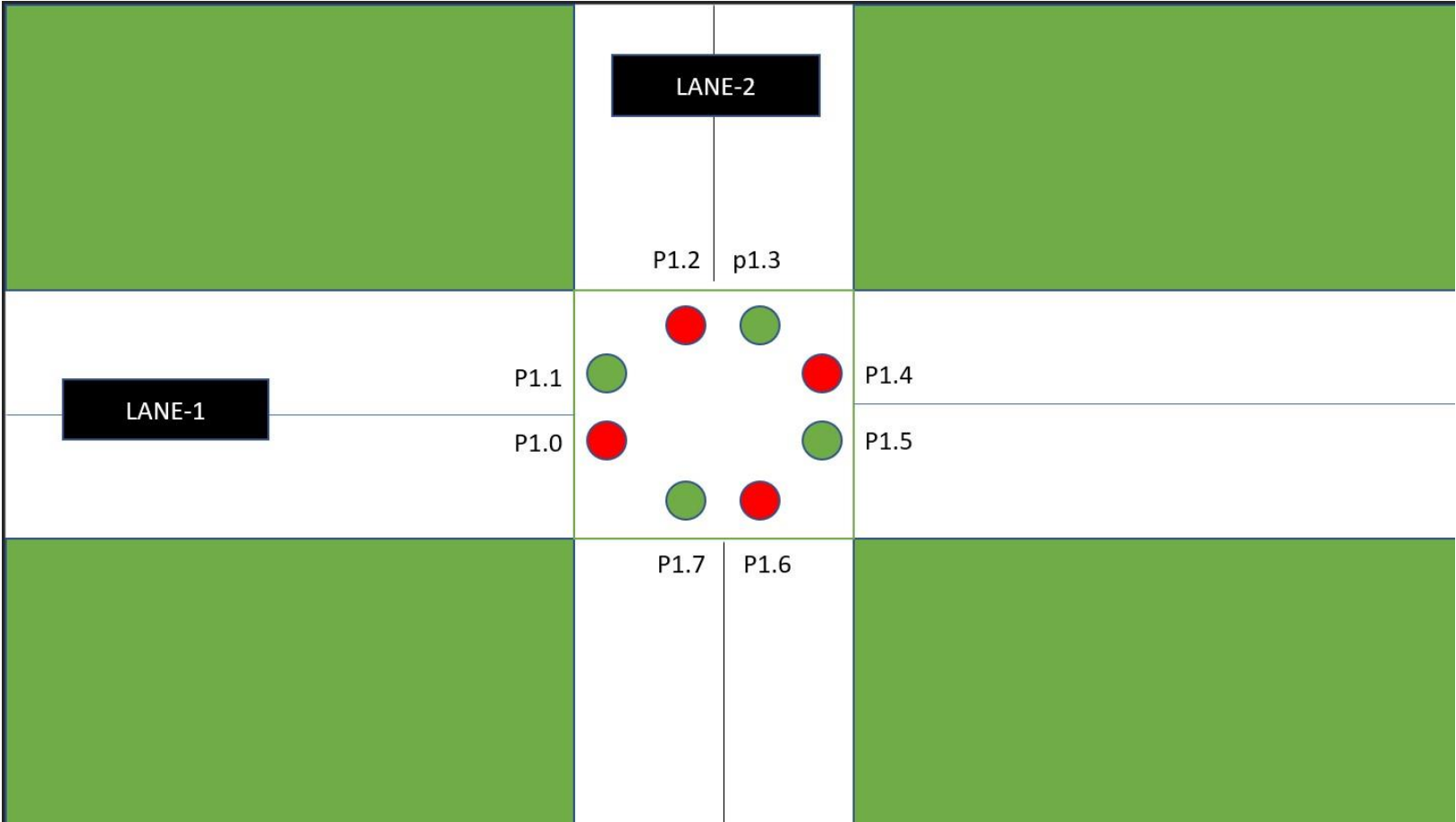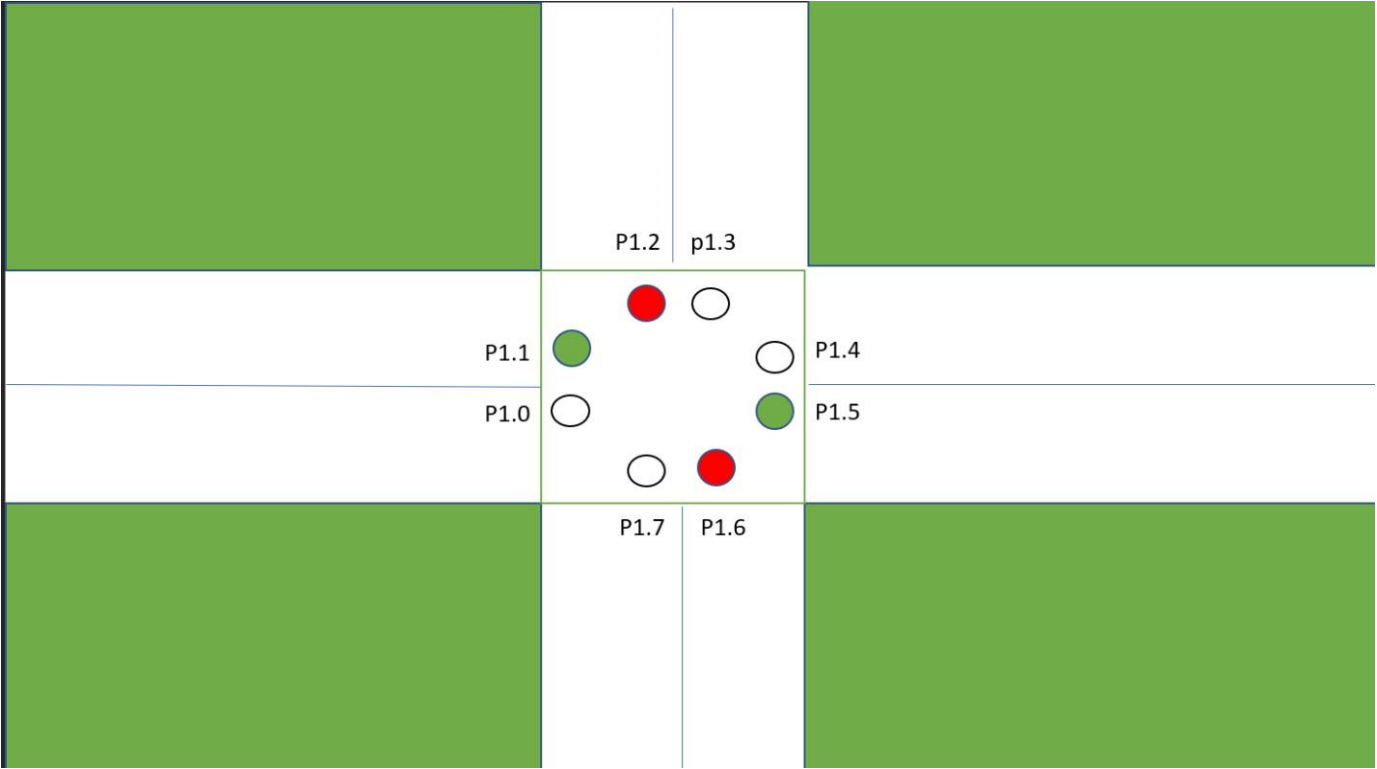# GROUP R9 MINI PROJECT
TRAFFIC LIGHTS SYSTEM

