یا لطیف

دانشکده مهندسی برق

تمرین های شبیه سازی ریز پردازنده

تمرین سری ۷

تهیه کننده و نویسنده:

رضا آدینه پور

استاد مربوطه:

جناب اقای دکتر حسین خسروی

تاریخ تهیه و ارائه:

آذر ماه ۱۴۰۰

۱) یک میکرو را به آیسی حافظه **eeprom** مدل **AT24C512** با رابط **i2c** وصل کنید و یک صفحه کلید هم به میکرو وصل کنید.

برای اولین بار که برنامه اجرا می شود، آدرس خانه های ۲۱۰ تا ۲۱۳ را خوانده و اگر محتویات همگی صفر بود، پیام زیر را بدهد.

Welcome

Set Password:

بعد از دریافت کد چهار رقمی از کاربر، مجدد کد را دریافت کند (**Verify Password**) و سپس آن را در همان خانه های ۲۱۰ تا ۲۱۳ ذخیره کند.

برای دفعات بعد، پیام **Enter Password** را نشان دهد و پس از دریافت عدد چهار رقمی از کاربر، آن را با رشته مندرج در در خانه های حافظه **eeprom** مقایسه کند، اگر درست بود، **Login Succeeded** و اگر استباه بود، پیام **Login Failed** را نشان دهد و دوباره رمز دریافت کند.

اگر سه مرتبه رمز اشتباه وارد شد، سیستم به مدن ۱۰ ثانیه قفل شده و ثانیه شمار به صورت معکوس از ۱۰ تا صفر بشمارد و مجدد رمز دریافت کند.

۲) (تمرین اختیاری): استفاده از ال سی دی گرافیکی و ساخت یک ساعت انالوگ-دیجیتال.

فرکانس کاری میکرو در **CodeVision** و **Proteus**، ۸ مگاهرتز تنظیم شده است.

کد سوال اول به صورت زیر است:

```
#include <mega32.h>
#include <i2c.h>
#include <alcd.h>
#include <stdio.h>
#include <delay.h>


unsigned int i = 210;
unsigned char str[2], j = 0, k = 0, e, z = 0, setPass, correctPass[4], code[4], flag =
2;



void byteWrite(unsigned char deviceAddres, unsigned int addres, unsigned char data)
{
	unsigned char lowAddres, highAddres;
	lowAddres = addres;
	highAddres = (addres >> 8);
	deviceAddres <<= 1;
	i2c_start();
	i2c_write(deviceAddres);
	i2c_write(highAddres);
	i2c_write(lowAddres);
	i2c_write(data);
	i2c_stop();
	delay_ms(10);
}


unsigned char randomRead(unsigned char deviceAddres, unsigned int addres)
{
	unsigned char lowAddres, highAddres, read;
	lowAddres = addres;
	highAddres = (addres >> 8);
	deviceAddres <<= 1;
	i2c_start();
	i2c_write(deviceAddres);
	i2c_write(highAddres);
	i2c_write(lowAddres);
	i2c_start();
	i2c_write(deviceAddres | 1);
	read = i2c_read(0);
	i2c_stop();
	delay_ms(10);
	return read;
}


interrupt [EXT_INT0] void ext_int0_isr(void)
{
	if(setPass == 0)
	{
		correctPass[j] = PINC & 0x0f;
		switch(correctPass[j])
		{
			case 0:
				correctPass[j] = 7;
				lcd_putchar('7');
				break;
			case 1:
				correctPass[j] = 4;
					lcd_putchar('4');
```

```
                        break;
                case 2:
                        correctPass[j] = 1;
                        lcd_putchar('1');
                        break;
                case 3:
                        correctPass[j] = 0;
                        lcd_putchar('0');
                        break;
                case 4:
                        correctPass[j] = 8;
                        lcd_putchar('8');
                        break;
                case 5:
                        correctPass[j] = 5;
                        lcd_putchar('5');
                        break;
                case 6:
                        correctPass[j] = 2;
                        lcd_putchar('2');
                        break;
                case 7:
                        correctPass[j] = 0;
                        lcd_putchar('0');
                        break;
                case 8:
                        correctPass[j] = 9;
                        lcd_putchar('9');
                        break;
                case 9:
                        correctPass[j] = 6;
                        lcd_putchar('6');
                        break;
                case 10:
                        correctPass[j] = 3;
                        lcd_putchar('3');
                        break;
                case 11:
                        correctPass[j] = '=';
                        lcd_putchar('=');
                        break;
                case 12:
                        correctPass[j] = '/';
                        lcd_putchar('/');
                        break;
                case 13:
                        correctPass[j] = '*';
                        lcd_putchar('*');
                        break;
                case 14:
                        correctPass[j] = '-';
                        lcd_putchar('-');
                        break;
                case 15:
                        correctPass[j] = '+';
                        lcd_putchar('+');
        }
        j++;
}

if(flag == 0)
{
```

