DIGITAL ELECTRONICS
(EC-262)

DIGITAL CLOCK WITH 7-SEGMENT DISPLAY USING ARDUINO

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PROGRAM CODE FOR ARDUINO :-

```
#include <Time.h>
#include <TimeLib.h>

// using 4 coomon anode 7 segment display.....
int digit1 = 13; //PWM Display pin 3 and 8 pins of segment display A1
int digit2 = 12; //PWM same as above A2
int digit3 = 11; //PWM same as above A3
int digit4 = 10; //PWM same as above A4

//Pin mapping from Arduino.....
int segB = 3; //Display pin b
int segC = 4; //Display pin c
int segD = 5; //Display pin d
int segE = 6; //Display pin e
int segF = 7; //Display pin f
int segG = 8; //Display pin g
int segDP = 9;// Display pin dot

//input pins for push buttons
byte SW0 = A0;
byte SW1 = A1;
byte SW2 = A2;


void setup() {
```

```
  pinMode(segA, OUTPUT);
  pinMode(segB, OUTPUT);
  pinMode(segC, OUTPUT);
  pinMode(segD, OUTPUT);
  pinMode(segE, OUTPUT);
  pinMode(segF, OUTPUT);
  pinMode(segG, OUTPUT);
  pinMode(segDP, OUTPUT);

  pinMode(digit1, OUTPUT);
  pinMode(digit2, OUTPUT);
  pinMode(digit3, OUTPUT);
  pinMode(digit4, OUTPUT);

//  pinMode(13, OUTPUT);

 Serial.begin(9600);

  pinMode(SW0, INPUT);  // for this use a slide switch
  pinMode(SW1, INPUT);  // N.O. push button switch
  pinMode(SW2, INPUT);  // N.O. push button switch

  digitalWrite(SW0, HIGH); // pull-ups on
  digitalWrite(SW1, HIGH);
  digitalWrite(SW2, HIGH);



}

 void loop() {
   digitalWrite(segDP, HIGH);
  int timp = hour()*100+minute();
// display parts
   for(int i = 250 ; i >0  ; i--) {
     if (timp > 100) displayNumber01(timp);
     else displayNumber02(timp);
   }

   for(int i = 250 ; i >0  ; i--) {
     if (timp > 100) displayNumber03(timp);
     else displayNumber04(timp);
   }

  if (!(digitalRead(SW0))) set_time(); // hold the switch to set time
```

```
}


void set_time()  {
 byte minutes1 = 0;
 byte hours1 = 0;
 byte minutes = minute();
 byte hours = hour();

 while (!digitalRead(SW0))  // set time switch must be released to exit
 {
  minutes1=minutes;
  hours1=hours;


  while (!digitalRead(SW1)) // set minutes
  {
   minutes++;

  if (minutes > 59) minutes = 0;
   for(int i = 20 ; i >0  ; i--) {
    int timp= hours*100+minutes;
   if (timp > 1000) displayNumber01(timp);
   else displayNumber02(timp);
   }

  delay(150);
  }

  while (!digitalRead(SW2)) // set hours
  {
   hours++;

   if (hours > 23) hours = 0;

   for(int i = 20 ; i >0  ; i--) {
   int timp= hours*100+minutes;
   if (timp > 1000) displayNumber01(timp);
   else displayNumber02(timp);
   }




   delay(150);
  }
```

```
    for(int i = 20 ; i >0  ; i--) {
    displayNumber01(hours*100+minutes);
    }
    setTime(hours,minutes,0,0,0,0);
 //  delay(150);

  }

}

void displayNumber01(int toDisplay) {
#define DISPLAY_BRIGHTNESS  1000

#define DIGIT_ON  HIGH
#define DIGIT_OFF  LOW

  for(int digit = 4 ; digit > 0 ; digit--) {

    //Turn on a digit for a short amount of time
    switch(digit) {
    case 1:
     digitalWrite(digit1, DIGIT_ON);
     digitalWrite(segDP, LOW);
      break;
   case 2:
     digitalWrite(digit2, DIGIT_ON);
     digitalWrite(segDP, LOW);
     break;
    case 3:
     digitalWrite(digit3, DIGIT_ON);
     digitalWrite(segDP, LOW);
     break;
    case 4:
     digitalWrite(digit4, DIGIT_ON);
     digitalWrite(segDP, LOW);
     break;
    }
    lightNumber(toDisplay % 10);
    toDisplay /= 10;
    delayMicroseconds(DISPLAY_BRIGHTNESS);

     //Turn off all segments
    lightNumber(10);

    //Turn off all digits
    digitalWrite(digit1, DIGIT_OFF);
```

```
  digitalWrite(digit2, DIGIT_OFF);
  digitalWrite(digit3, DIGIT_OFF);
  digitalWrite(digit4, DIGIT_OFF);
}
}

void displayNumber02(int toDisplay) {
#define DISPLAY_BRIGHTNESS  1000

#define DIGIT_ON  HIGH
#define DIGIT_OFF  LOW

 for(int digit = 4 ; digit > 0 ; digit--) {

  //Turn on a digit for a short amount of time
  switch(digit) {
  case 1:
   lightNumber(10);
   digitalWrite(segDP, LOW);
   break;
  case 2:
    digitalWrite(digit2, DIGIT_ON);
    digitalWrite(segDP, LOW);
    break;
  case 3:
    digitalWrite(digit3, DIGIT_ON);
    digitalWrite(segDP, LOW);
    break;
  case 4:
    digitalWrite(digit4, DIGIT_ON);
    digitalWrite(segDP, LOW);
    break;
  }
  lightNumber(toDisplay % 10);
  toDisplay /= 10;
  delayMicroseconds(DISPLAY_BRIGHTNESS);

