CA LAB 07
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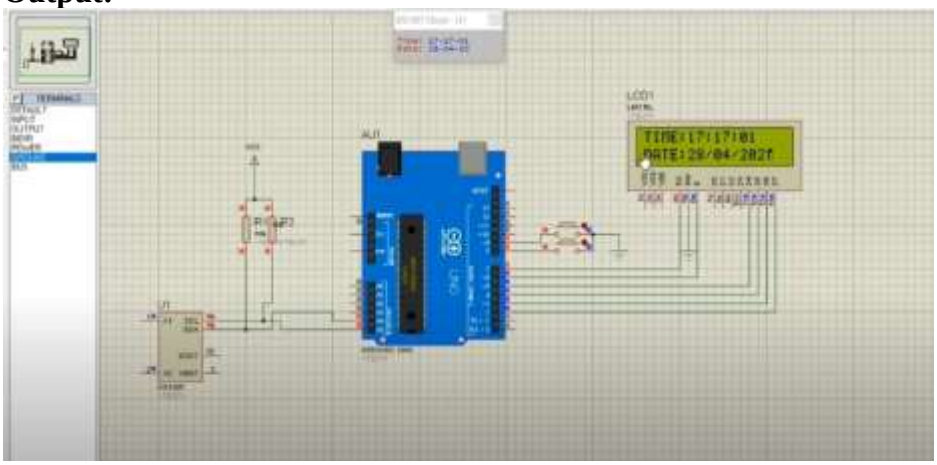
Output:



Code:

```
#include<LiquidCrystal.h>
#include<Wire.h> // needed for I2C protocol.

LiquidCrystal lcd(12,11,5,4,3,2);

void setup() {
pinMode(8,INPUT_PULLUP);
pinMode(9,INPUT_PULLUP);
lcd.begin(16,2);
Wire.begin(); //join i2c bus
  // put your setup code here, to run once:

}

char Time[] = "TIME:   :  :   ";
char Calendar[]="DATE:   /  /20  ";
byte i,second,minute,hour,date,month,year;
void DS3231_display(){
  //convert BCD to decimal
  second=(second>>4)*10+(second & 0x0F);
  minute = (minute>>4)*10+(minute & 0x0F);
  hour=(hour>>4)*10+(hour & 0x0F);
  date = (date>>4)*10+(date & 0x0F);
  month = (month>>4)*10+(month & 0x0F);
  year = (year>>4)*10+(year & 0x0F);
```

```
 //end conversion
 Time[13] = second % 10+48;
 Time[12] = second / 10+48;
 Time[10] = minute % 10+48;
 Time[9] = minute / 10+48;
 Time[7] = hour % 10+48;
 Time[6] = hour / 10+48;
 Calendar[15] = year % 10+48;
 Calendar[14] = year / 10+48;
 Calendar[10] = month % 10+48;
 Calendar[9] = month / 10+48;
 Calendar[7] = date % 10+48;
 Calendar[6] = date / 10+48;
 lcd.setCursor(0,0);
 lcd.print(Time);
 lcd.setCursor(0,1);
 lcd.print(Calendar);
}

void blink_parameter(){
  byte j=0;
  while(j<10 && digitalRead(8) && digitalRead(9)){
    j++;
    delay(25);
  }
}

byte edit(byte x,byte y, byte parameter){
  char text[15];
  while(!digitalRead(8)); //wait until button pin#8 released
  while(true){
    while(!digitalRead(9)){ //if button pin#9 is pressed
      parameter++;
      if(i==0 && parameter > 23){ //if hour>23 => hours =0
        parameter=0;
      }
      if(i==1 && parameter > 59){ //if minute>59 => minute =0
        parameter=0;
      }
      if(i==2 && parameter > 31){ //if date>31 => date=1
        parameter=1;
      }
      if(i==3 && parameter > 12){ //if month > 12 => months =1
        parameter=1;
      }
      if(i==4 && parameter > 99){ //if year> 99 => years =0
```

```
        parameter=0;
       }
      sprintf(text,"%02u",parameter); //The %02u says to write the integer using 2 characters,
adding leading 0's if needed.
      lcd.setCursor(x,y);
      lcd.print(text);
      delay(200);
    }
    lcd.setCursor(x,y);
    //lcd.print(" "); //display two spaces
    blink_parameter();
    sprintf(text,"%02u",parameter);
    lcd.setCursor(x,y);
    lcd.print(text);
    blink_parameter();
    if(!digitalRead(8)){ //if button pin 8 pressed
      i++;  // increment 'i' for the next parameter
      return parameter; //return parameter value and exit
    }
  }
}
void loop() {
  // put your main code here, to run repeatedly:
if(!digitalRead(8)){
  i=0;
  hour = edit(6,0, hour);
  minute= edit(9,0, minute);
  date = edit(6,1,date);
  month = edit(9,1, month);
  year = edit(14,1, year);
  //convert  decimal to BCD
  minute = ((minute / 10)<<4)+ (minute % 10);
  hour = ((hour / 10)<<4)+(hour % 10);
  date = ((date / 10<<4)) + (date % 10);
  month = ((month / 10)<<4) + (month % 10);
  year = ((year / 10)<<4) + (year %10);
  //End conversion
  //Write date to DS3231 RTC
  Wire.beginTransmission(0x68); // start I2C protocol with DS3231 address
  Wire.write(0);  //send register address
  Wire.write(0); //reset sensor and start oscillator.
  Wire.write(minute); //write minute
  Wire.write(hour);
  Wire.write(1);
  Wire.write(date);
  Wire.write(month);
```

```
  Wire.write(year);
  Wire.endTransmission(); // stop transmission and release the I2C bus
  delay(200);
  }
  Wire.beginTransmission(0x68);
  Wire.write(0);
  Wire.endTransmission(false); // I2C restart
  Wire.requestFrom(0x68, 7); //Request 7 bytes from DS3231 and release I2C bus at end of
readinhg
  second = Wire.read(); // Read second fron register 0
  minute = Wire.read(); // Read minute fron register 1
  hour = Wire.read(); // Read hour fron register 2
  Wire.read();  //Ready day from register 3 (not used)
  date = Wire.read(); // Read date fron register 4
  month = Wire.read(); // Read month fron register 5
  year = Wire.read(); // Read second fron register 6
  DS3231_display();  // Display time & calendar
  delay(50); //wait 50ms
}
```