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MICROCONTROLLER AND EMBEDDED C PROGRAMMING

EXPERIMENT 1

AIM: C language program for square wave generation.

SOFTWARE USED: Keil uVision5

Question-1:
Write a program to generate a square wave at port 1 using timer 0 mode 1 with a time period of 2ms and consider the crystal frequency as 12MHz.

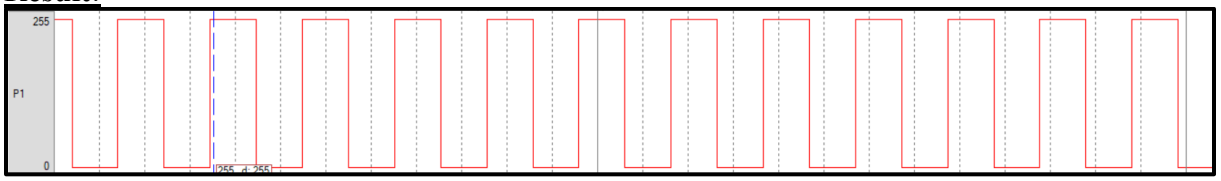
Code:

```
#include<reg51.h>
void delay();
void main(){
        P1=0x00;
        while(1){
                P1=0x00;
                delay();
                P1=0xFF;
                delay();
        }
}
void delay(){
        TMOD=0x01;
        TH0= 0xFC;
        TL0=0x17;
        TR0=1;
        while(TF0==0){}
                TF0=0;
                TR0=0;
}
```

Algorithm:

1. Initialize Port 1 (`P1`) to 0x00 to turn off all output pins.
2. Create an infinite loop using `while(1)` to continuously generate the square wave.
3. Inside the loop, set `P1` to 0x00 (low) and call `delay()`.
4. Set `P1` to 0xFF (high) and call `delay()` again.
5. In `delay()`, configure Timer 0 in Mode 1 by setting `TMOD` to 0x01.
6. Load Timer 0 with `TH0 = 0xFC` and `TL0 = 0x17` for a 1ms delay.
7. Start Timer 0 (`TR0 = 1`), wait for the overflow (`TF0 = 1`), then stop and clear the timer.
8. The loop repeats, toggling Port 1 to generate the square wave.

Result:



Conclusion:
This program effectively generates a square wave with a 2ms period at Port 1 by using Timer 0 in Mode 1 on a 12MHz crystal. The timer is configured to overflow every 1 ms, toggling the port state to create the square wave.

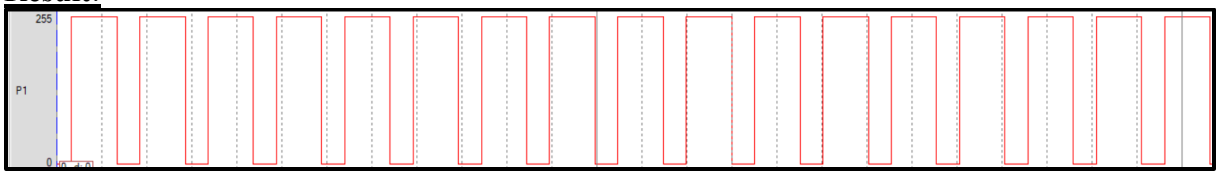
Question-2:
Write a program to generate a square wave at port 1 using timer 0 mode 1 with a time period of 3ms where Ton = 2ms and Toff=1ms and consider the crystal frequency as 12MHz.

Code:
```
#include<reg51.h>
void delay();
void delay1();
void main(){
	P1=0x00;
	while(1){
		P1=0x00;
		delay();
		P1=0xFF;
		delay1();
	}
}
void delay(){
	TMOD=0x01;
	TH0= 0xFC;
	TL0=0x17;
	TR0=1;
	while(TF0==0){}
		TF0=0;
		TR0=0;
}
void delay1(){
	TMOD=0x01;
	TH0= 0xF8;
	TL0=0x30;
	TR0=1;
	while(TF0==0){}
		TF0=0;
		TR0=0;
}
```

Algorithm:
1. Initialize Port 1 (`P1`) to 0x00, turning off all output pins.
2. Enter an infinite loop to continuously generate the square wave.
3. Set `P1` to 0x00 and call `delay()` for the low phase.
4. Set `P1` to 0xFF and call `delay1()` for the high phase.
5. In `delay()`, configure Timer 0, load it with 0xFC17, start it, wait for overflow, and then stop the timer.
6. In `delay1()`, configure Timer 0, load it with 0xF830, start it, wait for overflow, and then stop the timer.

7. Repeat the loop to generate the square wave with varying durations for high and low phases.

Result:



Conclusion:

This program successfully generates a square wave with a total period of 3ms on Port 1 of the 8051 microcontroller, using Timer 0 in Mode 1. The ON time (Ton) is set to 2ms and the OFF time (Toff) is set to 1ms, based on a crystal frequency of 12MHz. By accurately configuring the timer values, the desired time delays are achieved, ensuring a consistent square wave output.