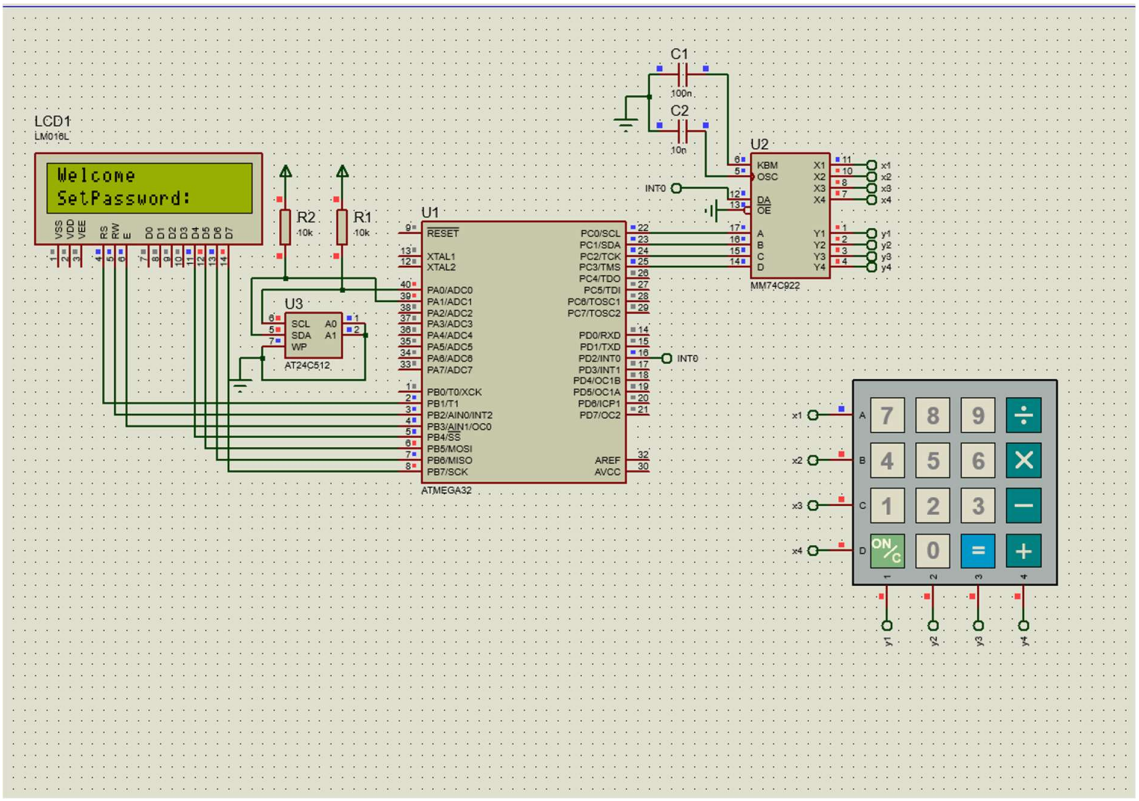
```
code[k] = PINC & 0x0f;
switch(code[k])
{
	case 0:
		code[k] = 7;
		lcd_putchar('7');
		break;
	case 1:
		code[k] = 4;
		lcd_putchar('4');
		break;
	case 2:
		code[k] = 1;
		lcd_putchar('1');
		break;
	case 3:
		code[k] = 0;
		lcd_putchar('0');
		break;
	case 4:
		code[k] = 8;
		lcd_putchar('8');
		break;
	case 5:
		code[k] = 5;
		lcd_putchar('5');
		break;
	case 6:
		code[k] = 2;
		lcd_putchar('2');
		break;
	case 7:
		code[k] = 0;
		lcd_putchar('0');
		break;
	case 8:
		code[k] = 9;
		lcd_putchar('9');
		break;
	case 9:
		code[k] = 6;
		lcd_putchar('6');
		break;
	case 10:
		code[k] = 3;
		lcd_putchar('3');
		break;
	case 11:
		code[k] = '=';
		lcd_putchar('=');
		break;
	case 12:
		code[k] = '/';
		lcd_putchar('/');
		break;
	case 13:
		code[k] = '*';
		lcd_putchar('*');
	break;
		case 14:
		code[k] = '-';
		lcd_putchar('-');
```

```
                        break;
                                case 15:
                                code[k] = '+';
                                lcd_putchar('+');
                }
                k++;
        }
}

void main(void)
{
        DDRA = 0x00;
        PORTA = 0x00;

        DDRB = 0x00;
        PORTB = 0x00;

        DDRC = 0x00;
        PORTC = 0x00;

        DDRD = 0x00;
        PORTD = 0x00;

        // External Interrupt(s) initialization
        // INT0: On
        // INT0 Mode: Falling Edge
        // INT1: Off
        // INT2: Off
        GICR|=(0<<INT1) | (1<<INT0) | (0<<INT2);
        MCUCR=(0<<ISC11) | (0<<ISC10) | (1<<ISC01) | (0<<ISC00);
        MCUCSR=(0<<ISC2);
        GIFR=(0<<INTF1) | (1<<INTF0) | (0<<INTF2);

        // Bit-Banged I2C Bus initialization
        // I2C Port: PORTA
        // I2C SDA bit: 1
        // I2C SCL bit: 0
        // Bit Rate: 100 kHz
        // Note: I2C settings are specified in the
        // Project|Configure|C Compiler|Libraries|I2C menu.
        i2c_init();

        lcd_init(16);

        #asm("sei")


        for(i = 210; i <= 213; i++)
        {
                byteWrite(0x50, i, 0);
        }

        if((randomRead(0x50, 210) == 0) &&  (randomRead(0x50, 211) == 0) &&
(randomRead(0x50, 212) == 0) && (randomRead(0x50, 213) == 0))
        {
                setPass = 0;
                lcd_gotoxy(0, 0);
                lcd_putsf("Welcome");
                lcd_gotoxy(0, 1);
                lcd_putsf("SetPassword:");
        }
```

```
        while (1)
        {
                if(j == 4)
                {
                        j = 0;
                        setPass = 1;
                        byteWrite(0x50, 210, correctPass[0]);
                        byteWrite(0x50, 211, correctPass[1]);
                        byteWrite(0x50, 212, correctPass[2]);
