.0   // compliment all bits of port-1
        CPL P1.1
        CPL P1.2
        CPL P1.3
        CPL P1.4
        CPL P1.5
        CPL P1.6
        CPL P1.7
        MOV R0, #2     // load register R0 with 2
        RPT:    SETB TR0 // start timer-0
```

```
CHECK:      JNB TF0, CHECK   // check TF flag till it becomes high
            CLR TR0          // clear timer-0

            CLR TF0      // clear TF flag

            DJNZ R0, RPT  // repeat till R0 becomes zero


            SJMP AGAIN

END
```

Output:



Result/ Conclusion:

The program generates a 1kHz square wave with a 50% duty cycle on Port-1 using Timer-0 in mode-2.

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR

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V Semester ECE-IoT

Date:16/10/2024

Experiment No. 9(D)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: - Generate rectangular wave with high time=10ms and low time=20ms.

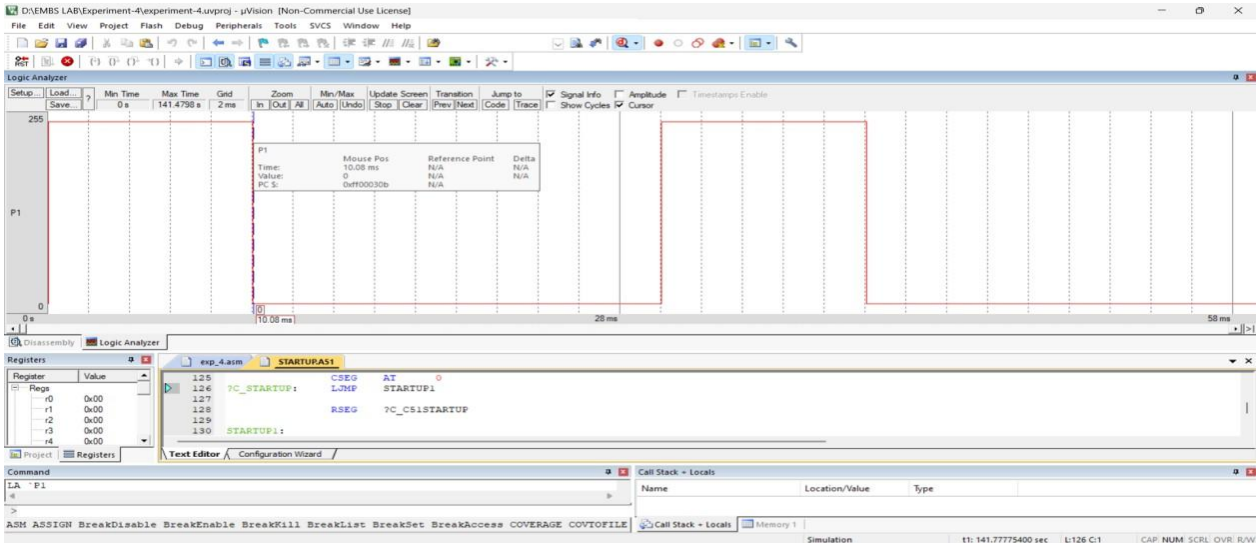
Requirements: Keil

Program Code:

```
ORG 0000H
LJMP START

 ORG 0300H
 START:    MOV P1, #00H   //set port-1 as low
           MOV TMOD, #11H    // load TMOD with #11H for using both the timers in mode-1
 RPT:  MOV P1, #0FFH // set the port-1 as high
           ACALL DELAY1          // call delay for high pulse of 10ms

           MOV P1, #00H   // set port-1 as low
           ACALL DELAY2  // call delay for low pulse of 20ms
           SJMP rpt      // repeat