Objective: construction of a traffic light system using Led's and 7segment display.

Design:
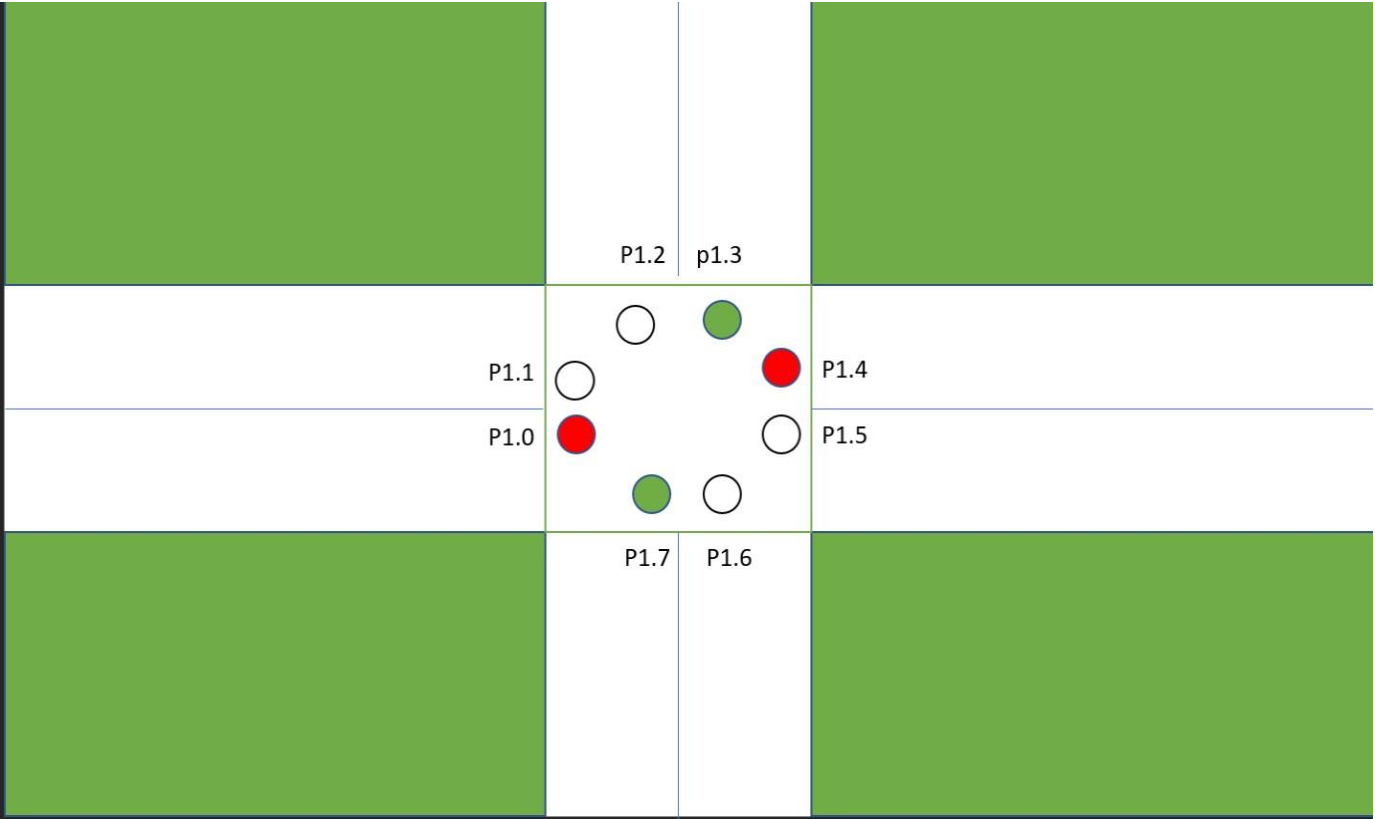
We have given the inputs to the traffic lights as follows:

when lane 1 is operating:

When lane-2 is operating:

Code:

```
ORG 0000H
    MOV P1,#99H
    LJMP START
ORG 001BH
    SJMP LANE
ORG 0040H
START:
    MOV TMOD,#10H
MOV TH1, #00H
mov TL1, #00H
MOV IE,#88H
    SETB TR1
    ACALL COUNTER
HERE: SJMP HERE
LANE:
    CLR TR1
    MOV A,P1
    CPL A
    MOV P1,A
    SETB TR1
```

```
        ACALL COUNTER
      RETI
DELAY:
        MOV R0,#2EH
LOOP1:MOV
R1,#0FFH
LOOP2:DJNZ
R1,LOOP2
        DJNZ R0,LOOP1
      RET
COUNTER:
      CLR P3.3
      CLR P3.4
      MOV P2,#0A4H
      ACALL DELAY
      MOV P2,#0F9H
      ACALL DELAY
      MOV P2,#0C0H
      ACALL DELAY
      RET
END
```

LOGIC:

Initiated the code with org 0000H.

we loaded Port P1 with 99H so that the lane1 lights will be green and lane 2 will be red.

