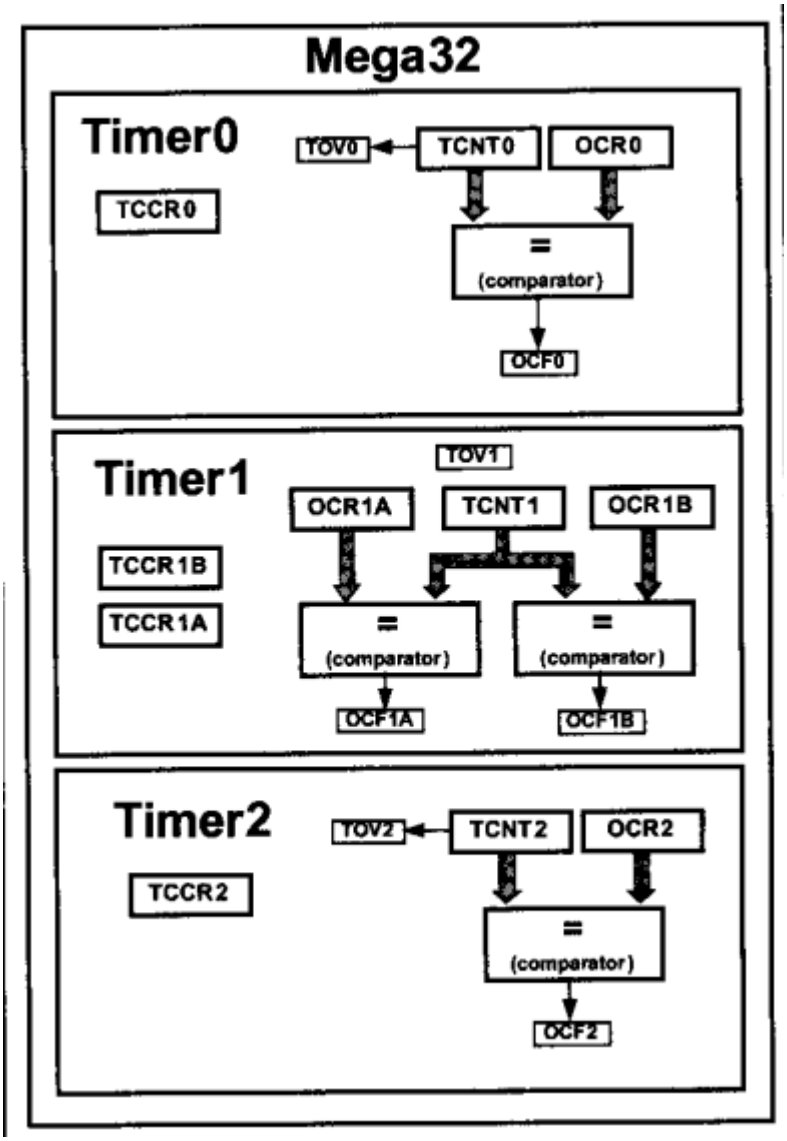
Marwadi University Marwadi Chandarana Group NAAC A+	**Marwadi University** **Faculty of Technology** **Department of Information and Communication Technology**	
Subject: Microcontroller and Interfacing (01CT0403)	**Aim:** AVR Microcontroller GPIO Programming In C.	
Assigment :- 1	**Date:-** 09-02-2024	**Enrollment No:-** 92200133030

Question – 1 :- List the basic registers used for timers in AVR ATMEGA32 along with their uses.

Answer :-



1) **TCNT(**Timer/Counter Control Register**) :-**

- Timer/Counter Register that initializes to zero upon reset. It increments with each clock pulse.

2)**TOV(**Timer Overflow Flag**) :-**

- It will be set when timer overflows.

3) **TCCR(** Timer/Counter Control Registers **) :-**

- This Registers is used for setting the modes of Operation.

4) **OCR(** Output Compare Registers**) :-**

- The Content of the OCR is Compared with the content of the TCNT

5) **ICR (** Input Capture Register **) :-**

6) **ASSR (**Asynchronous Status Register**) :-**

- It Used for External clock sources.

Question – 2:- Determine the timer's clock frequency and its period for various AVR based systems, with below mentioned crystal frequencies. Assume that no prescalar is used.

