**اسم الطالب : أيمن محمد نبيل محمد**

**سكشن : 2**

**قسم هندسة الحاسبات ونظم التحكم**

**Challenge 2 – Task**

**Smart RTC Clock**

**……………………………………….**

**Screenshot of the circuit**

**A screenshot of a computer

Description automatically generated**

**Code:**

**/\***

**\* File: main.c**

**\* Author: engay**

**\***

**\* Created on May 8, 2024, 4:19 PM**

**\*/**

**#include <xc.h>**

**#include "./lib/common.h"**

**#include "lib/keypad/keypad.h"**

**#include "lib/lcd/lcd.h"**

**#include "lib/timer/timer.h"**

**#define Leap\_Year\_Days 31622400 //(366\*24\*60\*60)**

**#define Year\_Days 31536000 //(365\*24\*60\*60)**

**#define IS\_LEAP\_YEAR(year) ( (year%4==0) && ( (year%100!=0) || (year%400==0) ) )**

**static unsigned long long epoch=0; // Global Variable.**

**void My\_Init\_Code()**

**{**

**timer0\_init(\_TIMER\_PRESCALER\_2);**

**lcd\_init();**

**keypad\_init();**

**}**

**char Get\_Num\_str(char\* stnum)**

**{**

**lcd\_set\_cursor(2,7);**

**char key=1,i=0;**

**for(i=0;i<10;i++)**

**{**

**key='\0';**

**while(key=='\0')**

**{**

**key=keypad\_get\_key();**

**}**

**while(key==keypad\_get\_key());**

**if(key=='=')**

**{**

**stnum[i]='\0';**

**break;**

**}**

**else**

**{**

**stnum[i]=key;**

**lcd\_chr\_cp(key);**

**}**

**}**

**keypad\_init();**

**return i-1;**

**}**

**unsigned long long power(char num,char repeat)**

**{**

**unsigned long long result=0;**

**result = num - 48 ;**

**while(repeat!=0)**

**{**

**result\*=10;**

**repeat--;**

**}**

**return result;**

**}**

**unsigned long long Conv\_Num(char \*snum,char end)**

**{**

**unsigned long long num=0;**

**while(\*snum!=0)**

**{**

**num+= power(\*snum,end);**

**end--;**

**snum++;**

**}**

**return num;**

**}**

**void Show\_4(int four)**

**{**

**char Show[5]={5,0,0,0,0};**

**char i=3;**

**while(i)**

**{**

**Show[i] = (four%10)+48;**

**four/=10;**

**i--;**

**}**

**Show[0]=four+48;**

**lcd\_out\_cp(Show);**

**}**

**void Show\_2(int two)**

**{**

**char Show[3]={0,0,0};**

**char i=1;**

**while(i)**

**{**

**Show[i] = (two%10)+48;**

**two/=10;**

**i--;**

**}**

**Show[0]=two+48;**

**lcd\_out\_cp(Show);**

**}**

**int year =1970;**

**char month=1,day=1,hour=0,minute=0;**

**void Print\_On\_Screen()**

**{**

**// First Line**

**lcd\_set\_cursor(1,3);**

**Show\_4(year);**

**lcd\_chr\_cp('-');**

**Show\_2(month);**

**lcd\_chr\_cp('-');**

**Show\_2(day);**

**// Second Line**

**lcd\_set\_cursor(2,4);**

**Show\_2(hour);**

**lcd\_chr\_cp(':');**

**Show\_2(minute);**

**lcd\_chr\_cp(':');**

**Show\_2((char)epoch);**

**}**

**extern unsigned long timer0\_time\_passed\_ms;**

**extern unsigned short overflow\_cnt;**

**void \_\_interrupt() my\_isr()**

**{**

**GIE=0;**

**if(TMR0IF==1 && TMR0IE==1)**

**{**

**overflow\_cnt++;**

**if(overflow\_cnt==4)**

**{**

**timer0\_time\_passed\_ms++;**

**overflow\_cnt = 0;**

**}**

**TMR0IF=0;**

