EXPERIMENT – 13

AIM: Write a program in C language to operate the

1. LCD
2. LEDs
3. 7 Segment display
4. Stepper Motor

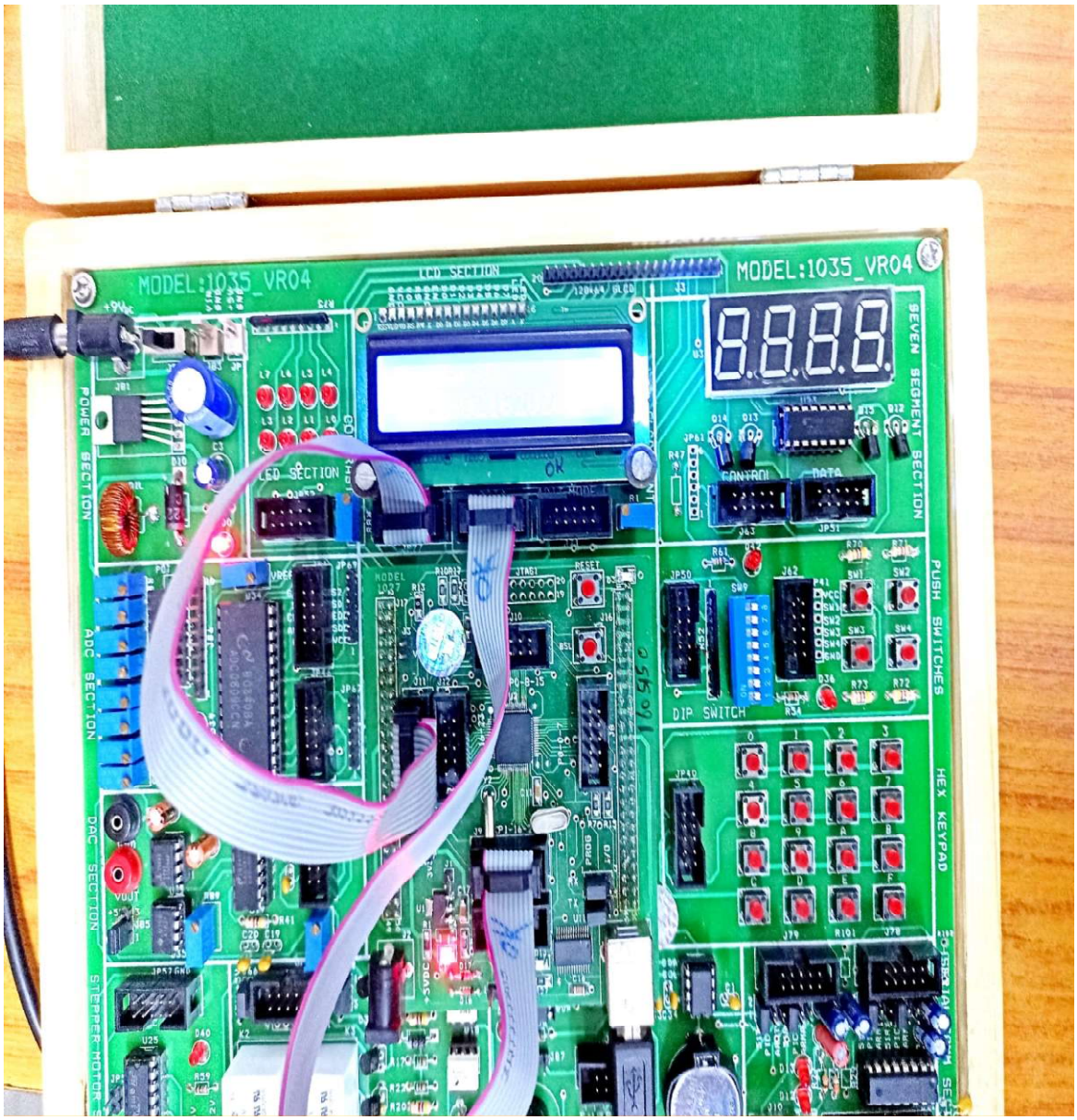
APPARATUS REQUIRED: Keil

CODE: LCD

```
//*************************INCLUDES*****************************************
#include <LPC214x.h>
////////////////////////USER SETTINGS//////////////////////////////////
#define DATA_PORT_SET      IOSET1
#define DATA_PORT_CLR      IOCLR1
#define DATA_DIR           IODIR1
#define D7                                    23
#define D6                                    22
#define D5                                    21
#define D4                                    20
#define D3                                    19
#define D2                                    18
#define D1                                    17
#define D0                                    16
//Set data port pins
#define DATA_PORT                                    (unsigned
long)((1<<D7)|(1<<D6)|(1<<D5)|(1<<D4))|((1<<D3)|(1<<D2)|(1<<D1)|(1<<D0))

#define CTRL_PORT_SET      IOSET1
#define CTRL_PORT_CLR      IOCLR1
#define CTRL_DIR           IODIR1
#define CTRL_RS            24
#define CTRL_EN            25
////////////////////////End of USER SETTINGS//////////////////////////////////
////////////////////////////////////////////////////////////////////////////
#include"delay.h"
#include"lcd.h"
//***********************End of INCLUDES*****************************************

int main()
{
 int i;
 init_lcd();

  while(1)
  {
     cmd_lcd(0x80);
                    string_lcd("jessica");
                    cmd_lcd(0xc0);
                    string_lcd(" ** jessica 602162008** ");
```

```
      for(i=0;i<5;i++)
      {
        cmd_lcd(0x1C);
        delay_ms(1000);
      }
      for(i=0;i<5;i++)
      {
        cmd_lcd(0x18);
        delay_ms(1000);
      }
  }
}
```

OBSERVATION:



CODE: LEDs

```
//*************************INCLUDES*****************************************
#include <LPC214x.h>
#include"delay.h"
//**********************End of INCLUDES*************************************

//**********************Private Macro Definitions*****************************
#define LED_SET                 IOSET1
#define LED_CLR         IOCLR1
#define LED_DIR         IODIR1
#define LED_PIN          IOPIN1

#define LED7                            23
#define LED6                            22
#define LED5                            21
#define LED4                            20
