```
/*****************************************************
This program was created by the CodeWizardAVR V3.49a
Automatic Program Generator
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Project :
Version :
Date    : 18/11/2022
Author  :
Company :
Comments:


Chip type               : ATmega32
Program type            : Application
AVR Core Clock frequency: 12,000000 MHz
Memory model            : Small
External RAM size       : 0
Data Stack size         : 512
*****************************************************/
#ifndef F_CPU
#define F_CPU 12000000UL
#endif

// I/O Registers definitions
#include <mega32.h>
#include <delay.h>
#include <stdbool.h>

// Alphanumeric LCD functions
#include <alcd.h>
```

```
// Declare your global variables here
// Variabel melacak timer
unsigned int ms = 0, s = 0, m = 0;
// Variabel melacak status timer
// On true jika timer sedang berjalan
// Running true jika timer masih memiliki waktu
// Prev melacak status timer sebelumnya
bool on =  false, prev = true, prev2 = true, running = false;
// Alert digunakan untuk LED kedap-kedip
bool alert = 0;

// Array berisi BCD yang dipakai untuk menampilkan angka pada LED 7SEG
unsigned char angka [100]={
0x00, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09,
0x10, 0x11, 0x12, 0x13, 0x14, 0x15, 0x16, 0x17, 0x18, 0x19,
0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28, 0x29,
0x30, 0x31, 0x32, 0x33, 0x34, 0x35, 0x36, 0x37, 0x38, 0x39,
0x40, 0x41, 0x42, 0x43, 0x44, 0x45, 0x46, 0x47, 0x48, 0x49,
0x50, 0x51, 0x52, 0x53, 0x54, 0x55, 0x56, 0x57, 0x58, 0x59,
0x60, 0x61, 0x62, 0x63, 0x64, 0x65, 0x66, 0x67, 0x68, 0x69,
0x70, 0x71, 0x72, 0x73, 0x74, 0x75, 0x76, 0x77, 0x78, 0x79,
0x80, 0x81, 0x82, 0x83, 0x84, 0x85, 0x86, 0x87, 0x88, 0x89,
0x90, 0x91, 0x92, 0x93, 0x94, 0x95, 0x96, 0x97, 0x98, 0x99,
};

// Fungsi dipanggil ketika waktu habis dan timer masih berjalan
void toggleLED(){
    running = false;
    while (PINA.0 == 0){
        alert = !alert;
        PINA.5 = alert;
```

```
        delay_ms(10);
    }
}

// Fungsi untuk mengupdate angka pada LED 7 Segment
void update(){
    PORTB = angka[m];
    PORTD =  angka[s];
    //lcd
}

// Fungsi utama
void main(void)
{
// Port A input dan output
PORTA = 0xFF;
DDRA = 0xFF;
// Port B,C dan D hanya berupa output
PORTB = 0x00;
DDRB = 0xFF;

PORTC = 0x00;
DDRC = 0xFF;

PORTD = 0x00;
DDRD = 0xFF;

// TCCR1B pada CS10, CS11 dan CS12 diset menjadi 101 sehingga prescalar bernilai 1024
TCCR1B = (1<<CS10) | (1<<CS12);
// Jumlah iterasi pada counter sebelum direset
OCR1A = 7;
// Nilai counter awal
```

```
TCNT1 = 0;

// Alphanumeric LCD initialization
// Connections are specified in the
// Project|Configure|C Compiler|Libraries|Alphanumeric LCD menu:
// RS: PORTC Bit 0
// RD: PORTC Bit 1
// EN: PORTC Bit 2
// D4: PORTC Bit 4
// D5: PORTC Bit 5
// D6: PORTC Bit 6
// D7: PORTC Bit 7
// Characters/line: 16
lcd_init(16);

while (1)
      {
      //Jika saklar tersambung maka on = true
        if (PINA.0 == 0){
            on = true;
        }
        else {
            on = false;
        }

        //Jika waktu habis maka running = false
        if (m <= 0 && s <= 0){
            running = false;
        }
        else {
            running = true;
        }
```

```
// Jika status timer berubah (prev1 & on dan prev2 & running) maka update status di LCD
if (prev != on || prev2 != running){
   lcd_clear();
   lcd_gotoxy(0,0);
   if (on && running){
      lcd_puts("TIMER BERJALAN..");
   }
   else if (on && !running){
      lcd_puts("WAKTU HABIS!!!");
   }
   else if (!on && running){
      lcd_puts("TIMER BERHENTI..");
   }
   else if(!on && !running){
      lcd_puts("TAMBAH WAKTU!!");
   }

   prev = on;
   prev2 = running;
}

// Jika timer sedang berhenti maka waktu dapat diubah
if (!on){
   //manipulate seconds
   if ((PINA.1 == 0) & (s < 60)){//increment second, bind to under 60
      s++;
   }
   else if ((PINA.2 == 0) & (s > 0)){//decrement seconds
      s--;
   }
   //manipulate minutes
```

```
    if ((PINA.3 == 0) & (m < 60)){
        m++;
    }
    else if ((PINA.4 == 0) & (m > 0)){
        m--;
    }
    //Delay antar input
    delay_ms(15);
}
// Selagi timer berjalan
else{
    // Menunggu hingga overflow flag dalam timer set
    while((TIFR && (1<<OCF1A)) == 0);
    // Jika timer habis maka LED berkedap kedip
    if (m == 0 & s == 0) {
     toggleLED();
     goto skip;
    }
    // Jika second habis maka menit berkurang dan second direset
    if (s ==  0) {
     s = 59;
     m--;
    }
    // Jika ms habis maka second berkurang dan ms direset
    if (ms == 0){
     ms = 100;
     s--;
    }
    // Dekremen ms
    else {
     ms--;
    }
```

```
    // Setelah variabel pelacak timer diupdate, reset counter dalam timer
    TCNT1 = 0;
    // Clear timer overflow flag
    TIFR |= (1<<OCF1A);
  }
  skip:
  // Update angka dalam LED
  update();
  }

}
```