 ORG 0030H
 DELAY1:   MOV TH0, #0D8H
           MOV TL0, #0F0H

           SETB TR0
```

```
CHECK1:   JNB TF0, CHECK1
          CLR TR0
          CLR TF0
          RET
ORG 00A0H
DELAY2: MOV TH1, #0B1H
          MOV TL1, #0E0H
          SETB TR1
CHECK2:    JNB TF1, CHECK2
          CLR TR1
          CLR TF1
          RET
          END
```

Output:



Result/ Conclusion:

The program generates a rectangular wave with a 10ms high time and 20ms low time on Port-1.

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INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR
Department of Electronics and Communication Engineering
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Embedded System Design LAB (ECL-322)

V Semester ECE-IoT

Date:16/10/2024

Experiment No. 9(E)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: Generate square wave with initial time period of 40ms then 10ms.

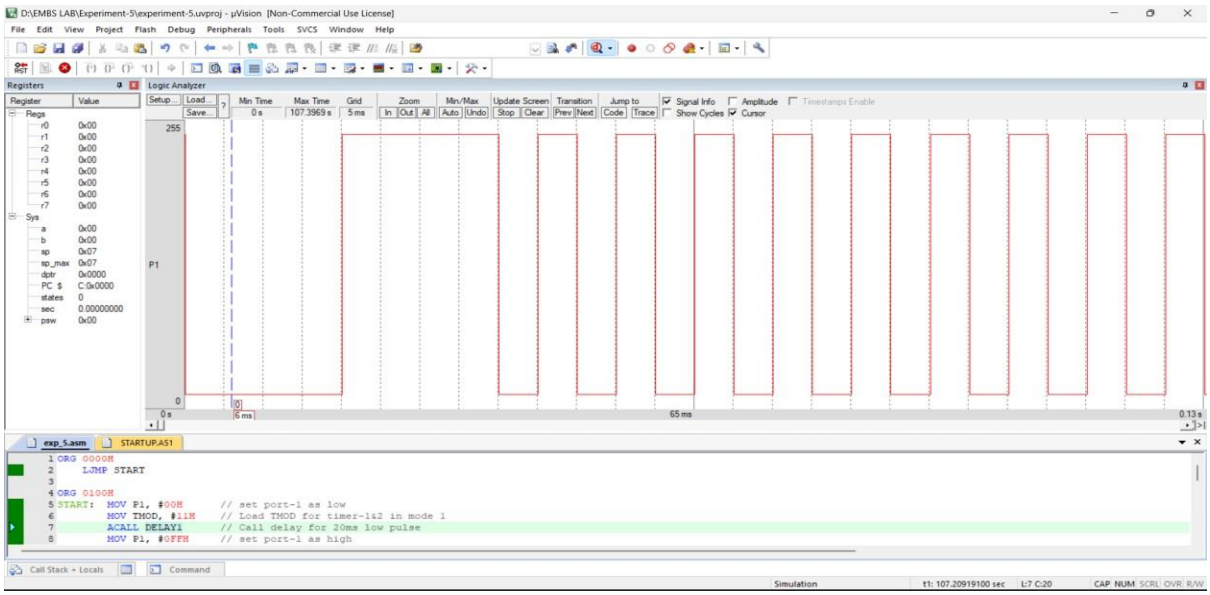
Requirements: Keil

Program Code:

```
ORG 0000H
        LJMP START
ORG 0100H
START:  MOV P1, #00H   // set port-1 as low
        MOV TMOD, #11H          // Load TMOD for timer-1&2 in mode 1
        ACALL DELAY1  // Call delay for 20ms low pulse
        MOV P1, #0FFH // set port-1 as high
        ACALL DELAY1  // Call delay for 20ms high pulse
RPT:    MOV P1, #00H  // set port-1 as low
        ACALL DELAY2  // Call delay for 5ms high pulse
        MOV P1, #0FFH // set port-1 as high
        ACALL DELAY2  // Call delay for 5ms low pulse
        SJMP RPT
ORG 0030H
DELAY1: MOV TH0, #63H
```

```
        MOV TL0, #0C0H

        SETB TR0
CHECK1: JNB TF0, CHECK1
        CLR TR0

        CLR TF0

        RET

ORG 00A0H
DELAY2: MOV TH1, #0D8H
        MOV TL1, #0F0H

        SETB TR1
CHECK2:   JNB TF1, CHECK2
        CLR TR1CLR TF1RET
        END
```

Output:



Result/ Conclusion:

The program generates a square wave with an initial 40ms period, followed by a 10ms period on Port-1.

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V Semester ECE-IoT

Date:16/10/2024

Experiment No. 9(F)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: - Assembly Program for Servo-motor.

Requirements: Keil

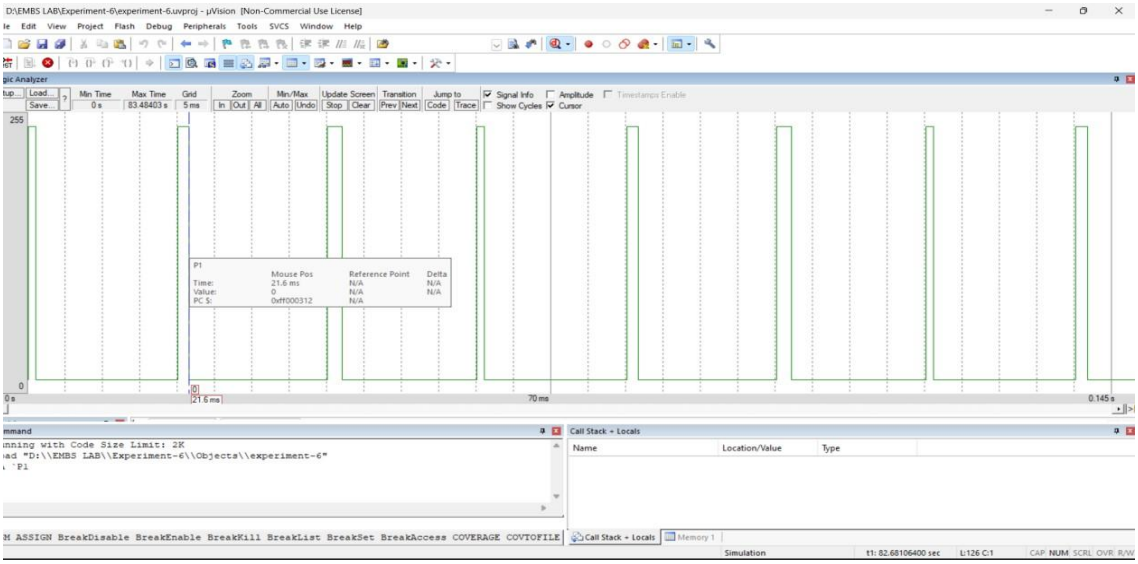
Program Code:

```
ORG 0000H
 LJMP START
 ORG 0100H
 START:      MOV P1, #00H
MOV TMOD, #11H// Load TMOD for timer-1&2 in mode-1

RPT:   ACALL ANG0  // Call delay for 0 degree (1ms high and 19ms low)
ACALL ANG90   // Call delay for 90 degrees (1,5ms high and 18.5ms low)

ACALL ANG180   // Call delay for 180 degrees (2ms high and 18ms low)
 SJMP RPT

 ORG 0200H
 ANG0: MOV P1, #0FFH
 MOV TH0, #0FCH

MOV TL0, #18H
```

```
SETB TR0

CHECK1:   JNB TF0, CHECK1
          CLR TR0CLR TF0
          MOV P1, #00H MOV TH1, #0B5H
          MOV TL1, #0C8H

          SETB TR1
          CHECK2:  JNB TF1, CHECK2
          CLR TR1
          CLR TF1
          RET
ORG 0300H
ANG90:    MOV P1, #0FFH
          MOV TH0, #0FAH
          MOV TL0, #24H
          SETB TR0
CHECK3:   JNB TF0, CHECK3
          CLR TR0
          CLR TF0
          MOV P1, #00H
          MOV TH1, #0B7H
          MOV TL1, #0BCH
          SETB TR1
CHECK4:   JNB TF1, CHECK4
          CLR TR1
          CLR TF1
```

```
        RET
ORG 0400H
ANG180: MOV P1, #0FFH
        MOV TH0, #0F8H
        MOV TL0, #30H
        SETB TR0
CHECK5: JNB TF0, CHECK5
        CLR TR0
                CLR TF0
        MOV P1, #00H
        MOV TH1, #0B9H
        MOV TL1, #0B0H
        SETB TR1
CHECK6: JNB TF1, CHECK6
        CLR TR1
        CLR TF1
        RET

        END
```

Output:



Result/ Conclusion:

The program controls a servo motor to rotate at 0°, 90°, and 180° using appropriate delays for each angle.

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Date:16/10/2024

Experiment No. 9(G)

Name of Student: Jjateen Gundesha

Registration No.: BT22ECI002

Aim: Assembly Program for stopwatch**.**

Requirements: Keil

Program Code:

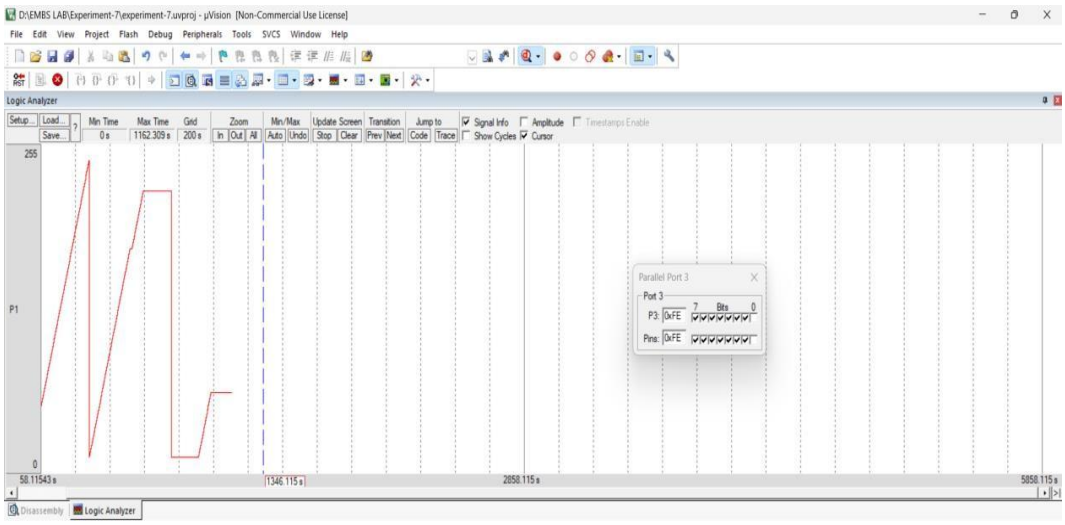
```
ORG 0000H MOV P1, #00H
MAIN: JB P3.0, START
JB P3.1, STOP
   JB P3.2, RESET
   SJMP MAIN
START: ACALL DELAY_1_SEC
       INC P1
    SJMP MAIN
STOP:SJMP MAIN
RESET:MOV P1, #00H
SJMP MAIN
DELAY_1_SEC:MOV R1, #20
       MOV R2, #250
       MOV R3, #250
```

```
DELAY_LOOP: DJNZ R3, DELAY_LOOP

DJNZ R2, DELAY_LOOP
        DJNZ R1, DELAY_LOOP
        RET

END
```

Output:



Result/ Conclusion:

The program implements a stopwatch with start, stop, and reset functions using Port 1 for time increments.

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