Used instruction LJMP to jump to START, here timer-1 mode 1 is selected by loading TMOD with 10H, loaded TH1, TL1 with 00H, and to enable timer-1 interrupt IE is loaded with 88H.

Started timer-1, and called COUNTER in which the values of 2,1,0 are displayed in an orderly fashion. In counter

DISP-0 is selected by clearing the values of P3.3,P3.4. And the values of 2,1,0 are loaded to port P2 with a delay of 27ms.

the total time of the counter is approximately equal to the time taken for the timer-1 interrupt to occur.

and the subroutine is finished and it returns back. now the interrupt occurs and it goes to ORG 001BH, where it again short jumps to LANE, here the value of port P1 is changed to complement of previous value which is 66H, such that the lane 2 will lit green light and lane 1 will be red light. Again the counter is called. this process is repeated.

Results:

When lane 1 has green light:

Screenshot 1

System Clock (MHz) 12.0 — 1000 — Update Freq.

SBUF

R/O	W/O	THO	TL0	R7	0x00	B	0x00
0x00	0x00	0x00	0x00	R6	0x00	ACC	0x00
RXD	TXD			R5	0x00	PSW	0x00
1	1	TMOD	0x10	R4	0x00	IP	0x00
SCON	0x00	TCON	0x48	R3	0x00	IE	0x88
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x22	DPH	0x00
0xE7	0xE7 P3	0x94	0x14	R0	0x13	DPL	0x00
0xF9	0xF9 P2					SP	0x0B
0x99	0x99 P1	PC		8051			
0xFF	0xFF P0	0x0062	PSW 0 0 0 0 0 0 0 0				

EDSIM51

Modify RAM   addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	13	22	00	00	00	00	00	00	50	00	75	00	62	00	5D	00
10	7A	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

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RST Step Run New Load Save Copy Paste X
Time: 37ms 921us - Instructions: 19000

```
            START:
0040|          MOV  TMOD,#10H
0043|          MOV  TH1, #00H
0046|          mov  TL1, #00H
0049|          MOV  IE,#88H
004C|          SETB TR1
004E|          ACALL COUNTER
0050|  HERE: SJMP HERE

            LANE:
0052|          CLR  TR1
0054|          MOV  A,P1
0056|          CPL  A
0057|          MOV  P1,A
0059|          SETB TR1
005B|          ACALL COUNTER
005D|          RETI

            DELAY:
005E|          MOV  R0,#2EH
0060|  LOOP1:MOV  R1,#0FFH
0062|  LOOP2:DJNZ R1,LOOP2
```

P0.7	1	Display-select Decoder CS	DAC WR
P0.6	1	Keypad Column 2
P0.5	1	Keypad Column 1
P0.4	1	Keypad Column 0
P0.3	1	Keypad Row 3
P0.2	1	Keypad Row 2
P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	1	LED 7|DAC DB7|LCD DB7|Mo..t 0
P1.6	0	LED 6|DAC DB6|LCD DB6
P1.5	0	LED 5|DAC DB5|LCD DB5
P1.4	1	LED 4|DAC DB4|LCD DB4
P1.3	0	LED 3|DAC DB3|LCD DB3|LCD RS
P1.2	0	LED 2|DAC DB2|LCD DB2|LCD E
P1.1	1	LED 1|DAC DB1|LCD DB1
P1.0	0	LED 0	DAC DB0
P2.7	1	SW 7|Seg. dp|ADC DB7
P2.6	1	SW 6|Seg. g|ADC DB6
P2.5	1	SW 5|Seg. f|ADC DB5
P2.4	1	SW 3|Seg. e|ADC DB4
P2.3	1	SW 3|Seg. d|ADC DB3
P2.2	0	SW 2|Seg. c|ADC DB2
P2.1	1	SW 1|Seg. b|ADC DB1
P2.0	1	SW 0|Seg. a|LCD DB0|ADC DB0
P3.7	1	ADC RD	Comparator Output
P3.6	1	ADC WR
P3.5	1	Motor Sensor
P3.4	0	Display-select Input 1
P3.3	0	AND Gate Output	Display-se..t 0
P3.2	1	ADC INTR
P3.1	1	Motor Control Bit 1	Ext. UART Rx
P3.0	1	Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6   AND Gate Disabled
7 8 9   Key Bounce Disabled
* 0 #   Standard