#define LED3                            19
#define LED2                            18
#define LED1                            17
#define LED0                            16
//Set data port pins
#define LED_PORT                                (unsigned
long)((1<<LED7)|(1<<LED6)|(1<<LED5)|(1<<LED4))|((1<<LED3)|(1<<LED2)|(1<<LED1)|(1<<LE
D0))
//*******************End of Private Macro Definitions**************************

int i,a,b,x,y;

int main()
{
        LED_DIR |= (unsigned long)(LED_PORT);               //initialize D0:D7 pins as output
        LED_CLR |= (unsigned long)(LED_PORT);               //initialize D0:D7 pins as output

        while(1)
        {
        ////////////////////////////////////////////////// nibble on off
           LED_CLR |= (0xf0) << LED0;
           LED_SET |= (0x0f) << LED0;
           delay_ms(500);
           LED_CLR |= (0x0f) << LED0;
           LED_SET |=  (0xf0) << LED0;
                delay_ms(500);
//////////                              ////////////////////////////////////// odd even on off
           LED_CLR |= (0xff) << LED0;
           LED_SET |= (0xaa) << LED0;
```

```
            delay_ms(500);
            LED_CLR |= (0xff) << LED0;
            LED_SET |= (0x55) << LED0;
            delay_ms(500);
          ////////////////////////////////////////////////// left shift
            LED_PIN = (0x01) << LED0;
            delay_ms(500);
                  for(i=0;i<7;i++)
                  {
                        LED_PIN = LED_PIN << 1;
                        delay_ms(500);
   }
////////////////////////////////////////////////// rotate left
            LED_PIN = (0x01) << LED0;
            delay_ms(500);
                  for(i=0;i<7;i++)
                  {
                        LED_PIN = LED_PIN << 1 | (0x01 << LED0);
                        delay_ms(500);
   }
//////////////////////////////////////////////////        right shift
                  LED_PIN = (0x80) << LED0;
                  delay_ms(500);

                  for(i=0;i<7;i++)
                  {
                        LED_PIN = (LED_PIN >> 1) & (0X7F << LED0);
                        delay_ms(500);
   }
//////////////////////////////////////////////////        rotate right
            LED_PIN = (0x80) << LED0;
            delay_ms(500);

                  for(i=0;i<7;i++)
                  {
                        LED_PIN = (LED_PIN >> 1);
                        delay_ms(500);
   }
  }
}
```