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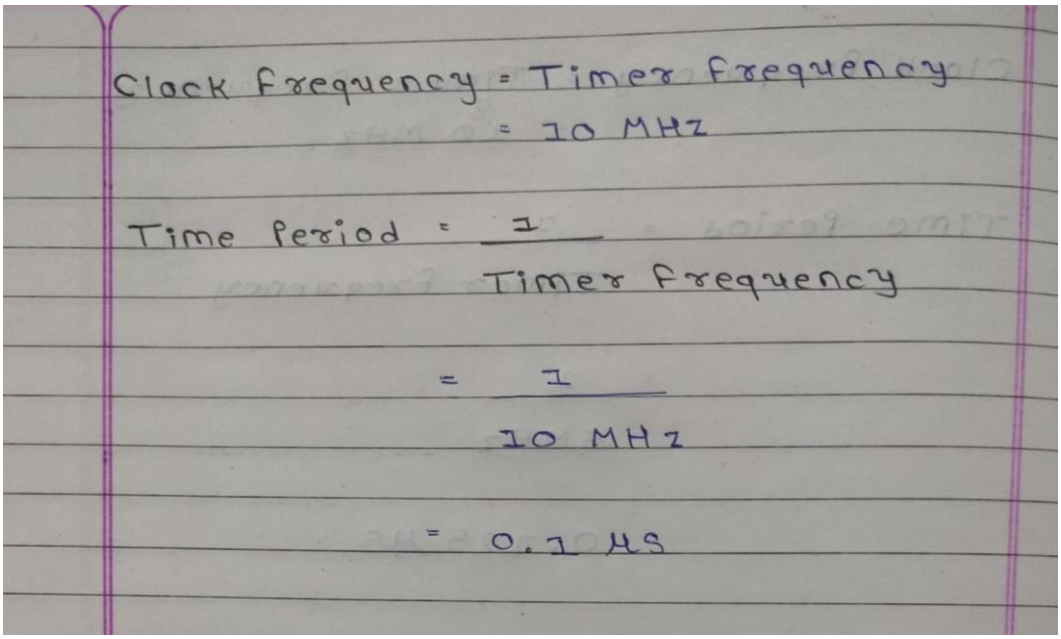
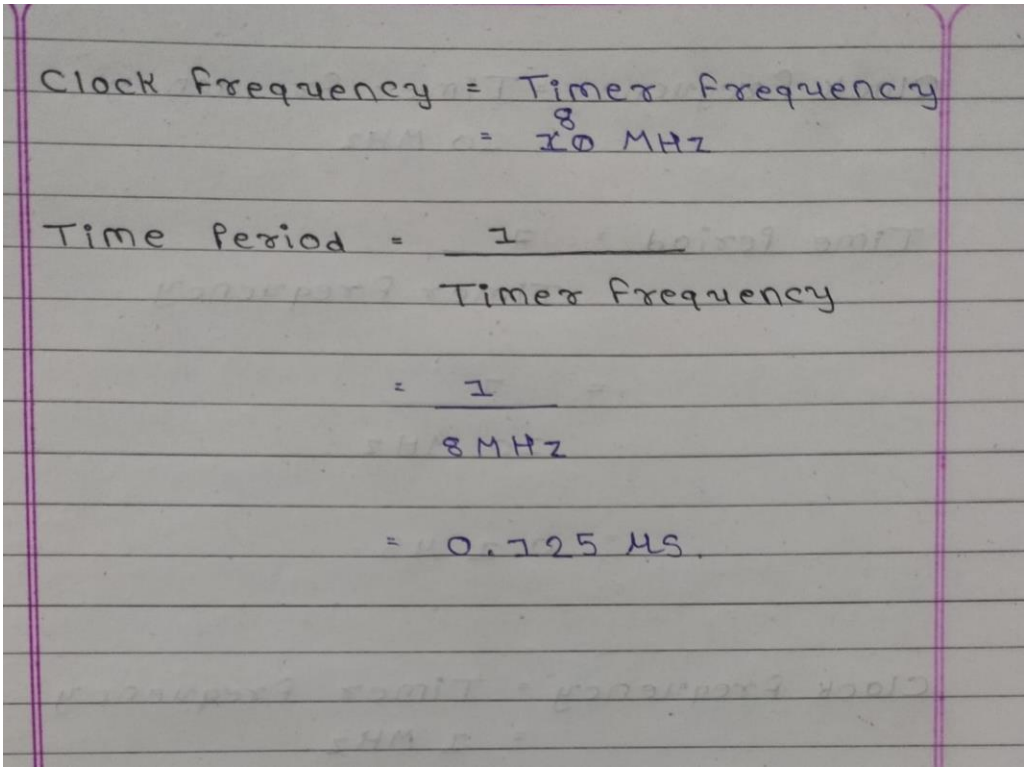
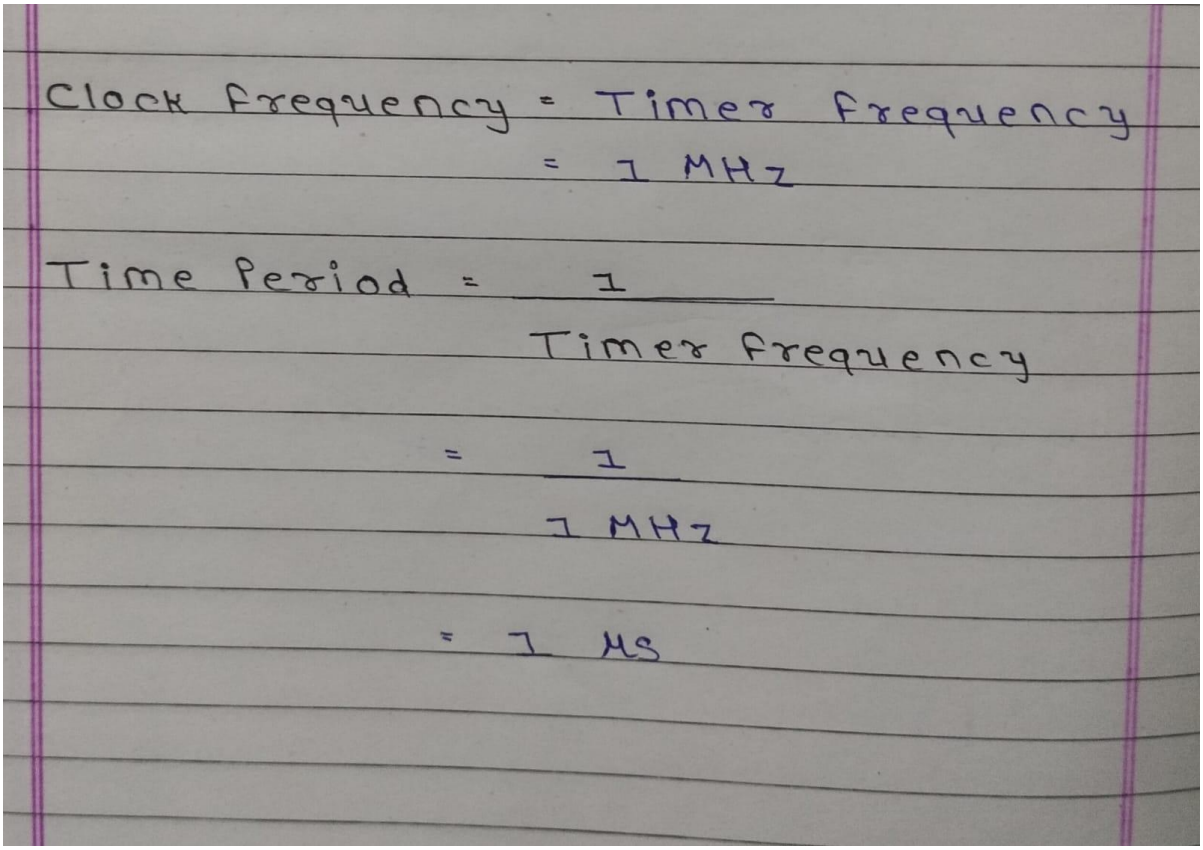
1) 10 MHz