U No Parity   8-bit UART @ 4800 Baud
Rx   Rx Reset
Tx   Tx Send

0.0 V input   MAX
11111111   MIN
ADC   Motor Disabled

0.0 V output
Scope
DAC   BF 0 AC 0x00 IR 0x00 DR 0x00

Screenshot 2

System Clock (MHz) 12.0 — 1000 — Update Freq.

SBUF

R/O	W/O	THO	TL0	R7	0x00	B	0x00
0x00	0x00	0x00	0x00	R6	0x00	ACC	0x00
RXD	TXD			R5	0x00	PSW	0x00
1	1	TMOD	0x10	R4	0x00	IP	0x00
SCON	0x00	TCON	0x48	R3	0x00	IE	0x88
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x59	DPH	0x00
0xE7	0xE7 P3	0xE9	0xD8	R0	0x16	DPL	0x00
0xC0	0xC0 P2					SP	0x0B
0x99	0x99 P1	PC		8051			
0xFF	0xFF P0	0x0062	PSW 0 0 0 0 0 0 0 0				

EDSIM51

Modify RAM   addr 0x00 0x00 value

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	16	59	00	00	00	00	00	00	50	00	7A	00	62	00	5D	00
10	7A	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

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RST Step Run New Load Save Copy Paste X
Time: 59ms 877us - Instructions: 30000

```
            START:
0040|          MOV  TMOD,#10H
0043|          MOV  TH1, #00H
0046|          mov  TL1, #00H
0049|          MOV  IE,#88H
004C|          SETB TR1
004E|          ACALL COUNTER
0050|  HERE: SJMP HERE

            LANE:
0052|          CLR  TR1
0054|          MOV  A,P1
0056|          CPL  A
0057|          MOV  P1,A
0059|          SETB TR1
005B|          ACALL COUNTER
005D|          RETI

            DELAY:
005E|          MOV  R0,#2EH
0060|  LOOP1:MOV  R1,#0FFH
0062|  LOOP2:DJNZ R1,LOOP2
```

P0.7	1	Display-select Decoder CS	DAC WR
P0.6	1	Keypad Column 2
P0.5	1	Keypad Column 1
P0.4	1	Keypad Column 0
P0.3	1	Keypad Row 3
P0.2	1	Keypad Row 2
P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	1	LED 7|DAC DB7|LCD DB7|Mo..t 0
P1.6	0	LED 6|DAC DB6|LCD DB6
P1.5	0	LED 5|DAC DB5|LCD DB5
P1.4	1	LED 4|DAC DB4|LCD DB4
P1.3	1	LED 3|DAC DB3|LCD DB3|LCD RS
P1.2	0	LED 2|DAC DB2|LCD DB2|LCD E
P1.1	0	LED 1|DAC DB1|LCD DB1
P1.0	0	LED 0	DAC DB0
P2.7	1	SW 7|Seg. dp|ADC DB7
P2.6	1	SW 6|Seg. g|ADC DB6
P2.5	0	SW 5|Seg. f|ADC DB5
P2.4	0	SW 4|Seg. e|ADC DB4
P2.3	0	SW 3|Seg. d|ADC DB3
P2.2	0	SW 2|Seg. c|ADC DB2
P2.1	0	SW 1|Seg. b|ADC DB1
P2.0	0	SW 0|Seg. a|LCD DB0|ADC DB0
P3.7	1	ADC RD	Comparator Output
P3.6	1	ADC WR
P3.5	1	Motor Sensor
P3.4	0	Display-select Input 1
P3.3	0	AND Gate Output	Display-se..t 0
P3.2	1	ADC INTR
P3.1	1	Motor Control Bit 1	Ext. UART Rx
P3.0	1	Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6   AND Gate Disabled
7 8 9   Key Bounce Disabled
* 0 #   Standard

U No Parity   8-bit UART @ 4800 Baud
Rx   Rx Reset
Tx   Tx Send

0.0 V input   MAX
11111111   MIN
ADC   Motor Disabled

0.0 V output
Scope
DAC   BF 0 AC 0x00 IR 0x00 DR 0x00

When lane-2 has green light:

Screenshot 1

System Clock (MHz) 12.0   1000 ▼ Update Freq.

