

```
/* Editor : Santipap.Poor and Chatchawan.phua */
```

```
// Where : BU-Eng
```

```
// When :22-11-2019
```

```
// How : MiniProject
```

```
#include <p30f4011.h>      // generic header file dsPIC
```

```
#include <uart.h>         // UART Lib
```

```
#include <stdlib.h>
```

```
#include <timer.h>        //library for timer
```

```
#include <math.h>         //library for random
```

```
// System Configuration
```

```
_FOSC(XT_PLL4 & CSW_FSCM_OFF); // SW disable, Mon Disable, XT w/PLL4
```

```
_FWDT(WDT_OFF);          // Watchdog timer off
```

```
_FBORPOR(PBOR_OFF&PWRT_64&MCLR_EN);
```

```
_FGS(CODE_PROT_OFF);
```

```
//keyped
```

```
#define Row1 _RB0 //Pin RB0 Output
```

```
#define Row2 _RB1 //Pin RB1 Output
```

```
#define Row3 _RB2 //Pin RB2 Output
```

```
#define Row4 _RB3 //Pin RB3 Output
```

```
#define Col1 _RB4 //Pin RB4 Input
```

```
#define Col2 _RB5 //Pin RB5 Input
```

```
#define Col3 _RB6 //Pin RB6 Input
```

```
#define TRUE 1
```

```
//LED LP
```

```
#define TRIS_LED TRISE
```

```
#define OUT_0      _RE0
```

```
#define OUT_1      _RE1
```

```
#define OUT_2      _RE2
```

```
#define OUT_3      _RE3
```

```
#define OUT_4      _RE4
```

```
#define OUT_5      _RE5
```

```
#define OUT_6      _RE6
```

```
#define OUT_7      _RE7
```

```
//LED Correct and Wrong
```

```
#define TRIS_LED2 TRISF
```

```
#define OUT2_0      _RF3
```

```
#define OUT2_1      _RF1
```

```
//Switch for skip
```

```
#define TRIS_SW1 TRISF
```

```
#define IN2_0 _RF2
```

```
//Show value uart
```

```
char uart_buf[40];
```

```
void _ISR_U1TXInterrupt(void);
```

```
void _ISR_U1RXInterrupt(void);
```

```
void uart1_init(void); //Uart
```

```
void Delay_MS(int); //Delay
```

```

void _ISR_T1Interrupt(void);
void Timer1_Init(void);      //On timer
void Timer2_Init(void);      //Off timer
void Quiz(void);             //Function show Question
void YN(void);               //Check Answer
void ALLrun(void);           //Run all function
void Correct(void);          //After answer correct
void SWRandom(void);         //Switch skip Question
void Wrong(void);            //After answer Wrong
void Random(void);           //Random Question
void Coutend(int);           //Count LED LP
char scankey(void);          //Get value from keypad

```

```

int skip=2;      //Skip 2 time
int i=0; //Use looping for
int spec=0;      //Check that press keypad
int t;           //Get value from random
int o;           //Number of Question
int x;           //Get value Question from Wrong
int score=0;     //Value count score
int coutend =5;  //Value LP
int countdown=10; //Value time countdown
char current_key = '.'; //Define the key as "dot"
char current_key1 = '.';
char current_key2 = '.';
char current_key3 = '.';

int LoopSt = 1; //Loop Check that press keypad

```

```
int Loop1=0; //Loop Question that Wrong
int Loop2=0; //Loop Check if the question is repeated
int notfix[15]={20,20,20,20,20,20,20,20,20,20,20,20,20,20,20}; //Keep the questions that
have already been asked.
int cnotfix=0; //Check if the question is repeated
int tick=1; //Check time
```

```
void _ISR_T1Interrupt(void)
{

    if(++tick==4) //if tick=4 = 1 second
    {

        tick=0;
        countdown--;
        if(spec==0) //if not press
        {

            sprintf(uart_buf,"\r %d ||",countdown);
            putsUART1((unsigned int *)uart_buf);
            while(BusyUART1());
        }
        else if(spec==1) //if pressed
        {

            sprintf(uart_buf,"\r %d ||",countdown);
            putsUART1((unsigned int *)uart_buf);
            while(BusyUART1());
            putcUART1(current_key);
            while(BusyUART1());
        }
    }
}
```

```

    }
    else
    {
        ;
    }

    if(countdown==0) //that time out
    {
        coutend--;
        Coutend(coutend);
        countdown=10;
        sprintf(uart_buf,"\n\rLP = %d",coutend);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf,"\r\nSkip = %d\r\n",skip);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf,"Score =
%d\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n",score);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        Quiz();
        //YN();
    }
    else
    {
        ;
    }
}

tick++;

```

```

_T1IF=0;
}

int main(void)
{

    //Variablee

    LATE = 0b00000000111111000;

    //Velue ramdom

    unsigned char random_no=0;


    //PORT B Config

    ADPCFG=0x01FF;                // Config ProtB = Analog = "0",Digital = "1"
    TRISB=0x01F0;                 // RB6 - RB4 = Input, and RB3 - RB0 = Output

                                //0b 0000 0001 1111 0000

    //PORT E Config

    TRIS_LED = 0x0000;//Out (0=Out, 1=In)

    TRIS_LED2 = 0x0000;//Out

    TRIS_SW1 = 0x1111; //In

    //Initialize

    uart1_init(); // initialize the UART1

    putsUART1((unsigned int *)"r***** Press [*] to start
*****\r\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n");

    while(BusyUART1());

    while(current_key == '.') //Check that press

    {

        current_key = scankey();

    }

    if(current_key == '*') //if press * to start

    {

```

```

        current_key = '.';
    }
    else
    {
        ;
    }
    ALLrun(); //all function
    return 0;
}
//END Main

```

```

void uart1_init(void)
{
    //Variables
    unsigned int baudvalue;
    unsigned int U1MODEvalue;
    unsigned int U1STAvale;
    //Close UART1
    CloseUART1();
    //Open UART1
    U1MODEvalue = UART_EN &
                    UART_IDLE_CON &
                    //0xFBE7 &
                    UART_DIS_WAKE &
                    UART_DIS_LOOPBACK &

```

```
    UART_DIS_ABAUD &
    UART_NO_PAR_8BIT &
    UART_1STOPBIT;
```

```
U1STAValue = UART_INT_TX_BUF_EMPTY &
    UART_TX_PIN_NORMAL &
    UART_TX_ENABLE &
    UART_INT_RX_3_4_FUL &
    UART_ADR_DETECT_DIS &
    UART_RX_OVERRUN_CLEAR;
```

```
baudvalue = 47; // How to calculate
```

```
OpenUART1(U1MODEValue, U1STAValue, baudvalue);
```

```
}
```

```
char scankey(void)
```

```
{
```

```
    char key = '.';
```

```
//-----ROW1-----//
```

```
    PORTB = 0x01FE;          //0b 0000 0001 1111 1110;
```

```
    Delay_MS(5);
```

```
    if(Col1 == 0)             {key = '1';}
```

```
    else if(Col2 == 0)        {key = '2';}
```

```
    else if(Col3 == 0)        {key = '3';}
```

```
    else                       ;
```

```
    while((Col1 ==0) || (Col2 ==0) || (Col3 ==0)); // Waiting for key
```



```

//-----ROW2-----//

    Delay_MS(5);

    PORTB = 0x01FD;          //0b 0000 0001 1111 1101;

    Delay_MS(5);

    if(Col1 ==0)              {key = '4';}
    else if(Col2 ==0)          {key = '5';}
    else if(Col3 ==0)          {key = '6';}
    else                        ;

    while((Col1 ==0) || (Col2 ==0) || (Col3 ==0)); // Waiting for key

//-----ROW3-----//

    Delay_MS(5);

    PORTB = 0x01FB;          //0b 0000 0001 1111 1011;

    Delay_MS(5);

    if(Col1 ==0)              {key = '7';}
    else if(Col2 ==0)          {key = '8';}
    else if(Col3 ==0)          {key = '9';}
    else                        ;

    while((Col1 ==0) || (Col2 ==0) || (Col3 ==0)); // Waiting for key

//-----ROW4-----//

    Delay_MS(5);

    PORTB = 0x01F7;          //0b 0000 0001 1111 0111;

    Delay_MS(5);

    if(Col1 ==0)              {key = '*';}
    else if(Col2 ==0)          {key = '0';}
    else if(Col3 ==0)          {key = '#';}
    else                        ;

    while((Col1 ==0) || (Col2 ==0) || (Col3 ==0)); // Waiting for key

```

```
return key;
```

```
}
```

```
//Set value LED from coutend
```

```
void Coutend(int coutend)
```

```
{
```

```
    if(coutend==8)
```

```
    {
```

```
        LATE = 0b00000000100000000;
```

```
    }
```

```
    else if(coutend==7)
```

```
    {
```

```
        LATE = 0b00000000110000000;
```

```
    }
```

```
    else if(coutend==6)
```

```
    {
```

```
        LATE = 0b00000000111000000;
```

```
    }
```

```
    else if(coutend==5)
```

```
    {
```

```
        LATE = 0b00000000111100000;
```

```
    }
```

```
    else if(coutend==4)
```

```
    {
```

```
        LATE = 0b00000000111110000;
```

```
    }
```

```
    else if(coutend==3)
```

```
    {
```

```

        LATE = 0b00000000111111000;
    }
    else if(coutend==2)
    {
        LATE = 0b00000000111111100;
    }
    else if(coutend==1)
    {
        LATE = 0b00000000111111110;
    }
    else if(coutend==0) //if coutend = 0 and "Game Over"
    {
        LATE = 0b00000000111111111;
        Timer2_Init();
        putsUART1((unsigned int *)"\n!!!!!!Game Over!!!!!!");
        while(BusyUART1());
        sprintf(uart_buf,"\n\rLP = %d\r\n",coutend);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf,"Score =
%d\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n",score);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        while(1)
        {
            ;
        }
    }
}

```

```
void Quiz(void)
{

    if(o== 1)
    {
        putsUART1((unsigned int *)"\r\n 1+2+3 = ? \r\n");
        while(BusyUART1());
    }

    else if(o== 2)
    {
        putsUART1((unsigned int *)"\r\n 2+3-1 = ? \r\n");
        while(BusyUART1());
    }

    else if(o== 3)
    {
        putsUART1((unsigned int *)"\r\n 5+1-5 = ? \r\n");
        while(BusyUART1());
    }

    else if(o== 4)
    {
        putsUART1((unsigned int *)"\r\n 4+3-7 = ? \r\n");
        while(BusyUART1());
    }

    else if(o== 5)
    {
        putsUART1((unsigned int *)"\r\n 5+5-5 = ? \r\n");
        while(BusyUART1());
    }
}
```

```

}
else if(o== 6)
{
    putsUART1((unsigned int *)"\r\n 7+1+1 = ? \r\n");
    while(BusyUART1());
}
else if(o== 7)
{
    putsUART1((unsigned int *)"\r\n 4+1-4 = ? \r\n");
    while(BusyUART1());
}
else if(o== 8)
{
    putsUART1((unsigned int *)"\r\n 3+3-3+3 = ? \r\n");
    while(BusyUART1());
}
else if(o== 9)
{
    putsUART1((unsigned int *)"\r\n 10-1-8 = ? \r\n");
    while(BusyUART1());
}
else if(o== 10)
{
    putsUART1((unsigned int *)"\r\n 1+2+3+4+5 = ? \r\n");
    while(BusyUART1());
}
else if(o== 11)
{
    putsUART1((unsigned int *)"\r\n 2x2 = ? \r\n");

```

```

        while(BusyUART1());
    }
    else if(o== 12)
    {
        putsUART1((unsigned int *)"\r\n 4x3 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 13)
    {
        putsUART1((unsigned int *)"\r\n 2x8 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 14)
    {
        putsUART1((unsigned int *)"\r\n 4/2 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 15)
    {
        putsUART1((unsigned int *)"\r\n 10/5 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 16)
    {
        putsUART1((unsigned int *)"\r\n 2x3x4 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 17)
    {

```

```

        putsUART1((unsigned int *)"\r\n 4+3x2 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 18)
    {
        putsUART1((unsigned int *)"\r\n 5x2/2 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 19)
    {
        putsUART1((unsigned int *)"\r\n 5x3-2+6/2 = ? \r\n");
        while(BusyUART1());
    }
    else if(o== 0)
    {
        putsUART1((unsigned int *)"\r\n 5+5 = ? \r\n");
        while(BusyUART1());
    }
    else
    {
        ;
    }

    putsUART1((unsigned int *)"\r\nPlease any Key : \r\n");
    while(BusyUART1());
}

void YN(void)
{

    while(1)

```

```

{
    // Scankey
    // Send the key to Computer
    while(LoopSt==1)
    {
        LoopSt=0;
        while(current_key == '.')
        {
            current_key = scankey();
            SWRandom(); //Check that press switch
        }
        spec=1;
        Delay_MS(10);
        putcUART1(current_key);
        while(current_key1 == '.')
        {
            current_key1 = scankey();
            SWRandom();
        }
        Delay_MS(10);
        if(current_key1!='#') //press # for confirm answer
        {
            putcUART1(current_key1);
            while(current_key2 == '.')
            {
                current_key2 = scankey();
                SWRandom();
            }
            if(current_key2!='#')//press # for confirm answer

```



```

        {
            putsUART1((unsigned int *)"\r\nYou input key too
much\r\n");

            while(BusyUART1());

            putsUART1((unsigned int *)"\r\nPlease any Key :
\r\n");

            while(BusyUART1());

        }

    }

if(current_key != '.') //Check that correct or wrong
{
    if(o==1)
    {
        if((current_key == '6' )&& (current_key1 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==2)
    {
        if((current_key == '4' )&& (current_key1 == '#'))

```

```
        {
            Correct();
        }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==3)
{
    if((current_key == '1' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==4)
{
```

```
        if((current_key == '0' )&& (current_key1 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==5)
    {
        if((current_key == '5' )&& (current_key1 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==6)
```

```

{
    if((current_key == '9' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==7)
{
    if((current_key == '1' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}

```

```
if(o==8)
{
    if((current_key == '6' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==9)
{
    if((current_key == '1' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
```

```

    }
    if(o==10)
    {
        if((current_key == '1' )&& (current_key1 == '5')&&
(current_key2 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==11)
    {
        if((current_key == '4' )&& (current_key1 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {

```

```

        ;
    }
    if(o==12)
    {
        if((current_key =='1' )&& (current_key1 =='2')&&
(current_key2 =='#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==13)
    {
        if((current_key =='1' )&& (current_key1 =='6')&&
(current_key2 =='#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }

```

```

else
{
    ;
}
if(o==14)
{
    if((current_key =='2' )&& (current_key1 =='#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==15)
{
    if((current_key =='2' )&& (current_key1 =='#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}

```



```

    }
    else
    {
        ;
    }
    if(o==16)
    {
        if((current_key =='2' )&& (current_key1 =='4')&&
(current_key2 =='#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==17)
    {
        if((current_key =='1' )&& (current_key1 =='0')&&
(current_key2 =='#'))
        {
            Correct();
        }
        else
        {

```

```

        Wrong();
    }
}
else
{
    ;
}
if(o==18)
{
    if((current_key == '5' )&& (current_key1 == '#'))
    {
        Correct();
    }
    else
    {
        Wrong();
    }
}
else
{
    ;
}
if(o==19)
{
    if((current_key == '1' )&& (current_key1 == '6')&&
(current_key2 == '#'))
    {
        Correct();
    }
    else

```

```

        {
            Wrong();
        }
    }
    else
    {
        ;
    }
    if(o==0)
    {
        if((current_key == '1' )&& (current_key1 == '0')&&
(current_key2 == '#'))
        {
            Correct();
        }
        else
        {
            Wrong();
        }
    }
    else
    {
        ;
    }
}
else
{
    ;
}
break;

```

```

    }

    //Change this to default.
    OUT2_1 = 1;
    current_key = '.';
    current_key1 = '.';
    current_key2 = '.';
    LoopSt=1;
    spec=0;
}

//function open timer
void Timer1_Init(void)
{
    unsigned int config,period;
    CloseTimer1();
    ConfigIntTimer1(T1_INT_ON);
    config=T1_ON &
    T1_IDLE_STOP &
    T1_GATE_OFF &
    T1_PS_1_64 &
    T1_SYNC_EXT_OFF &
    T1_SOURCE_INT;
    period=57604;
    OpenTimer1(config,period);
}

//function close timer
void Timer2_Init(void)
{
    unsigned int config,period;

```



```

        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf,"Score =
%d\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n",score);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        while(1)
        {
            ;
        }
    }
}

```

```

void Wrong(void)
{
    putsUART1((unsigned int *)"\r\n !!!!!Wrong!!!!
\r\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n");
    while(BusyUART1());
    OUT2_0 = 0; //Red LED ON
    Delay_MS(1000);
    Loop1=1;
    coutend=coutend-1; //if wrong LP - 1
}

```

```

void Random(void)
{
    srand(time(NULL));
    t=rand()%20;
    if(Loop1==0)
    {
        Loop2=0;
    }
}

```

```

while(Loop2==0)
{
    for(i=0;i<15;i++)//Check if the question is repeated
    {
        if(t==notfix[i])
        {
            t=rand()%20;
        }
        else
        {
            if(i==14)
            {
                notfix[cnotfix]=t;
                Loop2=1;
            }
            else
            {
                ;
            }
        }
    }
}
cnotfix++;
o = t ;
x = o ; //Get value Question from Wrong
}
else
{
    o = x ;

```

```

    }
}

void ALLrun(void)
{
    while(1)
    {
        Random(); //Random value Question
        Coutend(coutend); //Show value LP

        //Check Red and Blue LED
        OUT2_1 = 1;
        Delay_MS(50);
        OUT2_0 = 1;
        Delay_MS(50);

        sprintf(uart_buf, "\n\rLP = %d", coutend);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf, "\r\nSkip = %d\r\n", skip);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        sprintf(uart_buf, "Score = %d\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n\n", score);
        putsUART1((unsigned int *)uart_buf);
        while(BusyUART1());
        Quiz(); //Show Question from random
        Timer1_Init(); //open timer
        YN(); //Check Answer
    }
}

```



```

void SWRandom(void)
{
    if(IN2_0==1)
    {
        if(skip>0)//if skip > 0 will can skip Question
        {
            Delay_MS(500);
            skip--;
            countdown=10;
            ALLrun();//run function ALLrun again
        }
        else
        {
            ;
        }
    }
    else
    {
        ;
    }
}

```

```
void Delay_MS(int ms)
{
    unsigned int i;
    for(; ms>0; ms--)
        for(i=0; i<728; i++)
            Nop();
}
```