   //Turn off all segments
  lightNumber(10);

  //Turn off all digits
  digitalWrite(digit1, DIGIT_OFF);
  digitalWrite(digit2, DIGIT_OFF);
  digitalWrite(digit3, DIGIT_OFF);
  digitalWrite(digit4, DIGIT_OFF);
}
}
```

```
void displayNumber03(int toDisplay) {
#define DISPLAY_BRIGHTNESS  1000

#define DIGIT_ON  HIGH
#define DIGIT_OFF  LOW

 for(int digit = 4 ; digit > 0 ; digit--) {

   //Turn on a digit for a short amount of time
   switch(digit) {
   case 1:
    digitalWrite(digit1, DIGIT_ON);
    digitalWrite(segDP, HIGH);
     break;
  case 2:
     digitalWrite(digit2, DIGIT_ON);
     digitalWrite(segDP, HIGH);
     break;
   case 3:
     digitalWrite(digit3, DIGIT_ON);
     digitalWrite(segDP, HIGH);
     break;
   case 4:
     digitalWrite(digit4, DIGIT_ON);
     digitalWrite(segDP, HIGH);
     break;
   }
   lightNumber(toDisplay % 10);
   toDisplay /= 10;
   delayMicroseconds(DISPLAY_BRIGHTNESS);

    //Turn off all segments
   lightNumber(10);

   //Turn off all digits
   digitalWrite(digit1, DIGIT_OFF);
   digitalWrite(digit2, DIGIT_OFF);
   digitalWrite(digit3, DIGIT_OFF);
   digitalWrite(digit4, DIGIT_OFF);
}
}

void displayNumber04(int toDisplay) {
#define DISPLAY_BRIGHTNESS  1000

#define DIGIT_ON  HIGH
#define DIGIT_OFF  LOW
```

```
 for(int digit = 4 ; digit > 0 ; digit--) {

  //Turn on a digit for a short amount of time
  switch(digit) {
  case 1:
   lightNumber(10);
   digitalWrite(segDP, HIGH);
   break;
 case 2:
    digitalWrite(digit2, DIGIT_ON);
    digitalWrite(segDP, HIGH);
    break;
  case 3:
    digitalWrite(digit3, DIGIT_ON);
    digitalWrite(segDP, HIGH);
    break;
  case 4:
    digitalWrite(digit4, DIGIT_ON);
    digitalWrite(segDP, HIGH);
    break;
  }
  lightNumber(toDisplay % 10);
  toDisplay /= 10;
  delayMicroseconds(DISPLAY_BRIGHTNESS);

   //Turn off all segments
  lightNumber(10);

  //Turn off all digits
  digitalWrite(digit1, DIGIT_OFF);
  digitalWrite(digit2, DIGIT_OFF);
  digitalWrite(digit3, DIGIT_OFF);
  digitalWrite(digit4, DIGIT_OFF);
}
}

//Given a number, turns on those segments
//If number == 10, then turn off number
void lightNumber(int numberToDisplay) {

#define SEGMENT_ON  LOW
#define SEGMENT_OFF HIGH

 switch (numberToDisplay){

 case 0:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
```

```
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_ON);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_OFF);
  break;

 case 1:
  digitalWrite(segA, SEGMENT_OFF);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_OFF);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_OFF);
  digitalWrite(segG, SEGMENT_OFF);
  break;

 case 2:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_OFF);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_ON);
  digitalWrite(segF, SEGMENT_OFF);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 3:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_OFF);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 4:
  digitalWrite(segA, SEGMENT_OFF);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_OFF);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 5:
```

```
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_OFF);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 6:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_OFF);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_ON);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 7:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_OFF);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_OFF);
  digitalWrite(segG, SEGMENT_OFF);
  break;

 case 8:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_ON);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_ON);
  break;

 case 9:
  digitalWrite(segA, SEGMENT_ON);
  digitalWrite(segB, SEGMENT_ON);
  digitalWrite(segC, SEGMENT_ON);
  digitalWrite(segD, SEGMENT_ON);
  digitalWrite(segE, SEGMENT_OFF);
  digitalWrite(segF, SEGMENT_ON);
  digitalWrite(segG, SEGMENT_ON);
  break;
```

```
  // all segment are ON
  case 10:
    digitalWrite(segA, SEGMENT_OFF);
    digitalWrite(segB, SEGMENT_OFF);
    digitalWrite(segC, SEGMENT_OFF);
    digitalWrite(segD, SEGMENT_OFF);
    digitalWrite(segE, SEGMENT_OFF);
    digitalWrite(segF, SEGMENT_OFF);
    digitalWrite(segG, SEGMENT_OFF);
    break;
  }
}
```