SBUF

R/O	W/O		TH0	TL0	R7	0x00		B	0x00
0x00	0x00		0x00	0x00	R6	0x00		ACC	0x66
RXD	TXD				R5	0x00		PSW	0x00
1	1		TMOD	0x10	R4	0x00		IP	0x00
SCON	0x00		TCON	0x48	R3	0x00		IE	0x88
					R2	0x00		PCON	0x00
pins	bits		TH1	TL1	R1	0xA0		DPH	0x00
0xE7	0xE7 P3		0x8D	0x21	R0	0x16		DPL	0x00
0xF9	0xF9 P2							SP	0x11
0x66	0x66 P1								
0xFF	0xFF P0								

8051

PC
0x0062   / PSW 0 0 0 0 0 0 0 0

Modify RAM
Data Memory   addr   0x00   0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	12	84	00	00	00	00	00	00	50	00	7A	00	62	00	5D	00
10	75	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step **Pause** **New** ~~Load~~ ~~Save~~ Copy Paste X

Time: 103ms 782us - Instructions: 52000   U

```
            START:
0040|            MOV  TMOD,#10H
0043|            MOV  TH1, #00H
0046|            mov  TL1, #00H
0049|            MOV  IE,#88H
004C|            SETB TR1
004E|            ACALL COUNTER
0050| HERE: SJMP HERE

            LANE:
0052|            CLR  TR1
0054|            MOV  A,P1
0056|            CPL  A
0057|            MOV  P1,A
0059|            SETB TR1
005B|            ACALL COUNTER
005D|            RETI

            DELAY:
005E|            MOV  R0,#2EH
0060| LOOP1:MOV  R1,#0FFH
0062| LOOP2:DJNZ R1,LOOP2
```

P0.7	1	Display-select Decoder CS|DAC WR
P0.6	1	Keypad Column 2
P0.5	1	Keypad Column 1
P0.4	1	Keypad Column 0
P0.3	1	Keypad Row 3
P0.2	1	Keypad Row 2
P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	0	LED 7|DAC DB7|LCD DB7|Mo..t 0
P1.6	1	LED 6|DAC DB6|LCD DB6
P1.5	1	LED 5|DAC DB5|LCD DB5
P1.4	0	LED 4|DAC DB4|LCD DB4
P1.3	0	LED 3|DAC DB3|LCD DB3|LCD RS
P1.2	1	LED 2|DAC DB2|LCD DB2|LCD E
P1.1	1	LED 1|DAC DB1|LCD DB1
P1.0	0	LED 0|DAC DB0
P2.7	1	SW 7|Seg. dp|ADC DB7
P2.6	1	SW 6|Seg. g|ADC DB6
P2.5	1	SW 5|Seg. f|ADC DB5
P2.4	1	SW 4|Seg. e|ADC DB4
P2.3	1	SW 3|Seg. d|ADC DB3
P2.2	0	SW 2|Seg. c|ADC DB2
P2.1	1	SW 1|Seg. b|ADC DB1
P2.0	1	SW 0|Seg. a|LCD DB0|ADC DB0
P3.7	1	ADC RD|Comparator Output
P3.6	1	ADC WR
P3.5	1	Motor Sensor
P3.4	0	Display-select Input 1
P3.3	1	AND Gate Output|Display-se..t 0
P3.2	1	ADC INTR
P3.1	1	Motor Control Bit 1|Ext. UART Rx
P3.0	1	Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6
7 8 9
* 0 #

AND Gate Disabled
Key Bounce Disabled
Standard ▼

U No Parity   8-bit UART @ 4800 Baud ▼
Rx   Rx Reset
Tx   Tx Send

0.0 V
input   0.0 V   MAX
11111111   MIN
ADC   Motor Disabled

0.0 V   output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

Screenshot 2

System Clock (MHz) 12.0   1000 ▼ Update Freq.