                        byteWrite(0x50, 213, correctPass[3]);
                        lcd_clear();
                        lcd_gotoxy(0, 0);
                        lcd_putsf("Verify Password");
                        delay_ms(3000);
                        lcd_clear();
                        lcd_gotoxy(1, 0);
                        lcd_putsf("Enter Password:");
                        flag = 0;
                }
                if(k == 4)
                {
                        k = 0;
                        flag = 1;
                        if( (code[0] == randomRead(0x50, 210)) && (code[1] ==
randomRead(0x50, 211)) && (code[2] == randomRead(0x50, 212)) && (code[3] ==
randomRead(0x50, 213)) )
                        {
                                lcd_gotoxy(0, 1);
                                lcd_putsf("Login Succeeded!");
                                delay_ms(3000);
                                lcd_clear();
                                lcd_gotoxy(1, 0);
                                lcd_putsf("Enter Password:");
                                flag = 0;
                        }
                        else
                        {
                                lcd_gotoxy(0, 1);
                                lcd_putsf("Login Failed!");
                                delay_ms(3000);
                                lcd_clear();
                                lcd_gotoxy(1, 0);
                                lcd_putsf("Enter Password:");
                                flag = 0;
                                z++;
                                if(z == 3)
                                {
                                        z = 0;
                                        lcd_clear();
                                        lcd_gotoxy(0, 0);
                                        lcd_puts("SystemLocked!");
                                        for(e = 10; e > 0; e--)
                                        {
                                                flag = 1;
                                                lcd_gotoxy(14, 0);
                                                sprintf(str, "%2d", e);
                                                lcd_puts(str);
                                                delay_ms(1000);
                                        }
                                        lcd_clear();
                                        lcd_gotoxy(1, 0);
```

```
                                    lcd_putsf("Enter Password:");
                                    flag = 0;
                                }
                            }

                        }
                }//End While(1)
}//End main()
```