CODE: 7 Segment Display

```
/*
connection of 7-seg
          data     P0.16 to P0.23
          control  P0.8 to P0. 15
*/

#include"lpc214x.h"
#include"delay.h"

int main()
```

```
{
int a,b,c,d,e;
unsigned char arr[] = {0xbf, 0x86, 0xdb, 0xcf, 0xe6, 0xed, 0xfd, 0x87, 0xff, 0xef};
IODIR0 = 0xffffffff;
while(1)
 {
for(a=0;a<=9;a++)
 {
  for(b=0;b<=9;b++)
  {
    for(c=0;c<=9;c++)
    {
            for(d=0;d<=9;d++)
            {
              for(e=0;e<=50;e++)
              {
                  IOCLR0 = 0xFFFFFFFF;
                  IOSET0 = arr[d]<<16 | 0x0100;
                  delay_ms(2);
                  IOCLR0 = 0xFFFFFFFF;
                  IOSET0 = arr[c]<<16 | 0x0200;
                  delay_ms(2);
                  IOCLR0 = 0xFFFFFFFF;
                  IOSET0 = arr[b]<<16 | 0x0400;
                  delay_ms(2);
                  IOCLR0 = 0xFFFFFFFF;
                  IOSET0 = arr[a]<<16 | 0x0800;
                  delay_ms(2);
                     }
      }
           }
  }
 }
}
}
```

CODE: Stepper Motor

```
#include"lpc214x.h"
#include"delay.h"

#define m1                                      16
#define m2                                      17
#define PORT_SET       IOSET1
#define PORT_CLR       IOCLR1
#define DIR            IODIR1

int main()
{
DIR |= (1<<m1)|(1<<m2);
PORT_CLR = (1<<m1) | (1<<m2);
```

```
while(1)
{

                PORT_CLR = (1<<m1) | (1<<m2);
                PORT_SET = (1<<m1);
                delay_ms(4000);
                PORT_CLR = (1<<m1) | (1<<m2);
                delay_ms(1000);
                PORT_CLR = (1<<m1) | (1<<m2);
                PORT_SET = (1<<m2);
                delay_ms(4000);
                PORT_CLR = (1<<m1) | (1<<m2);
                delay_ms(1000);

}
}
```

RESULT:

The C codes Written above have been implemented and verified successfully.