**}**

**TMR0= 6+40;**

**GIE=1;**

**}**

**void my\_delay(unsigned long mytime)**

**{**

**unsigned long start\_time=0,end\_time=0;**

**end\_time = timer\_get\_time\_since\_init();**

**while(end\_time-start\_time<=mytime)**

**{**

**end\_time = timer\_get\_time\_since\_init();**

**}**

**timer0\_time\_passed\_ms=0;**

**}**

**void main(void) {**

**char months[12]={31,28,31,30,31,30,31,31,30,31,30,31};**

**My\_Init\_Code();**

**lcd\_cmd(\_LCD\_CLEAR);**

**char myname[]="Ayman Mohamed";**

**lcd\_out(1,6,"Welcome");**

**lcd\_out(2,3,myname);**

**my\_delay(2000); // 2 Seconds**

**lcd\_cmd(\_LCD\_CLEAR);**

**char snum[11];**

**lcd\_out(1,1,"Enter Epoch Unix");**

**lcd\_out(2,1,"Time :");**

**char end=0;**

**end = Get\_Num\_str(snum);**

**lcd\_cmd(\_LCD\_CLEAR);**

**epoch = Conv\_Num(snum,end);**

**while( (IS\_LEAP\_YEAR(year) && epoch>=Leap\_Year\_Days) || (epoch>=Year\_Days && !IS\_LEAP\_YEAR(year)))**

**{**

**if(IS\_LEAP\_YEAR(year))**

**{**

**epoch-=Leap\_Year\_Days;**

**}**

**else**

**{**

**epoch-=Year\_Days;**

**}**

**year++;**

**}**

**// Year is Done.**

**if(epoch>=86400) // 24\*60\*60**

**{**

**int num\_of\_days=epoch/(86400);**

**int desired = 0 ;**

**int i=0;**

**for( i=0; i<11 && desired + months[i] <num\_of\_days && num\_of\_days!=0 ;i++)**

**{**

**if(i==1 && IS\_LEAP\_YEAR(year) )**

**{**

**desired+=(months[i]+1);**

**continue;**

**}**

**desired+=months[i];**

**}**

**month = i+1;**

**epoch-=(desired\*86400);**

**}**

**// Month is Done.**

**if(epoch>=86400) // 24\*60\*60**

**{**

**day = epoch / 86400; // I added one because we started from 1 Jan 1970.**

**day++; // I added one because we started from 1 Jan 1970.**

**epoch= (epoch % 86400) ;**

**} // Day is Done.**

**if(epoch>=3600) // 60\*60**

**{**

**hour = epoch/(3600);**

**epoch= (epoch%3600);**

**}**

**// Hour is Done.**

**if(epoch>=60) // 60**

**{**

**minute = epoch/(60);**

**epoch -= (minute\*60);**

**}**

**// Minutes is Done.**

**// Seconds is Done. I will use epoch as a variable for seconds. (Ayman Mohamed)**

**while(1)**

**{**

**Print\_On\_Screen();**

**my\_delay(1000);**

**if(epoch==59)**

**{**

**epoch=0;**

**if(minute==59)**

**{**

**minute=0;**

**if(hour==23)**

**{**

**hour =0;**

**// Check Day**

**if(IS\_LEAP\_YEAR(year) && month == 2 && day==29)**

**{**

**day = 0;**

**month++;**

**}**

**else if(IS\_LEAP\_YEAR(year) && month == 2 && day ==28)**

**{**

**day=29;**

**}**

**else if(IS\_LEAP\_YEAR(year) && month == 2)**

**{**

**day++;**

**}**

**else**

**{**

**if(day < months[month-1] )**

**{**

**day++;**

**}**

**else**

**{**

**day=0;**

**if(month == 12)**

**{**

**month = 0 ;**

**year++;**

**}**

**else**

**{**

**month++;**

**}**

**}**

**}**

**}**

**else**

**{**

**hour++;**

**}**

**}**

**else**

**{**

**minute++;**

**}**

**}**

**else**

**{**

**epoch++;**

**}**

**}**

**return;**

**}**