SBUF

R/O	W/O		TH0	TL0	R7	0x00		B	0x00
0x00	0x00		0x00	0x00	R6	0x00		ACC	0x66
RXD	TXD				R5	0x00		PSW	0x00
1	1		TMOD	0x10	R4	0x00		IP	0x00
SCON	0x00		TCON	0x48	R3	0x00		IE	0x88
					R2	0x00		PCON	0x00
pins	bits		TH1	TL1	R1	0x9F		DPH	0x00
0xE7	0xE7 P3		0xE3	0x4D	R0	0x19		DPL	0x00
0xC0	0xC0 P2							SP	0x11
0x66	0x66 P1								
0xFF	0xFF P0								

8051

PC
0x0062   / PSW 0 0 0 0 0 0 0 0

Modify RAM
Data Memory   addr   0x00   0x00 value

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	15	BB	00	00	00	00	00	00	50	00	7A	00	62	00	5D	00
10	7A	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step **Pause** **New** ~~Load~~ ~~Save~~ Copy Paste X

Time: 123ms 742us - Instructions: 62000   U

```
            START:
0040|            MOV  TMOD,#10H
0043|            MOV  TH1, #00H
0046|            mov  TL1, #00H
0049|            MOV  IE,#88H
004C|            SETB TR1
004E|            ACALL COUNTER
0050| HERE: SJMP HERE

            LANE:
0052|            CLR  TR1
0054|            MOV  A,P1
0056|            CPL  A
0057|            MOV  P1,A
0059|            SETB TR1
005B|            ACALL COUNTER
005D|            RETI

            DELAY:
005E|            MOV  R0,#2EH
0060| LOOP1:MOV  R1,#0FFH
0062| LOOP2:DJNZ R1,LOOP2
```

P0.7	1	Display-select Decoder CS|DAC WR
P0.6	1	Keypad Column 2
P0.5	1	Keypad Column 1
P0.4	1	Keypad Column 0
P0.3	1	Keypad Row 3
P0.2	1	Keypad Row 2
P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	0	LED 7|DAC DB7|LCD DB7|Mo..t 0
P1.6	1	LED 6|DAC DB6|LCD DB6
P1.5	1	LED 5|DAC DB5|LCD DB5
P1.4	0	LED 4|DAC DB4|LCD DB4
P1.3	0	LED 3|DAC DB3|LCD DB3|LCD RS
P1.2	1	LED 2|DAC DB2|LCD DB2|LCD E
P1.1	1	LED 1|DAC DB1|LCD DB1
P1.0	0	LED 0|DAC DB0
P2.7	1	SW 7|Seg. dp|ADC DB7
P2.6	1	SW 6|Seg. g|ADC DB6
P2.5	1	SW 5|Seg. f|ADC DB5
P2.4	1	SW 4|Seg. e|ADC DB4
P2.3	0	SW 3|Seg. d|ADC DB3
P2.2	0	SW 2|Seg. c|ADC DB2
P2.1	0	SW 1|Seg. b|ADC DB1
P2.0	0	SW 0|Seg. a|LCD DB0|ADC DB0
P3.7	1	ADC RD|Comparator Output
P3.6	1	ADC WR
P3.5	1	Motor Sensor
P3.4	0	Display-select Input 1
P3.3	1	AND Gate Output|Display-se..t 0
P3.2	1	ADC INTR
P3.1	1	Motor Control Bit 1|Ext. UART Rx
P3.0	1	Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6
7 8 9
* 0 #

AND Gate Disabled
Key Bounce Disabled
Standard ▼

U No Parity   8-bit UART @ 4800 Baud ▼
Rx   Rx Reset
Tx   Tx Send

0.0 V
input   0.0 V   MAX
11111111   MIN
ADC   Motor Disabled

0.0 V   output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

Designed a traffic light system, in which opposite lanes will be operated at a time where as the adjacent lines will be stopped, for the same time and the count is displayed using 7-segment display.