# Experiment 3

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# Question 1

Design one digit timer 0 - 9:

### **Answer:**

We need this following specification for 1s timer:

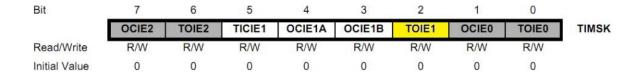
- Clock = 8MHz
- Timer= Timer1 16bit
  - Prescaler = 8
  - Overflow = 15
  - Reminder = 16960
  - o This timer should count every 1s

For specify prescaler we need configure TCCR1B to 8 prescaler mode:

Bit	7	6	5	4	3	2	1	0	
	ICNC1	ICES1	-	WGM13	WGM12	CS12	CS11	CS10	TCCR1B
Read/Write	R/W	R/W	R	R/W	R/W	R/W	R/W	R/W	-
Initial Value	0	0	0	0	0	0	0	0	

CS12	CS11	CS10	Description	
0	0	0	No clock source (Timer/Counter stopped).	
0	0	1	clk <sub>I/O</sub> /1 (No prescaling)	
0	1	0	clk <sub>I/O</sub> /8 (From prescaler)	
0	1	1	clk <sub>i/O</sub> /64 (From prescaler)	
1	0	0	clk <sub>I/O</sub> /256 (From prescaler)	
1	0	1	clk <sub>I/O</sub> /1024 (From prescaler)	
1	1	0	External clock source on T1 pin. Clock on falling edge.	
1	1	1	External clock source on T1 pin. Clock on rising edge.	

Also we need to set timer1 overflow interrupt with TIMSK Register:



For use 7seg with real number we need to convert that with bottom array:

```
char array[]=\{0xC0,0xF9,0xA4,0xB0,0x99,0x92,0x82,0xF8,0x80,0x90\};
```

#### **Resources:**

- Atmel AVR Timer Calculator Electrical
- AVR Timers TIMER1 » maxEmbedded
- Avr Atmega 7 Segment Display Interfacing With Atmega16 32 | Avr A...

## Question 2

Design 4 digit timer with timer 1 & 0

#### **Answer:**

Answer of This question is like question 1 but in this question we need an additional timer(0) for switching between 4-7segs.

We need this following specification for 1s timer:

- Clock = 8MHz
- Timer= Timer1 16bit
  - Prescaler = 8
  - Overflow = 15
  - Reminder = 16960

o This timer should count every 1s

Also we need this specification for timer 0:

- Clock = 8Mhz
- Timer = Timer 0 8bit
  - Prescaler = 8
  - Overflow = 78
  - Reminder = 32
  - $\circ\$  This timer should switch between 7seg every 0.02s

### **Resources:**

• AVR Timers - TIMERO » maxEmbedded