EXPERIMENT – 14

AIM: Write a program in ARM assembly language to solve the equation

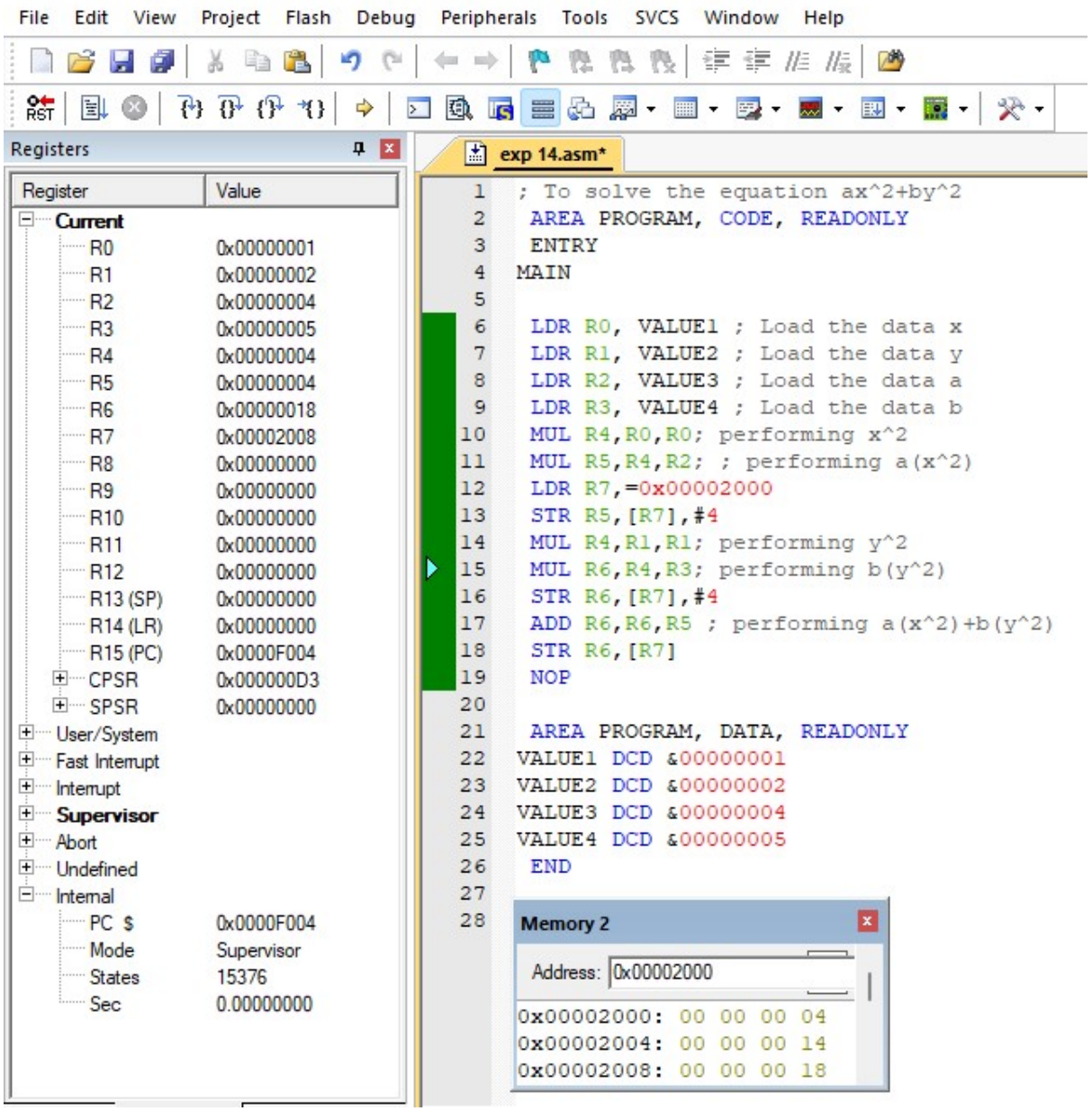
1. ax^2+by^2
2. 6(x + y) +2z+4

APPARATUS REQUIRED: Keil

CODE:

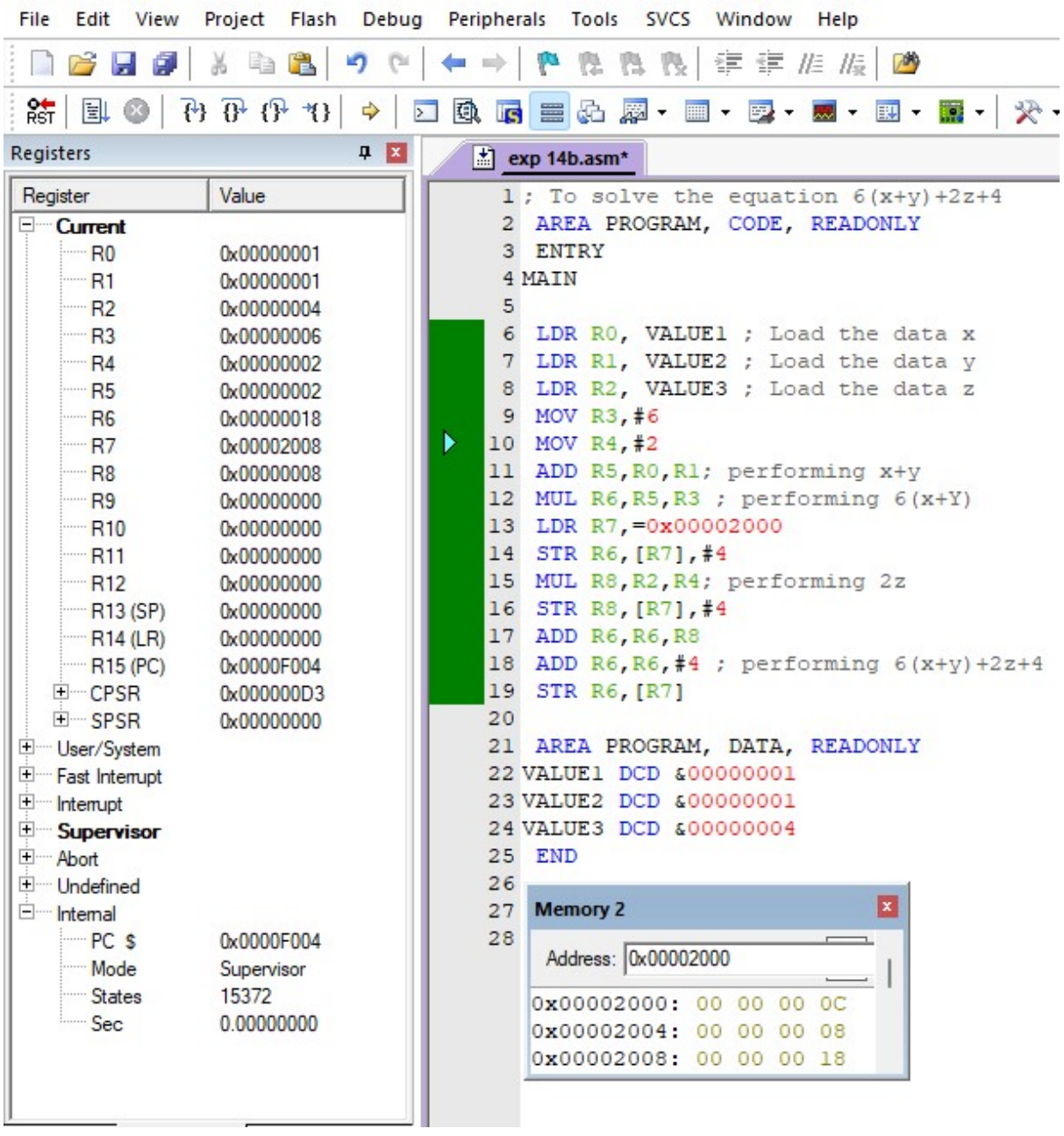
```
; To solve the equation ax^2+by^2
 AREA PROGRAM, CODE, READONLY
 ENTRY
MAIN

 LDR R0, VALUE1 ; Load the data x
 LDR R1, VALUE2 ; Load the data y
 LDR R2, VALUE3 ; Load the data a
 LDR R3, VALUE4 ; Load the data b
 MUL R4,R0,R0; performing x^2
 MUL R5,R4,R2; ; performing a(x^2)
 LDR R7,=0x00002000
 STR R5,[R7],#4
 MUL R4,R1,R1; performing y^2
 MUL R6,R4,R3; performing b(y^2)
 STR R6,[R7],#4
 ADD R6,R6,R5 ; performing a(x^2)+b(y^2)
 STR R6,[R7]
 NOP

 AREA PROGRAM, DATA, READONLY
VALUE1 DCD &00000001
VALUE2 DCD &00000002
VALUE3 DCD &00000004
VALUE4 DCD &00000005
 END
```

OBSERVATION:



```
; To solve the equation 6(x + y) +2z+4
 AREA PROGRAM, CODE, READONLY
 ENTRY
MAIN

 LDR R0, VALUE1 ; Load the data x
 LDR R1, VALUE2 ; Load the data y
 LDR R2, VALUE3 ; Load the data z
 MOV R3,#6
 MOV R4,#2
 ADD R5,R0,R1; performing x+y
 MUL R6,R5,R3 ; performing 6(x+Y)
 LDR R7,=0x00002000
 STR R6,[R7],#4
 MUL R8,R2,R4; performing 2z
 STR R8,[R7],#4
 ADD R6,R6,R8
 ADD R6,R6,#4 ; performing 6(x+y)+2z+4
 STR R6,[R7]

 AREA PROGRAM, DATA, READONLY
VALUE1 DCD &00000001
VALUE2 DCD &00000001
VALUE3 DCD &00000004
 END
```

OBSERVATION:



RESULT:

The output of the codes executed above have been verified successfully.