2) 8 MHz



3) 1 MHz



Question – 3:- Write a program to generate a square wave with a period of 12.5us on pin PORTB.3. Assume that XTAL = 8MHz.

Answer :-

```
void Generate_Delay() {
        TCNT0 = 0xCE ;
        TCCR0 = 0x01 ;

        while (TCNT0 != 0) ;
}

int main(void)
{
        PORTB = 0x00 ;
        while (1) {
                PORTB = 0x08 ;
```

```
            Generate_Delay();
            PORTB ^= 0x08 ;
        }
}
```

Question – 4:- Write a C program to toggle all the bits of PORTB continuously with a delay of 10ms. Use Timer 0, normal mode, with suitable prescalar to generate the delay. Assume the frequency to be 8MHz

Answer :-

```
#include <avr/io.h>
#include <avr/delay.h>
#include <util/delay.h>
#define  F_CPU 16000000UL

void Generate_Delay() {
        TCNT0 = 0xF6 ;
        TCCR0 = 0x02 ;

        while(TCNT0 != 0) ;
}

int main(void)
{
        DDRB = 0xFF ;
        PORTB = 0x00 ;
        while (1) {
            PORTB = 0xFF ;
            Generate_Delay();
            PORTB ^= 0xFF ;
        }
}
```

Question – 5:- Write a C program to toggle only PORTB.4 bit continuously every 70us. Use Timer 0, Normal Mode, and 1:8 prescalar to create the delay. Assume XTAL= 8MHz.

Answer :-

```
#include <avr/io.h>
#include <avr/delay.h>
#include <util/delay.h>
#define  F_CPU 16000000UL
```

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```
void Generate_Delay() {
        TCNT0 = 0xBB ;
        TCCR0 = 0x02 ;

        while(TCNT0 != 0) ;
}

int main(void)
{
        DDRB = 0xFF ;
        PORTB = 0x00 ;
        while (1) {
                PORTB = 0x10 ;
                Generate_Delay();
                PORTB ^= 0x10 ;
        }
}
```