#include <avr/io.h>

//header to enable data flow control over pins

                #define F\_CPU 1000000

//telling controller crystal frequency attached

                #include <util/delay.h>

//header to enable delay function in program

                #define    E   5

//giving name “enable”  to 5th pin of PORTD, since it Is connected to LCD enable pin

                #define RS  6

//giving name “registerselection” to 6th pin of PORTD, since is connected to LCD RS pin

                void send\_a\_command(unsigned char command);

                void send\_a\_character(unsigned char character);

               void send\_a\_string(char \*string\_of\_characters);

                int main(void)

                {

                                DDRB = 0xFF;

                                      //putting portB and portD as output pins

                                DDRD = 0xFF;

                                \_delay\_ms(50);//giving delay of 50ms

                                int key=0;//allocating integer to reset the LCD once it reaches its display limit

                                int keypressed=0;//integer for storing matrix value

                                send\_a\_command(0x01); //Clear Screen 0x01 = 00000001

                                \_delay\_ms(50);

                                send\_a\_command(0x38);//telling lcd we are using 8bit command /data mode

                                \_delay\_ms(50);

                                send\_a\_command(0b00001111);//LCD SCREEN ON and courser blinking

                                send\_a\_string("PRESS A KEY");//displaying a string

                                send\_a\_command(0x80 + 0x40 +0);// moving courser to second line of LCD

                                                DDRA=0xF0;//taking column pins as input and row pins as output

                                                \_delay\_ms(1);

                                                PORTA=0x0F;// powering the row ins

                                                \_delay\_ms(1);

                                while(1)

                {

                       if (PINA!=0b11110000)//in any of column pins goes high execute the loop

                                {

                                                \_delay\_ms(5);

                                                keypressed = PINA;//taking the column value into integer

                                                DDRA ^=0b11111111;//making rows as inputs and columns as ouput

                                                \_delay\_ms(1);

                                                PORTA ^= 0b11111111;//powering columns

                                                \_delay\_ms(1);

                                                keypressed |=PINA;taking row value and OR ing it to column value

                                                if (keypressed==0b00010001)

                                                {

                                                                send\_a\_string("1");//if row1 and column1 is high show “1”

                                                                                key++;

                                                }

                                                if (keypressed==0b00010010)

                                                {

                                                                send\_a\_string("4");// if row1 and column2 is high show “4”

                                                                                key++;

                                                }

                                                if (keypressed==0b00010100)

                                                {

                                                                send\_a\_string("7");// if row1 and column3 is high show “7”

                                                                                key++;

                                                }

                                                if (keypressed==0b00011000)

                                                {

                                                                send\_a\_string("\*");//if row1 and column4 is high show “\*”

                                                                                key++;

                                                }

                                                if (keypressed==0b00100001)

                                                {

                                                                send\_a\_string("2");// if row2 and column1 is high show “2”

                                                                key++;

                                                }

                                                if (keypressed==0b00100010)

                                                {

                                                                send\_a\_string("5");// if row2 and column2 is high show “5”

                                                                key++;

                                                }

                                                if (keypressed==0b00100100)

                                                {

                                                                send\_a\_string("8");// if row2 and column3 is high show “8”

                                                                key++;

                                                }

                                                if (keypressed==0b00101000)

                                                {

                                                                send\_a\_string("0");// if row2 and column4 is high show “0”

                                                                key++;

                                                }

                                                if (keypressed==0b01000001)

                                                {

                                                                send\_a\_string("3");

                                                                key++;

                                                }

                                                if (keypressed==0b01000010)

                                                {

                                                                send\_a\_string("6");

                                                                key++;

                                                }

                                                if (keypressed==0b01000100)

                                                {

                                                                send\_a\_string("9");

                                                                key++;

                                                }

                                                if (keypressed==0b01001000)

                                                {

                                                                send\_a\_string("#");

                                                                key++;

                                                }

                                                if (keypressed==0b10000001)

                                                {

                                                                send\_a\_string("A");

                                                                key++;

                                                }

                                                if (keypressed==0b10000010)

                                                {

                                                                send\_a\_string("B");

                                                                key++;

                                                }

                                                if (keypressed==0b10000100)

                                                {

                                                                send\_a\_string("C");

                                                                key++;

                                                }

                                                if (keypressed==0b10001000)

                                                {

                                                                send\_a\_string("D");

                                                                key++;

                                                }

                                                keypressed=0;//after showing integer erasing the row column memory

                                                DDRA ^=0b11111111;//shifting input and power port

                                                \_delay\_ms(1);

                                                PORTA ^= 0b11111111;//powering row pins of keypad

                                                \_delay\_ms(220);

                                }

                                if (key==16)//if 16 characters are shown on LCD

                                {

                                                send\_a\_command(0x01);//clear lcd

                                                send\_a\_string("PRESS A KEY");//display string

                                                send\_a\_command(0x80 + 0x40 +0);//move courser to second line.

                                                key=0;

                                }

                }

                }

                void send\_a\_command(unsigned char command)

                {

                                PORTA = command;

                                PORTD &= ~ (1<<RS); //putting 0 in RS to tell lcd we are sending command

                                PORTD |= 1<<E; //telling lcd to receive command /data at the port

                                \_delay\_ms(50);

                                PORTD &= ~1<<E;//telling lcd we completed sending data

                                PORTA= 0;

                }

                void send\_a\_character(unsigned char character)

                {

                                PORTA= character;

                                PORTD |= 1<<RS;//telling LCD we are sending data not commands

                                PORTD |= 1<<E;//telling LCD to start receiving command/data

                                \_delay\_ms(50);

                                PORTD &= ~1<<E;//telling lcd we completed sending data/command

                                PORTA = 0;

                }

                void send\_a\_string(char \*string\_of\_characters)

{

                while(\*string\_of\_characters > 0)

                {

                                send\_a\_character(\*string\_of\_characters++);

                }

}