تصویر شبیه سازی شده این تمرین به صورت زیر است:



کد تمرین اختیاری به صورت زیر است:

```
#include <mega32.h>
#include <delay.h>
#include <stdio.h>
#include "Includes/GLCD.h"


flash unsigned char clock[]=
{
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x80,0x80,0x40,0x20,0x20
,0x90,0x88,
	0x08,0x00,0x04,0x04,0x02,0x02,0x02,0x02,0x01,0x01,0x01,0x01,0x01,0xF9,0x01,0x01
,0x01,0x01,
	0x01,0x01,0x02,0x02,0x02,0x02,0x04,0x04,0x80,0xC8,0x08,0x10,0x20,0x20,0x40,0x80
,0x80,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xC0,0x20,0x18,0x0C,0x02,0x01,0x01,0x00,0x00
,0x00,0x00,
	0x00,0x01,0x06,0x08,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x01
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x06,0x03,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x01,0x01,0x02,0x0C,0x18,0x20,0xC0,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0xC0,0x30,0x06,0x01,0x00,0x06,0x04,0x0C,0x08,0x10,0x10
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x08,0x08,0x04,0x04,0x02,0x02,0x00,0x00,0x01,0x06,0x38,0xC0,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0xFC,0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
```

```
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x80,0x80,0x80,0x80,0x80,0x80,0x00,0x03,0xFC
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
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,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x3F,0xC0,0x01,0x01,0x01,0x01,0x01,0x01
,0x01,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
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,0x00,0x00,
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,0xC0,0x3F,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
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,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x03,0x0C,0x60,0x80,0x00
,0x00,0x40,
	0x60,0x20,0x10,0x18,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
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,0x00,0x00,
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,0x60,0x1C,
	0x03,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
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,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x03,
	0x04,0x18,0x30,0x40,0x80,0x80,0x00,0x00,0x00,0x00,0x00,0x00,0x80,0xE0,0x30,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x80,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x30,0xC0,0x80,0x00,0x00,0x00,0x00,0x00,0x80,0x80,0x40,0x30,0x18,0x04
,0x03,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x01,0x01,0x02,0x04,0x04,0x08,0x12,0x11,0x20
,0x20,0x20,
	0x40,0x40,0x40,0x40,0x80,0x80,0x80,0x80,0x80,0x80,0x9F,0x80,0x80,0x80,0x80,0x80
,0x40,0x40,
	0x40,0x40,0x20,0x20,0x20,0x10,0x11,0x08,0x04,0x04,0x02,0x01,0x01,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
```

```
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
,0x00,0x00,
	0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
};


unsigned char str[10];

long int i = 0;

interrupt [TIM0_OVF] void timer0_ovf_isr(void)
{
	i++;
}

void main(void)
{
	int hour = 10, min = 35, sec = 30, Rh = 15, Rs = 23, Rm = 20;
	float Xh = 0, Yh = 0, Xs = 0, Ys = 0, Xm, Ym, H;
	H = hour + (min/60.0);

	DDRA=(1<<DDA7) | (1<<DDA6) | (1<<DDA5) | (1<<DDA4) | (1<<DDA3) | (1<<DDA2) |
(1<<DDA1) | (1<<DDA0);
	DDRC=(0<<DDC7) | (0<<DDC6) | (0<<DDC5) | (0<<DDC4) | (0<<DDC3) | (0<<DDC2) |
(0<<DDC1) | (0<<DDC0);

	// Timer/Counter 0 initialization
	// Clock source: System Clock
	// Clock value: 1000/000 kHz
	// Mode: Normal top=0xFF
	// OC0 output: Disconnected
	// Timer Period: 0/256 ms
	TCCR0=(0<<WGM00) | (0<<COM01) | (0<<COM00) | (0<<WGM01) | (0<<CS02) | (0<<CS01)
| (1<<CS00);
	TIMSK=(0<<OCIE2) | (0<<TOIE2) | (0<<TICIE1) | (0<<OCIE1A) | (0<<OCIE1B) |
(0<<TOIE1) | (0<<OCIE0) | (1<<TOIE0);
	ACSR=(1<<ACD) | (0<<ACBG) | (0<<ACO) | (0<<ACI) | (0<<ACIE) | (0<<ACIC) |
(0<<ACIS1) | (0<<ACIS0);
	TCNT0=0x00;
	OCR0=0x00;

	glcd_on();
	glcd_clear();
	bmp_disp(clock, 0, 0, 127, 7);
	point_at(32, 32, 1);

	#asm("sei")

	while (1)
	{
		if(i*256 + TCNT0>=999999)
		{
			line(32, 32, Xs, Ys, 0, 0);
			sec++;
			i = 0;
			TCNT0 = 0;
			Xh = Rh*cos((3-H)*2*3.1415/12)+32;
			Yh=-Rh*sin((3-H)*2*3.1415/12)+32;
			line(32,32,Xh,Yh,0,1);
			Xm=Rm*cos((15-min)*2*3.1415/60)+32;
			Ym=-Rm*sin((15-min)*2*3.1415/60)+32;
			line(32,32,Xm,Ym,0,1);
```

```
                Xs=(Rs*cos((15-sec)*2*3.1415/60))+32;
                Ys=-Rs*sin((15-sec)*2*3.1415/60)+32;
                line(32,32,Xs,Ys,0,1);
                sprintf(str,"%02d:%02d:%02d",hour,min,sec);
                glcd_puts(str,60,7,0,1,0);


                if(sec == 59)
                {
                        sec = 0;
                        min++;
                        line(32,32,Xm,Ym,0,0);
                        if(min == 59)
                        {
                                min = 0;
                                hour++;
                                line(32, 32, Xh, Yh, 0, 0);
                                if(hour == 24)
                                hour = min = sec = 0;
                        }
                }
        }
    }//End While()
}//End Main()
```

تصویر شبیه سازی شده این تمرین به صورت زیر است: