EXPERIMENT 1:

WRITE A 8051 C PROGRAM TO MULTIPLY TWO 16 BIT NUMBERS

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

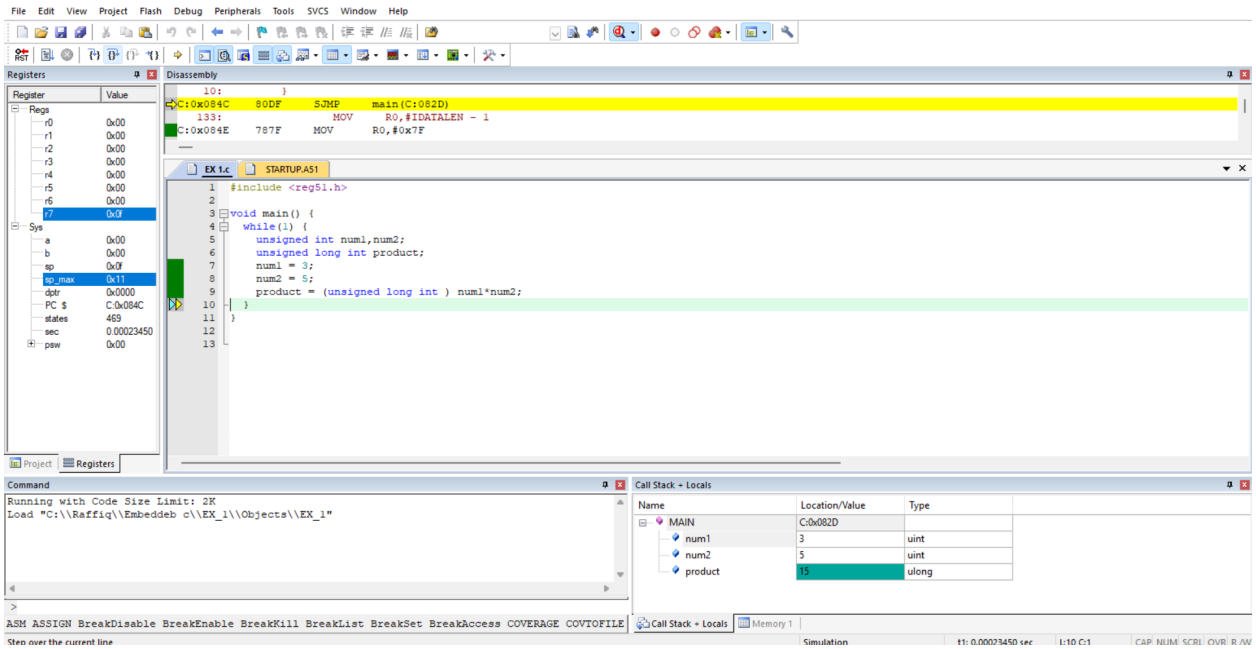
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   while(1) {
      unsigned int num1,num2;
      unsigned long int product;
      num1 = 3;
      num2 = 5;
      product = (unsigned long int ) num1*num2;
   }
}
```

OUTPUT:



RESULT:

The multiplication of two 16 bit numbers using the 8051 C program is successful.

EXPERIMENT 2:

WRITE A 8051 C PROGRAM TO FIND THE SUM OF FIRST 10 INTEGER NUMBERS

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

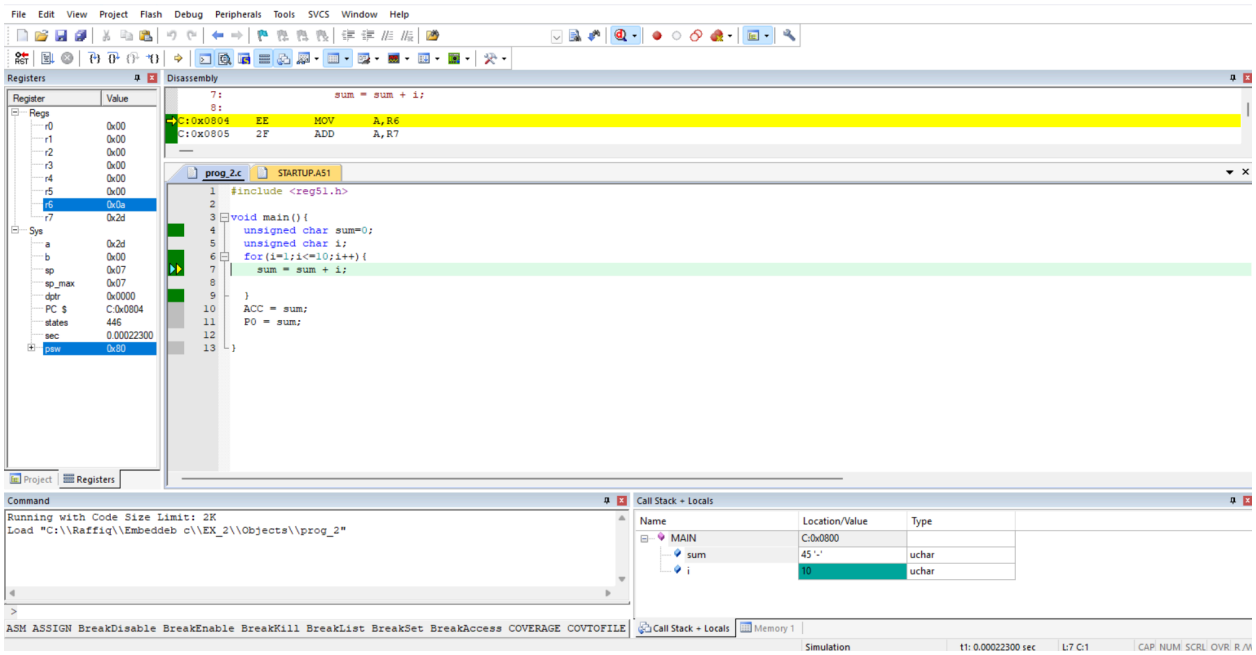
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main(){
   unsigned char sum=0;
   unsigned char i;
   for(i=1;i<=10;i++){
      sum = sum + i;
     }
   ACC = sum;
   P0 = sum;
}
```

OUTPUT:



RESULT:

The sum of first 10 integer numbers using 8051 C program is successful

EXPERIMENT 3:

WRITE A 8051 C PROGRAM TO FIND FACTORIAL OF A GIVEN NUMBER

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software.

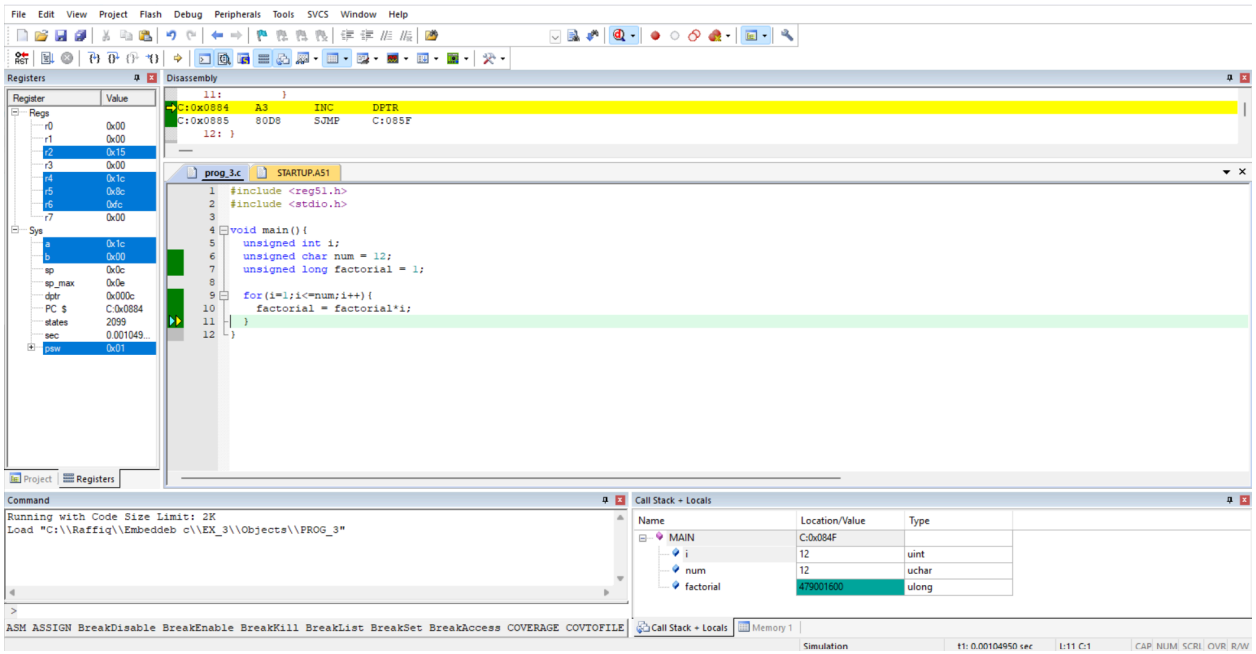
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>
#include <stdio.h>

void main(){
   unsigned int i;
   unsigned char num = 12;
   unsigned long factorial = 1;

   for(i=1;i<=num;i++){
      factorial = factorial*i;
   }
}
```

OUTPUT:



RESULT:

The verification of factorial of given number is successful using 8051 C program

EXPERIMENT 4:

WRITE A 8051 C PROGRAM TO ADD AN ARRAY OF 16-BIT NUMBERS AND STORE THE 32-BIT RESULT IN INTERNAL RAM

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

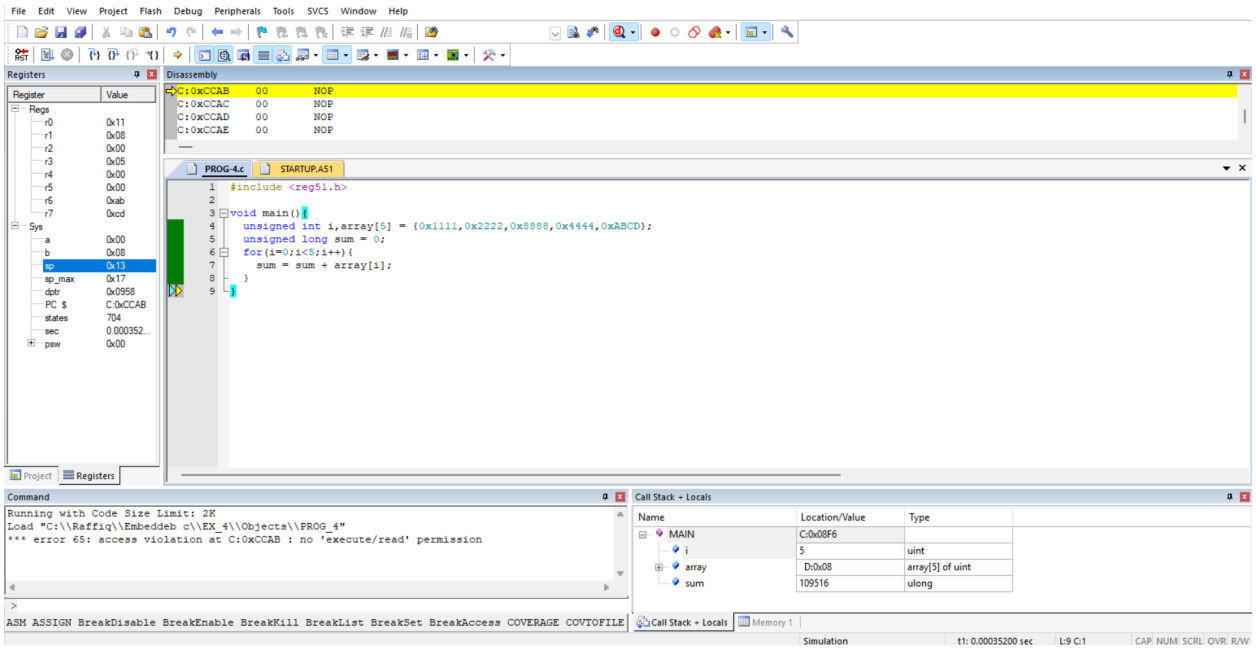
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main(){
   unsigned int i,array[5] = {0x1111,0x2222,0x8888,0x4444,0xABCD};
   unsigned long sum = 0;
   for(i=0;i<5;i++){
      sum = sum + array[i];
   }
}
```

OUTPUT:



RESULT:

The verification of 32-bit sum of the given 16-bit numbers is stored in internal RAM starting from address 0x30 is successful using C program

EXPERIMENT 5:

WRITE A 8051 C PROGRAM TO FIND THE SQUARE OF A NUMBER (1 TO 10) USING LOOK-UP TABLE

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

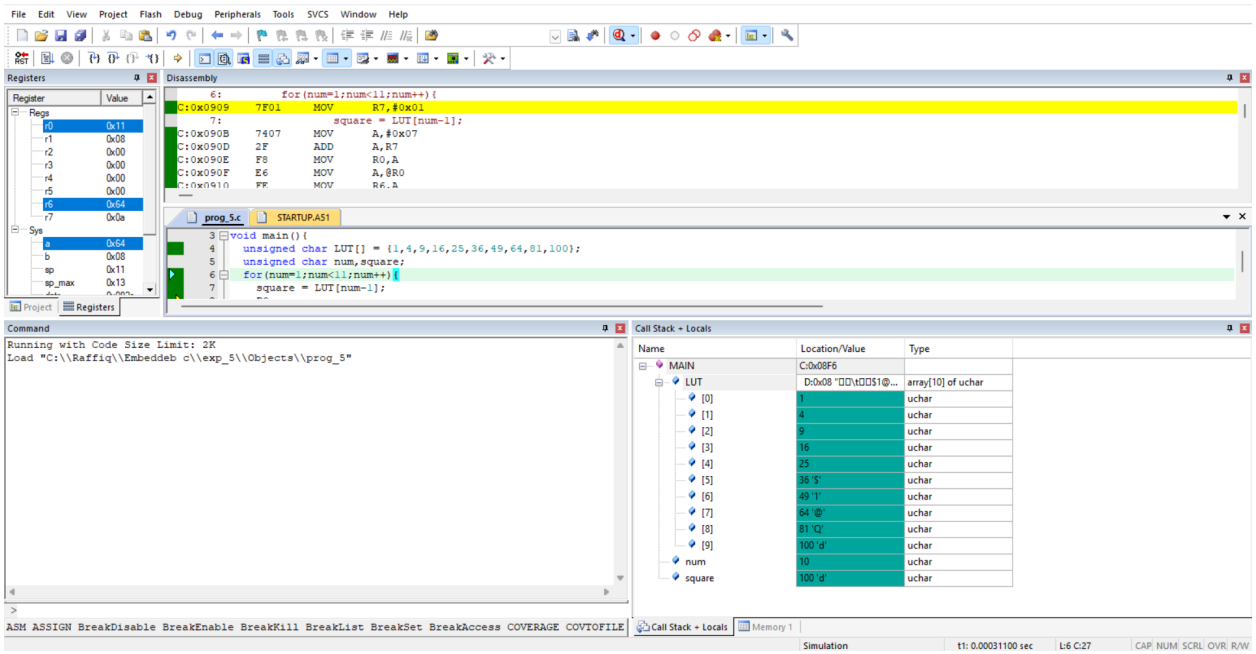
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main(){
   unsigned char LUT[] = {1,4,9,16,25,36,49,64,81,100};
   unsigned char num,square;
   for(num=1;num<11;num++){
      square = LUT[num-1];
      P0 = square;
   }
}
```

OUTPUT:



RESULT:

The verification of square of number(1 to 10) using look up table is successful using C program

EXPERIMENT 6:

WRITE A 8051 C PROGRAM TO FIND THE LARGEST/SMALLEST NUMBER IN AN ARRAY OF NUMBERS

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

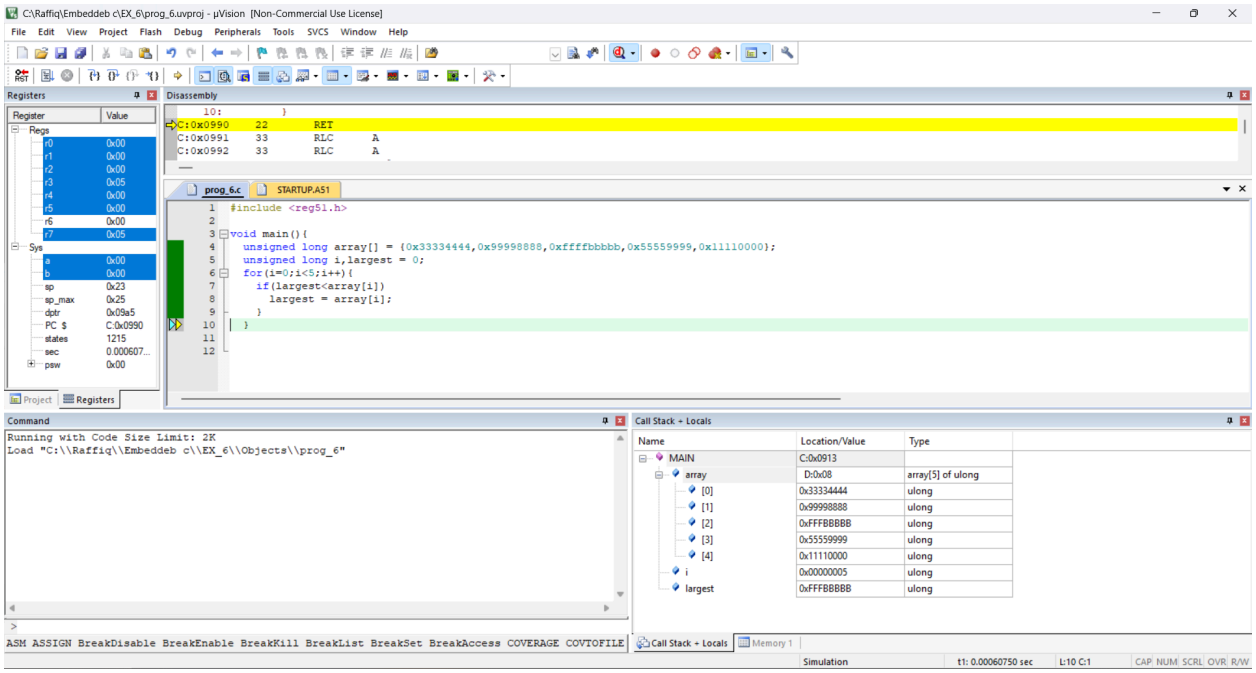
PROCEDURE:

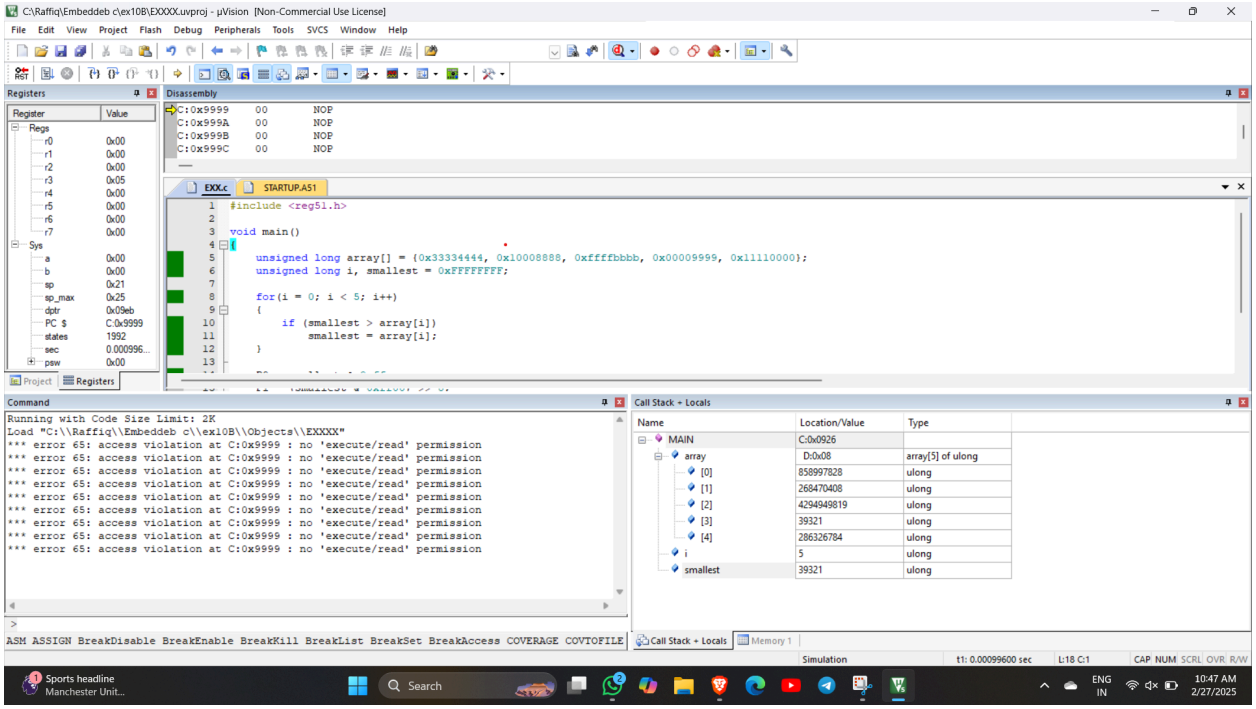
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main(){
   unsigned long array[] = {0x33334444,0x99998888,0xffffbbbbb,0x55559999,0x11110000};
   unsigned long i,largest = 0;
   for(i=0;i<5;i++){
      if(largest<array[i])
         largest = array[i];
      }
   }
```

OUTPUT:





RESULT:

The verification of to find the largest and smallest number in an array of numbers using C program is successful

EXPERIMENT 7:

WRITE A 8051 C PROGRAM TO ARRANGE A SERIES OF NUMBERS IN ASCENDING/DESCENDING ORDER LOCATIONS

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

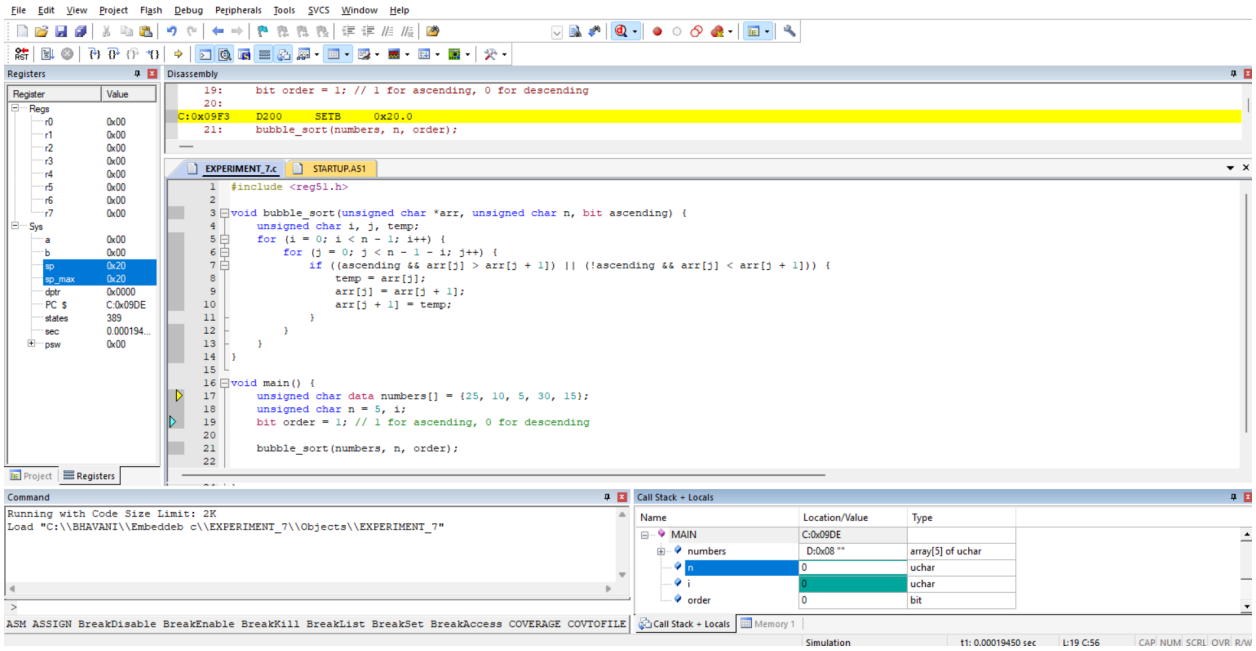
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

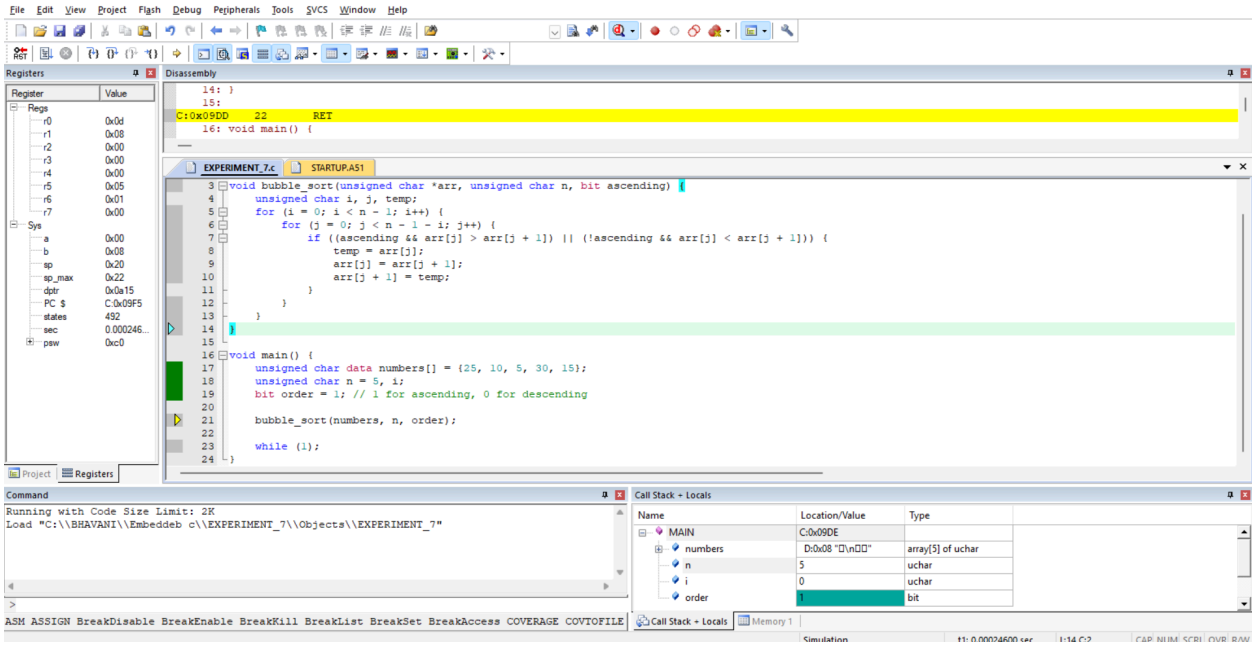
PROGRAM:

```
#include <reg51.h>

void bubble_sort(unsigned char *arr, unsigned char n, bit ascending) {
   unsigned char i, j, temp;
   for (i = 0; i < n - 1; i++) {
      for (j = 0; j < n - 1 - i; j++) {
         if ((ascending && arr[j] > arr[j + 1]) || (!ascending && arr[j] < arr[j + 1])) {
            temp = arr[j];
            arr[j] = arr[j + 1];
            arr[j + 1] = temp;
         }
```

```
        }
    }
}
void main() {
    unsigned char data numbers[] = {25, 10, 5, 30, 15};
    unsigned char n = 5, i;
    bit order = 1; // 1 for ascending, 0 for descending

    bubble_sort(numbers, n, order);

    while (1);
}
```

OUTPUT:





RESULT:

To arrange series of numbers in ascending and descending order using C program is successful

EXPERIMENT 8:

WRITE A 8051 C PROGRAM TO COUNT THE NUMBER OF ONES AND ZEROS IN TWO CONSECUTIVE MEMORY LOCATIONS

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

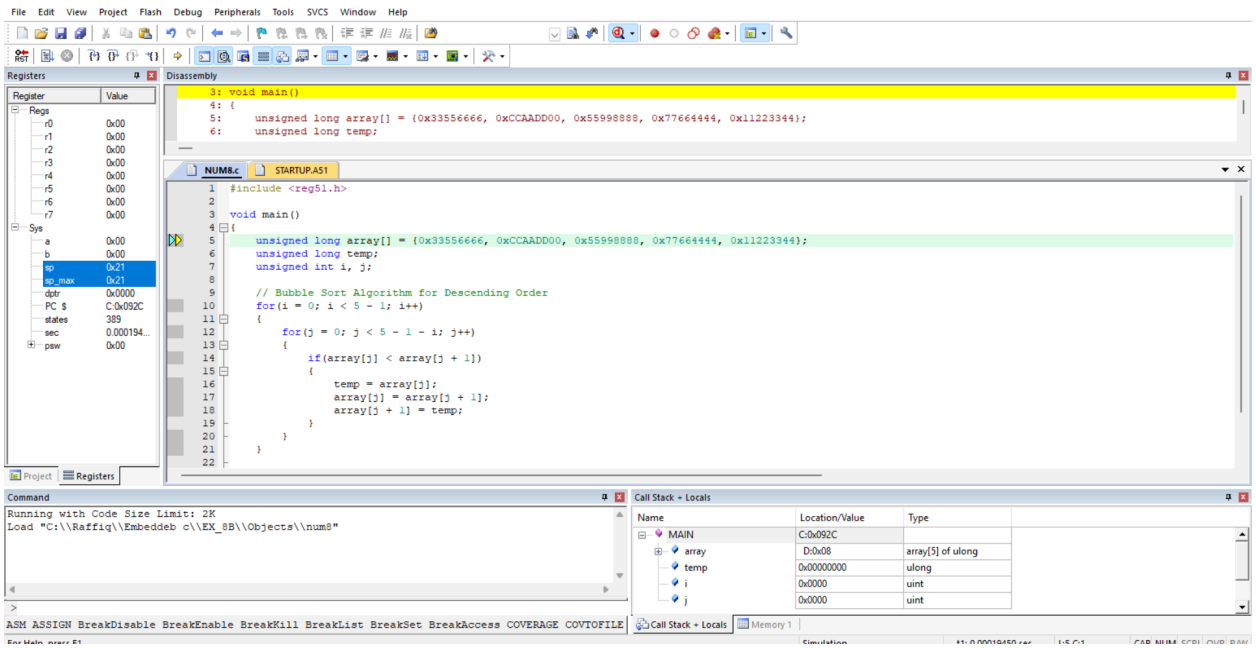
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main()
{
   unsigned long array[] = {0x33556666, 0xCCAADD00, 0x55998888, 0x77664444,
0x11223344};
   unsigned long temp;
   unsigned int i, j;

   // Bubble Sort Algorithm for Descending Order
   for(i = 0; i < 5 - 1; i++)
```

```
    {
        for(j = 0; j < 5 - 1 - i; j++)
        {
            if(array[j] < array[j + 1])
            {
                temp = array[j];
                array[j] = array[j + 1];
                array[j + 1] = temp;
            }
        }
    }

    while(1);  // Infinite loop to keep the program running
}
```

OUTPUT:



RESULT:

To count the number of ones and Zeros in two consecutive memory locations using C program is successful.

EXPERIMENT 9:

WRITE A 8051 C PROGRAM TO SCAN A SERIES OF NUMBERS TO FIND HOW MANY ARE NEGATIVE

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

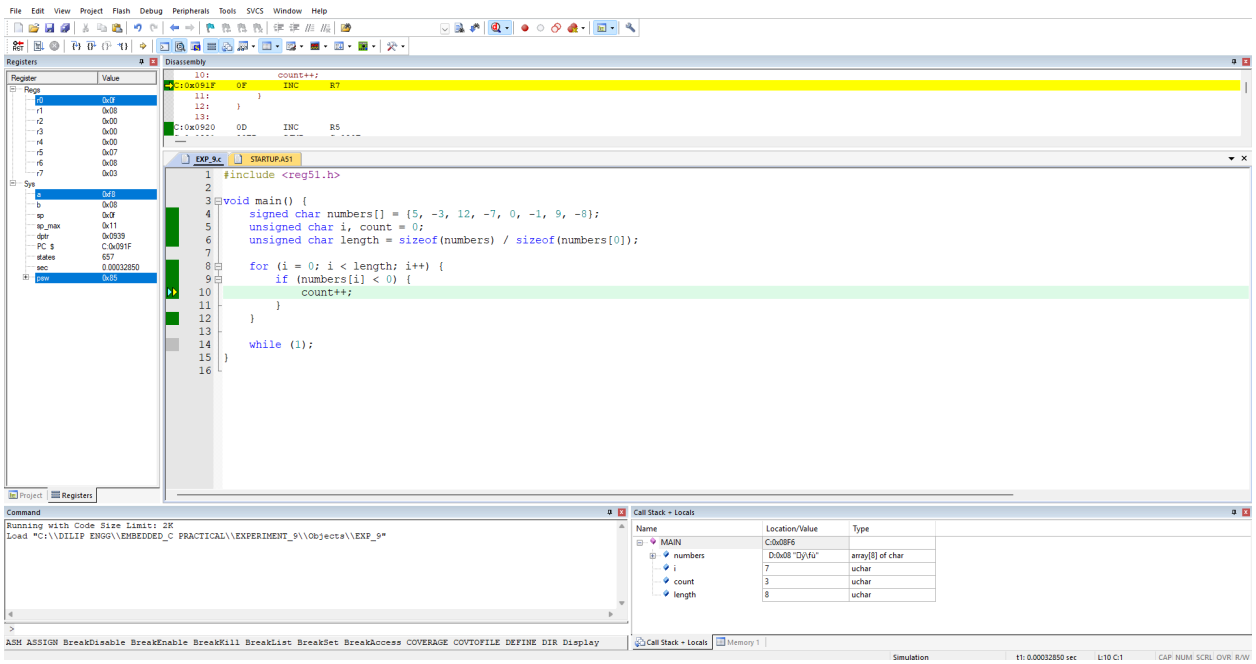
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   signed char numbers[] = {5, -3, 12, -7, 0, -1, 9, -8};
   unsigned char i, count = 0;
   unsigned char length = sizeof(numbers) / sizeof(numbers[0]);

   for (i = 0; i < length; i++) {
      if (numbers[i] < 0) {
         count++;
      }
   }
```

```
    while (1);
}
```

OUTPUT:



RESULT:

To scan a series of numbers to find how many are negative is successful using a C program.

EXPERIMENT 10:

WRITE A 8051 C PROGRAM TO DISPLAY "HELLO WORLD" MESSAGE (EITHER IN SIMULATION MODE OR INTERFACE AN LCD DISPLAY)

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

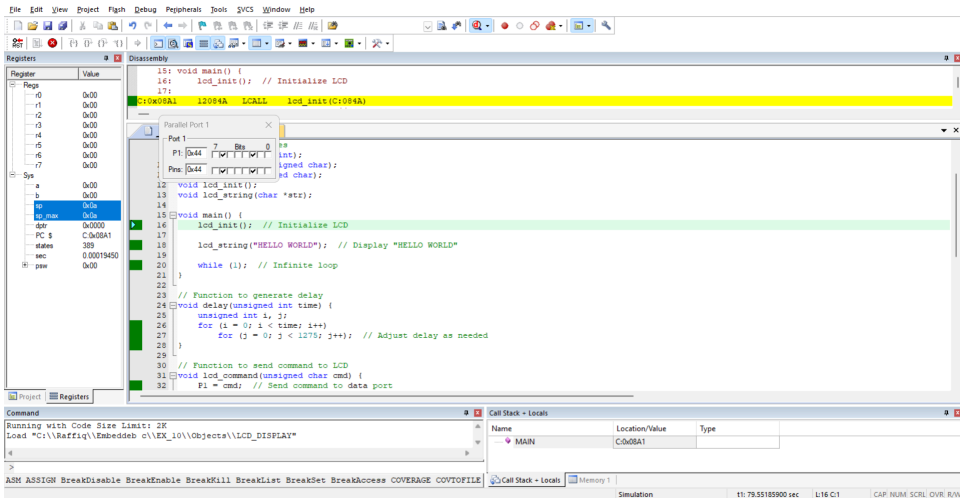
PROGRAM:

```
#include <reg51.h>

// Define LCD control pins
sbit RS = P2^0;  // Register Select
sbit RW = P2^1;  // Read/Write
sbit EN = P2^2;  // Enable

// Function prototypes
void delay(unsigned int);
void lcd_command(unsigned char);
```

```
void lcd_data(unsigned char);
void lcd_init();
void lcd_string(char *str);

void main() {
   lcd_init();  // Initialize LCD

   lcd_string("HELLO WORLD");  // Display "HELLO WORLD"

   while (1);  // Infinite loop
}

// Function to generate delay
void delay(unsigned int time) {
   unsigned int i, j;
   for (i = 0; i < time; i++)
      for (j = 0; j < 1275; j++);  // Adjust delay as needed
}

// Function to send command to LCD
void lcd_command(unsigned char cmd) {
   P1 = cmd;  // Send command to data port
   RS = 0;    // Command mode
   RW = 0;    // Write mode
   EN = 1;
   delay(2);
   EN = 0;
}

// Function to send data to LCD
void lcd_data(unsigned char dat) {  // Corrected parameter name
   P1 = dat;  // Send data to data port
   RS = 1;    // Data mode
   RW = 0;    // Write mode
   EN = 1;
   delay(2);
   EN = 0;
}

// Function to initialize LCD
```

```
void lcd_init() {
    lcd_command(0x38);  // 2-line, 5x7 matrix
    delay(5);
    lcd_command(0x0C);  // Display ON, Cursor OFF
    delay(5);
    lcd_command(0x06);  // Increment cursor
    delay(5);
    lcd_command(0x01);  // Clear display
    delay(10);
}

// Function to send a string to LCD
void lcd_string(char *str) {
    while (*str) {
        lcd_data(*str);
        str++;
    }
}
```

OUTPUT:



RESULT:

The display of Message in port is successful using the C program.

EXPERIMENT 11:

WRITE A 8051 C PROGRAM TO CONVERT THE HEXADECIMAL DATA 0XCFH TO DECIMAL AND DISPLAY THE DIGITS ON PORTS P0, P1, AND P2 (PORT WINDOW IN SIMULATOR)

AIM:

To multiply two 16 bit numbers using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

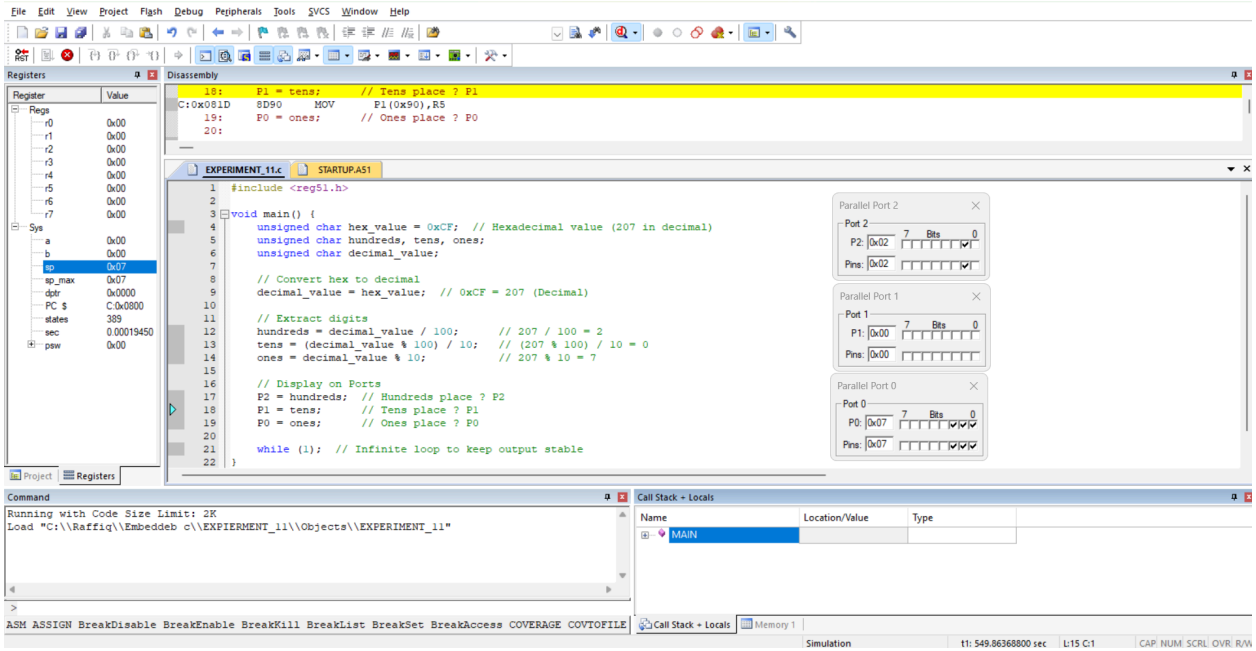
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char hex_value = 0xCF;  // Hexadecimal value (207 in decimal)
   unsigned char hundreds, tens, ones;
   unsigned char decimal_value;

   // Convert hex to decimal
   decimal_value = hex_value;  // 0xCF = 207 (Decimal)
```

```
    // Extract digits
    hundreds = decimal_value / 100;      // 207 / 100 = 2
    tens = (decimal_value % 100) / 10;   // (207 % 100) / 10 = 0
    ones = decimal_value % 10;           // 207 % 10 = 7

    // Display on Ports
    P2 = hundreds;  // Hundreds place ? P2
    P1 = tens;      // Tens place ? P1
    P0 = ones;      // Ones place ? P0

    while (1);  // Infinite loop to keep output stable
}
```

OUTPUT:



RESULT:

The program to convert an hexadecimal data to decimal data and display in port 0,1,2 is successful using C program

EXPERIMENT 12:

Write a 8051 C program to generate and print the first 10 numbers in the Fibonacci sequence

AIM:

To generate and print the first 10 numbers in the fibonacci sequence

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

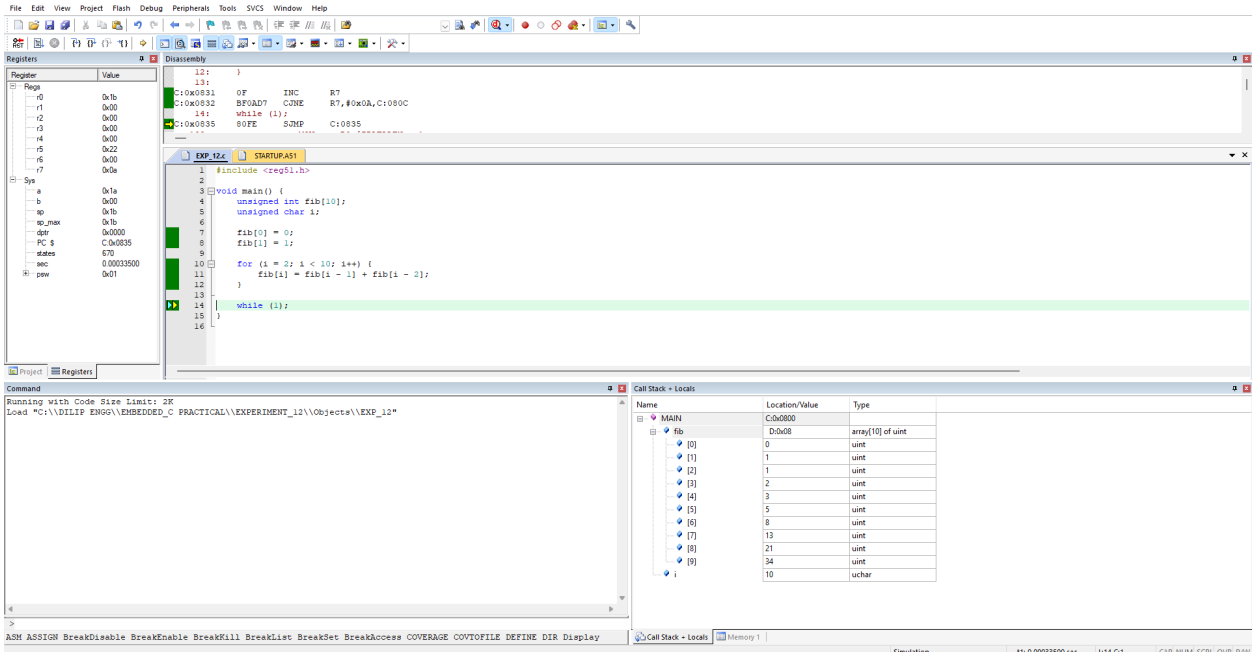
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned int fib[10];
   unsigned char i;

   fib[0] = 0;
   fib[1] = 1;

   for (i = 2; i < 10; i++) {
      fib[i] = fib[i - 1] + fib[i - 2];
```

```
    }

    while (1);
}
```

OUTPUT:



RESULT:

To generate and print the first 10 numbers in the fibonacci sequence is successful.

EXPERIMENT 13:

Write a 8051 C program to perform matrix addition of two 2×2 matrices

AIM:

To generate the C program to perform matrix addition of two 2x2 matrices.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

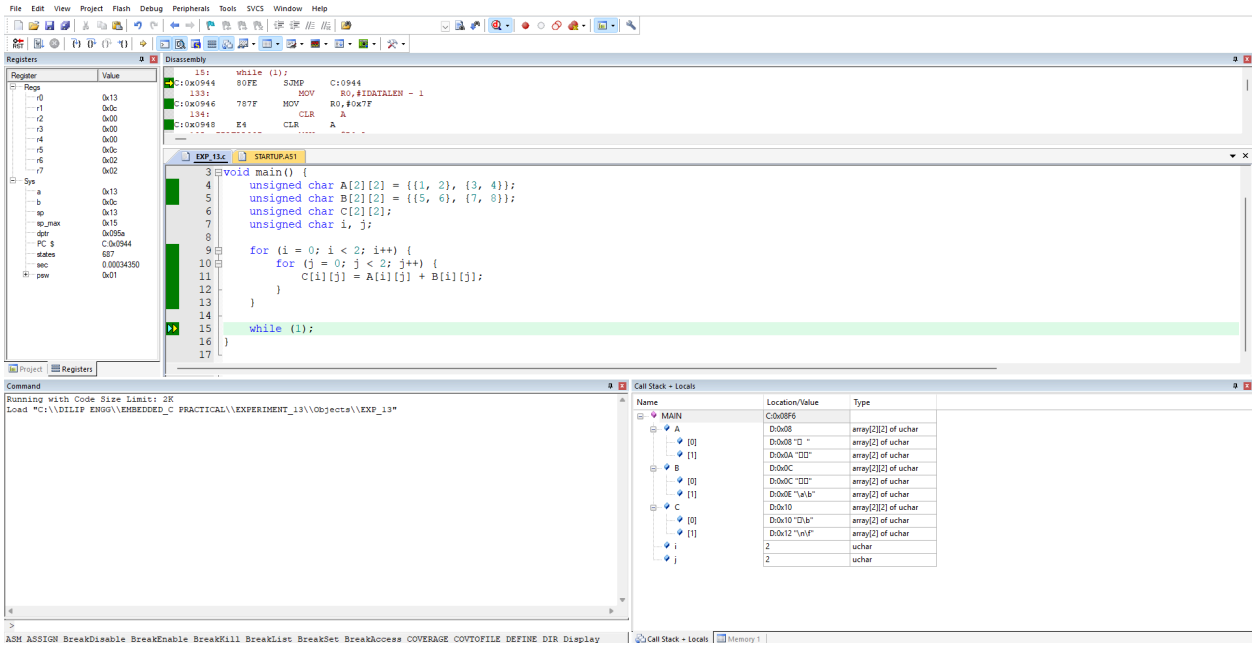
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char A[2][2] = {{1, 2}, {3, 4}};
   unsigned char B[2][2] = {{5, 6}, {7, 8}};
   unsigned char C[2][2];
   unsigned char i, j;

   for (i = 0; i < 2; i++) {
      for (j = 0; j < 2; j++) {
         C[i][j] = A[i][j] + B[i][j];
      }
```

```
    }

    while (1);
}
```

OUTPUT:



RESULT:

The generation of the C program to perform matrix addition of two 2x2 matrices is successful

EXPERIMENT 14:

Write a C program to check if a given string is a palindrome

AIM:

To perform the palindrome operation in a C program using the given string.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

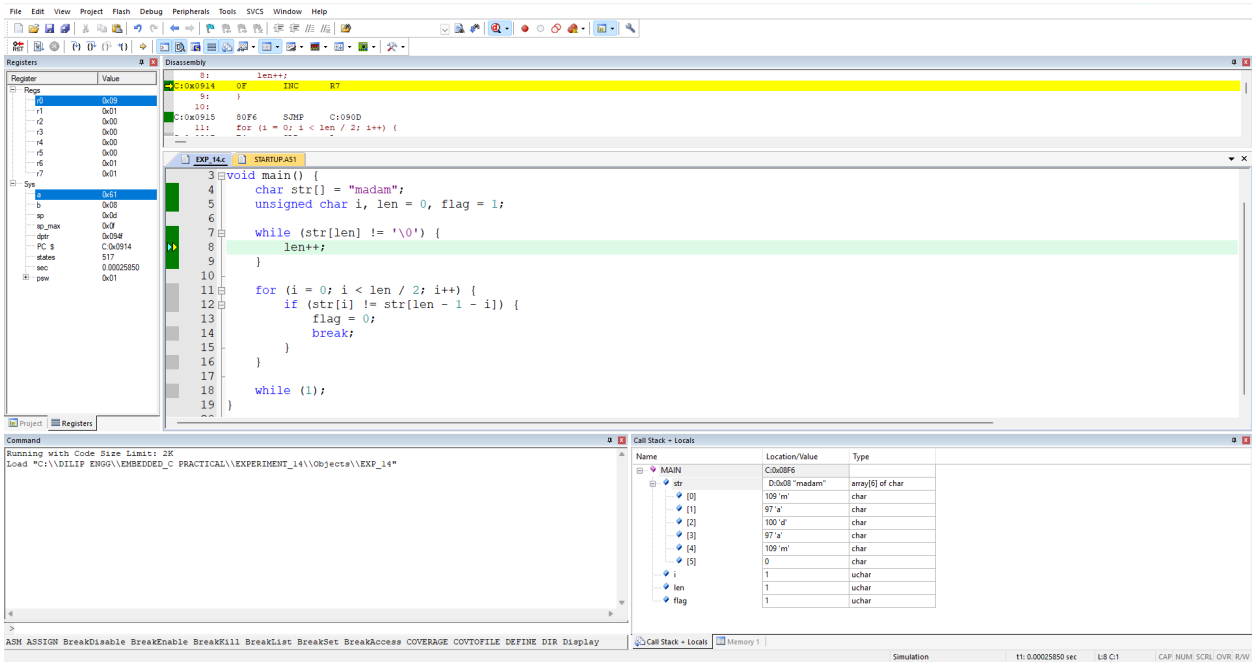
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   char str[] = "madam";
   unsigned char i, len = 0, flag = 1;

   while (str[len] != '\0') {
      len++;
   }

   for (i = 0; i < len / 2; i++) {
      if (str[i] != str[len - 1 - i]) {
         flag = 0;
```

```
            break;
        }
    }

    while (1);
}
```

OUTPUT:



RESULT:

To Perform the operation to check the string is palindrome is successful using C program

EXPERIMENT 15:

Write a 8051 C program to calculate the greatest common divisor (GCD) of two integers

AIM:

To calculate the GCD of two integers using C program

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

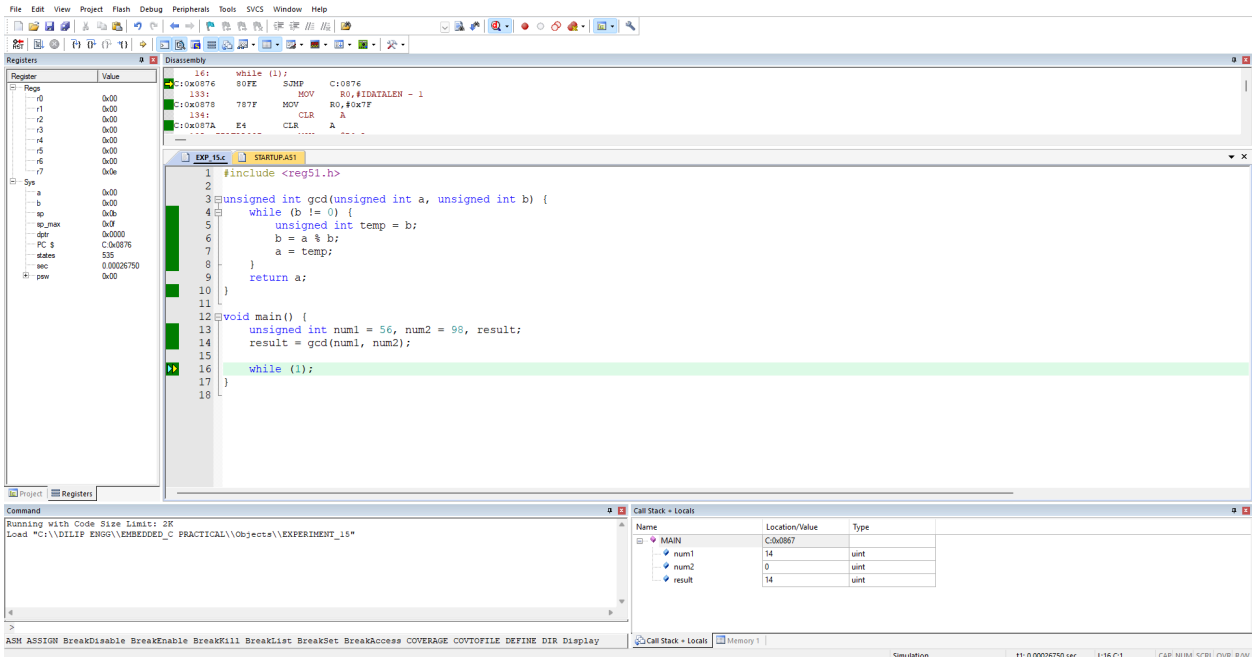
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

unsigned int gcd(unsigned int a, unsigned int b) {
   while (b != 0) {
      unsigned int temp = b;
      b = a % b;
      a = temp;
   }
   return a;
}

void main() {
```

```
    unsigned int num1 = 56, num2 = 98, result;
    result = gcd(num1, num2);

    while (1);
}
```

OUTPUT:



RESULT:

The calculation of GCD of two numbers is successful using C program

EXPERIMENT 16:

Write a 8051 C program to merge two arrays of integers into a single array

AIM:

To merge two arrays of integers into a single array using C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

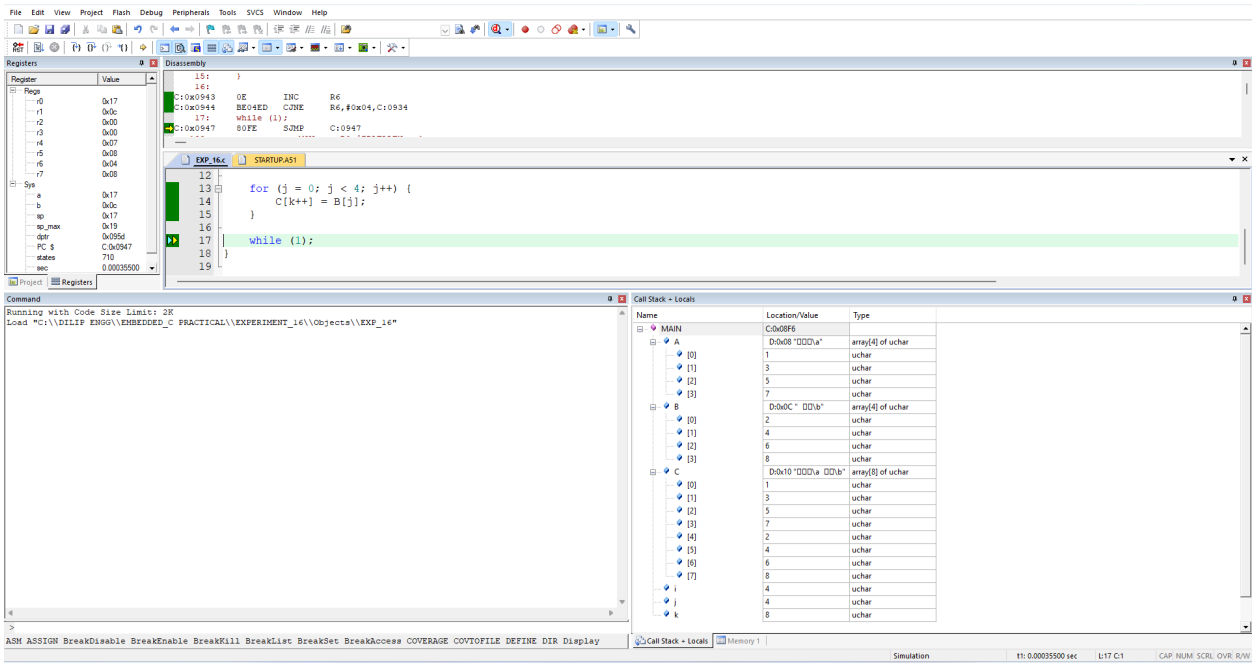
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char A[] = {1, 3, 5, 7};
   unsigned char B[] = {2, 4, 6, 8};
   unsigned char C[8];
   unsigned char i, j, k = 0;

   for (i = 0; i < 4; i++) {
      C[k++] = A[i];
   }

   for (j = 0; j < 4; j++) {
```

```
        C[k++] = B[j];
    }

    while (1);
}
```

OUTPUT:



RESULT:

The merger of two arrays into a single array is successful using C program

EXPERIMENT 17:

Write a 8051 C program to sort an array of integers in ascending order

AIM:

To sort an array of integers in the ascending order using the C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

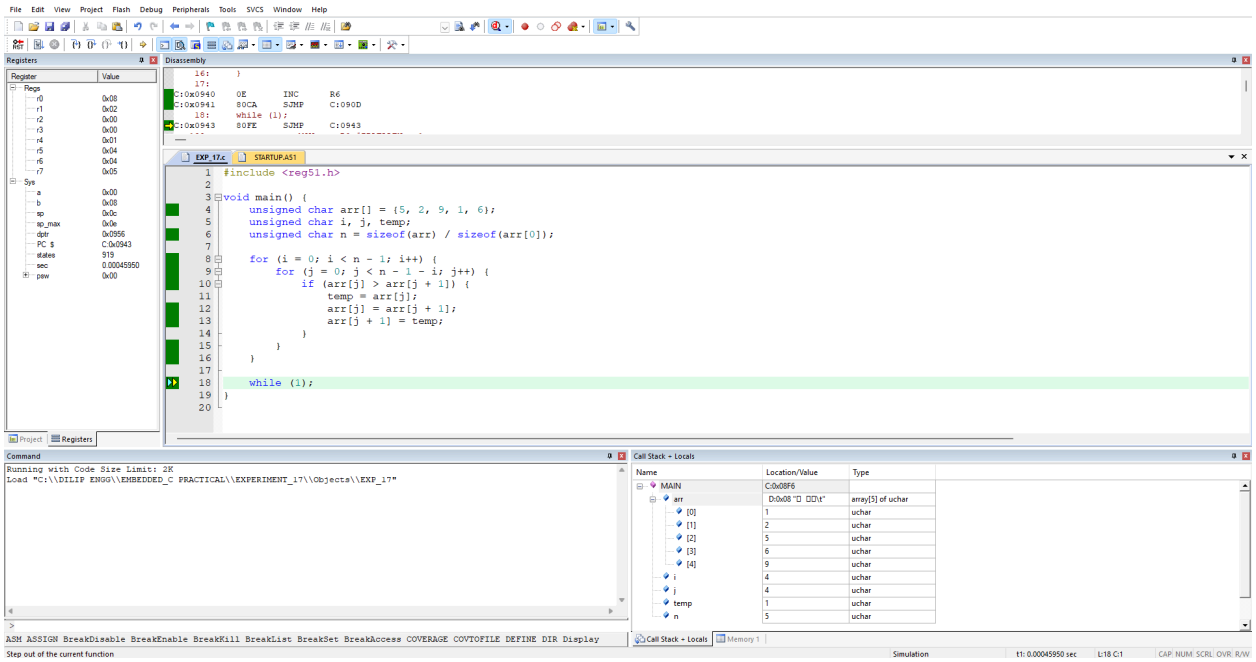
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char arr[] = {5, 2, 9, 1, 6};
   unsigned char i, j, temp;
   unsigned char n = sizeof(arr) / sizeof(arr[0]);

   for (i = 0; i < n - 1; i++) {
      for (j = 0; j < n - 1 - i; j++) {
         if (arr[j] > arr[j + 1]) {
            temp = arr[j];
            arr[j] = arr[j + 1];
            arr[j + 1] = temp;
```

```
            }
        }
    }

    while (1);
}
```

OUTPUT:



RESULT:

The sorting of array in ascending order is successful using a C program.

EXPERIMENT 18:

Write a 8051 C program to initialize UART communication at 9600 baud rate and send "Hello, World!" (simulation mode)

AIM:

To initialize UART communication at 9600 baud rate and send "Hello world" using the C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

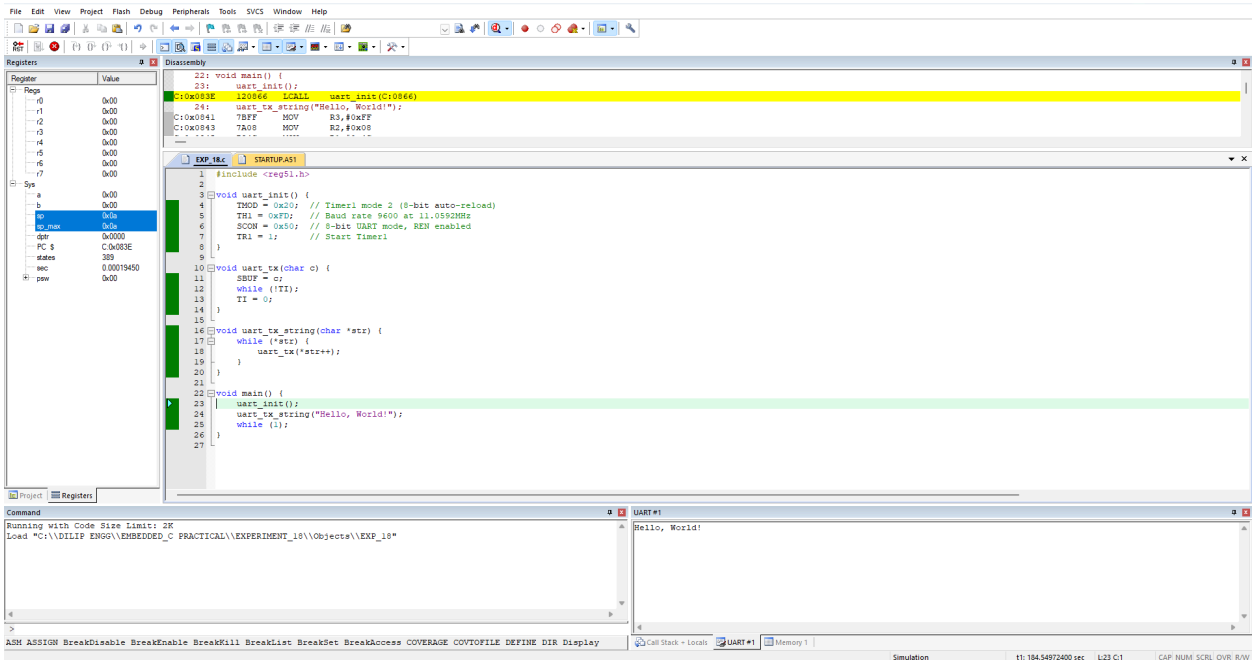
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void uart_init() {
   TMOD = 0x20;  // Timer1 mode 2 (8-bit auto-reload)
   TH1 = 0xFD;   // Baud rate 9600 at 11.0592MHz
   SCON = 0x50;  // 8-bit UART mode, REN enabled
   TR1 = 1;      // Start Timer1
}

void uart_tx(char c) {
   SBUF = c;
```

```
    while (!TI);
    TI = 0;
}

void uart_tx_string(char *str) {
    while (*str) {
        uart_tx(*str++);
    }
}

void main() {
    uart_init();
    uart_tx_string("Hello, World!");
    while (1);
}
```

OUTPUT:



RESULT:

To initialize UART communication at 9600 baud rate and send "Hello world" using the C program is successful using a C program.

EXPERIMENT 19:

Write a C program to find the transpose of a matrix

AIM:

To find the transpose of a matrix using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

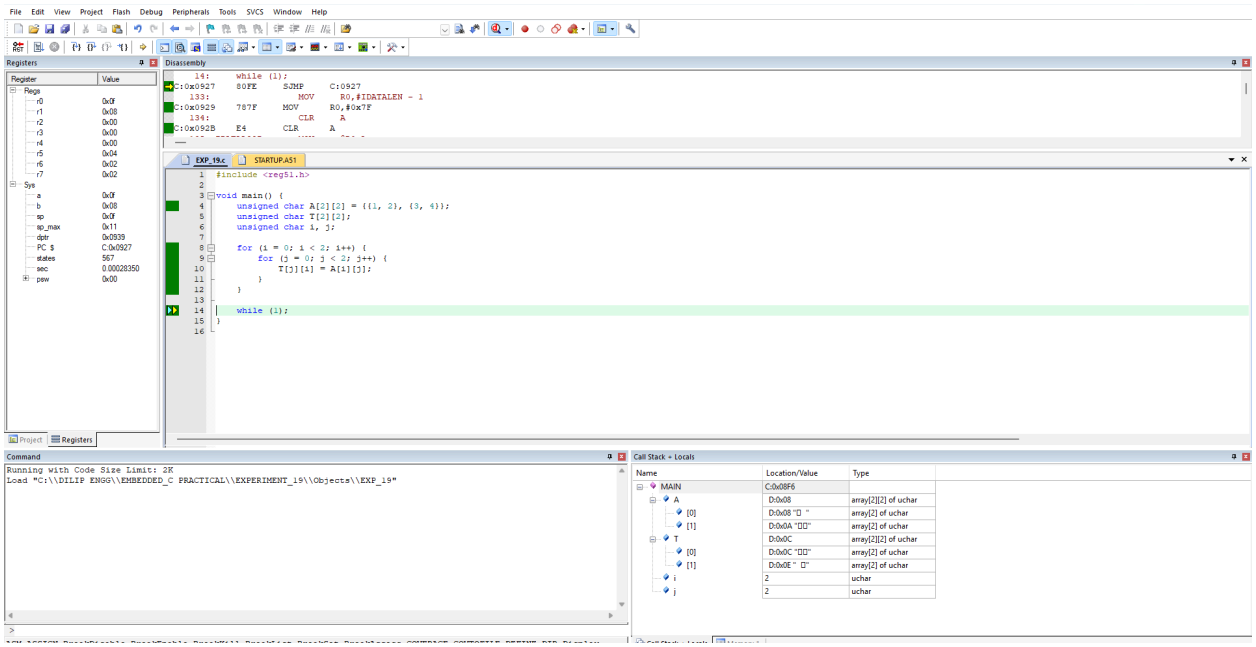
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char A[2][2] = {{1, 2}, {3, 4}};
   unsigned char T[2][2];
   unsigned char i, j;

   for (i = 0; i < 2; i++) {
      for (j = 0; j < 2; j++) {
         T[j][i] = A[i][j];
      }
   }
```

```
    while (1);
}
```

OUTPUT:



RESULT:

To find the transpose of a matrix is successful using a C program.

EXPERIMENT 20:

Write a C program to count the frequency of each character in a given string

AIM:

To count the frequency of each character in a given string using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

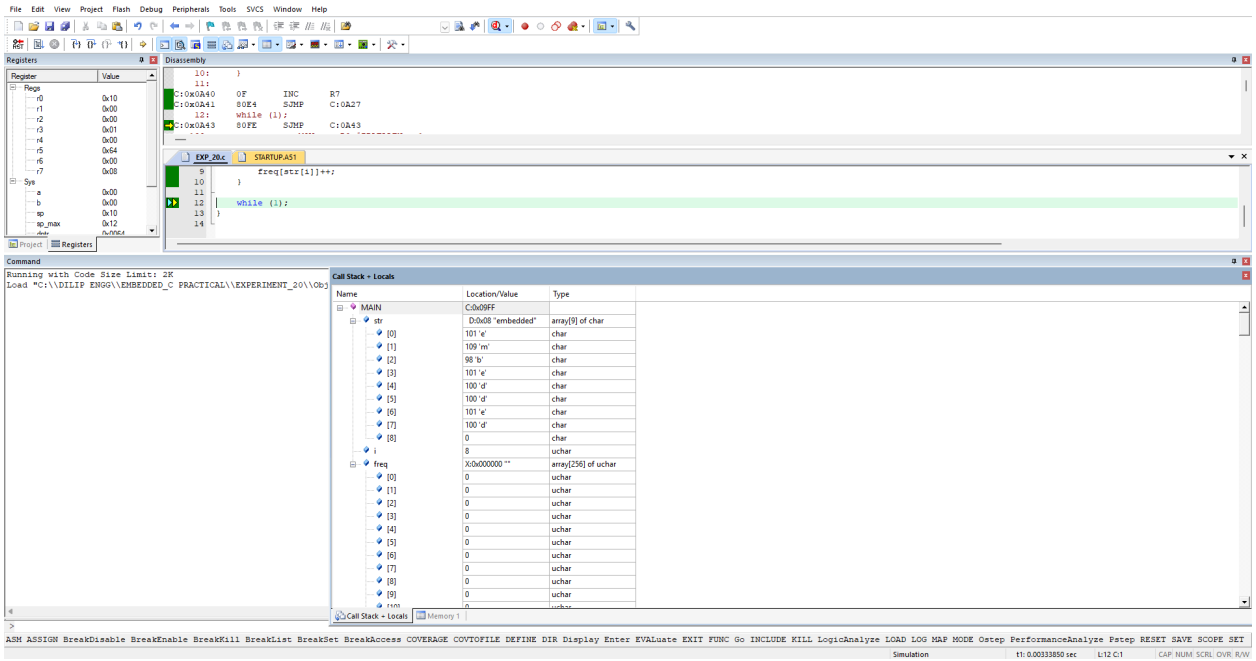
PROCEDURE:

- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   char str[] = "embedded";
   unsigned char i;
   unsigned char xdata freq[256] = {0};  // Use external RAM (xdata)

   for (i = 0; str[i] != '\0'; i++) {
      freq[str[i]]++;
   }

   while (1);
}
```

OUTPUT:



RESULT:

To count the frequency of each character in a given string is successful using a C program.

EXPERIMENT 21:

Write a C program to find the factorial of a number

AIM:

To find the factorial of a number using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

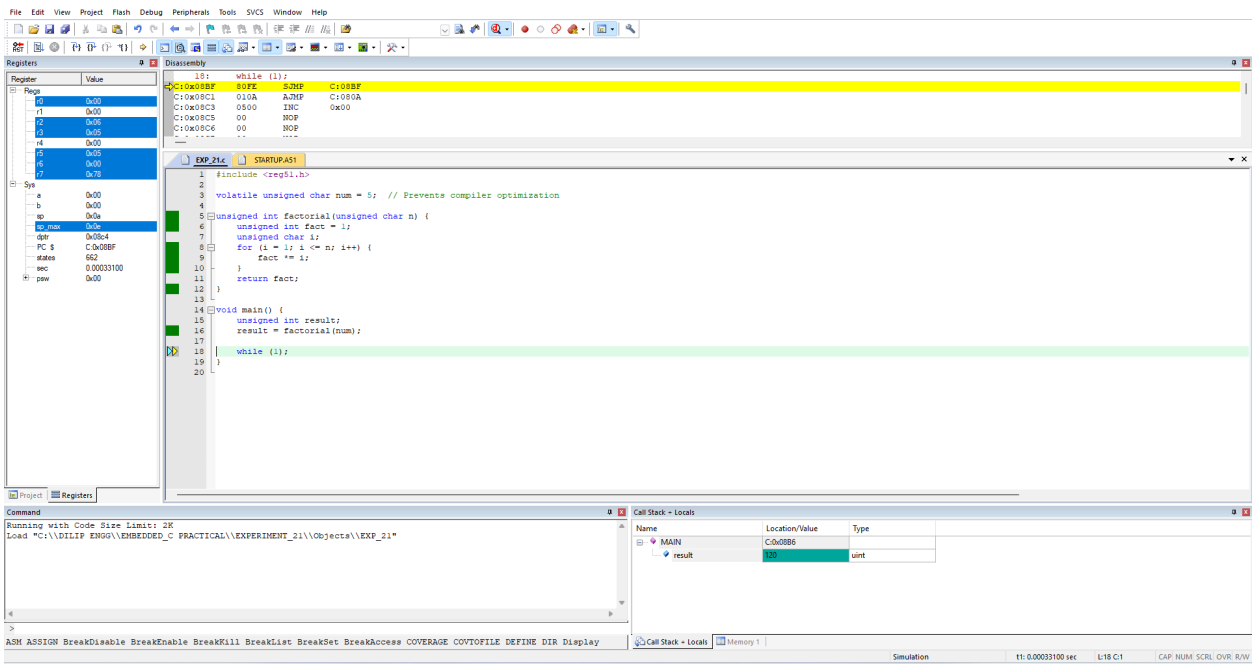
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

volatile unsigned char num = 5;  // Prevents compiler optimization

unsigned int factorial(unsigned char n) {
   unsigned int fact = 1;
   unsigned char i;
   for (i = 1; i <= n; i++) {
      fact *= i;
   }
   return fact;
}
```

```
void main() {
    unsigned int result;
    result = factorial(num);

    while (1);
}
```

OUTPUT:



RESULT:

To find the factorial of a number is successful using a C program.

EXPERIMENT 22:

Write a 8051 C program to generate the multiplication table for a number (1 to 10) and store it in internal RAM

AIM:

To generate the multiplication table for a number from (1 to 10) using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

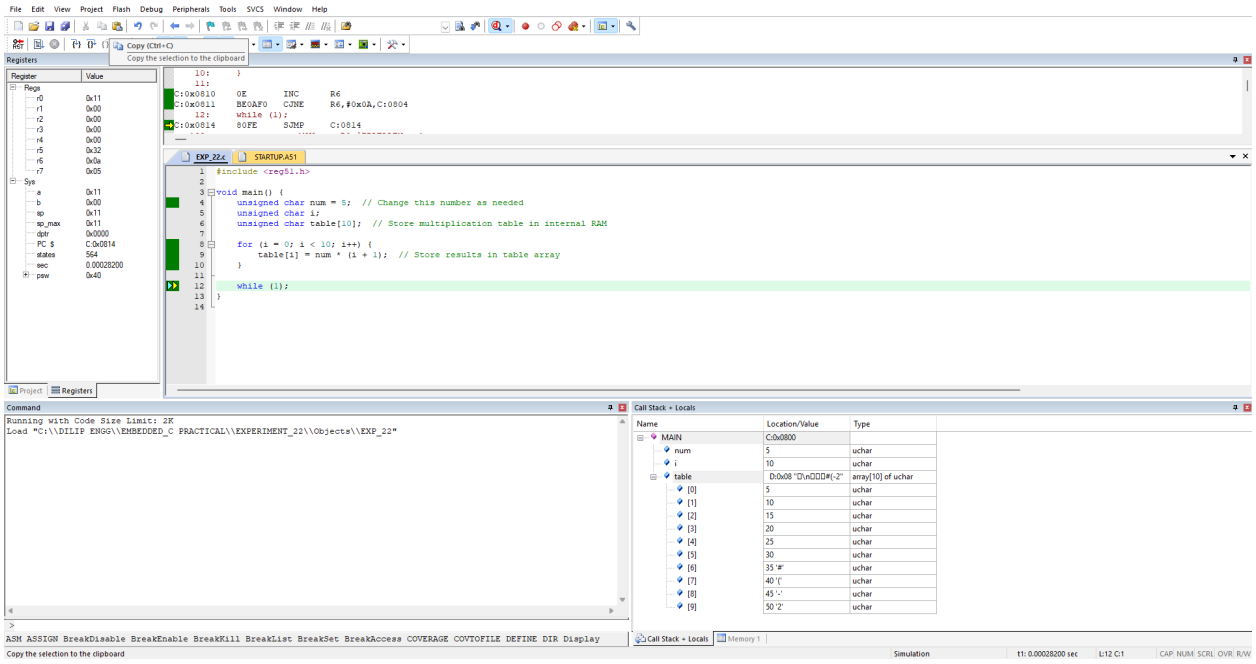
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char num = 5;  // Change this number as needed
   unsigned char i;
   unsigned char table[10];  // Store multiplication table in internal RAM

   for (i = 0; i < 10; i++) {
      table[i] = num * (i + 1);  // Store results in table array
   }

   while (1);
```

}

OUTPUT:



RESULT:

To generate the multiplication table for a number from (1 to 10) is successful using a C program.

EXPERIMENT 23:

Write a 8051 C program to find and store all prime numbers between 1 and 50 in an array

AIM:

To find and store all prime numbers between 1 and 50 in an array using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

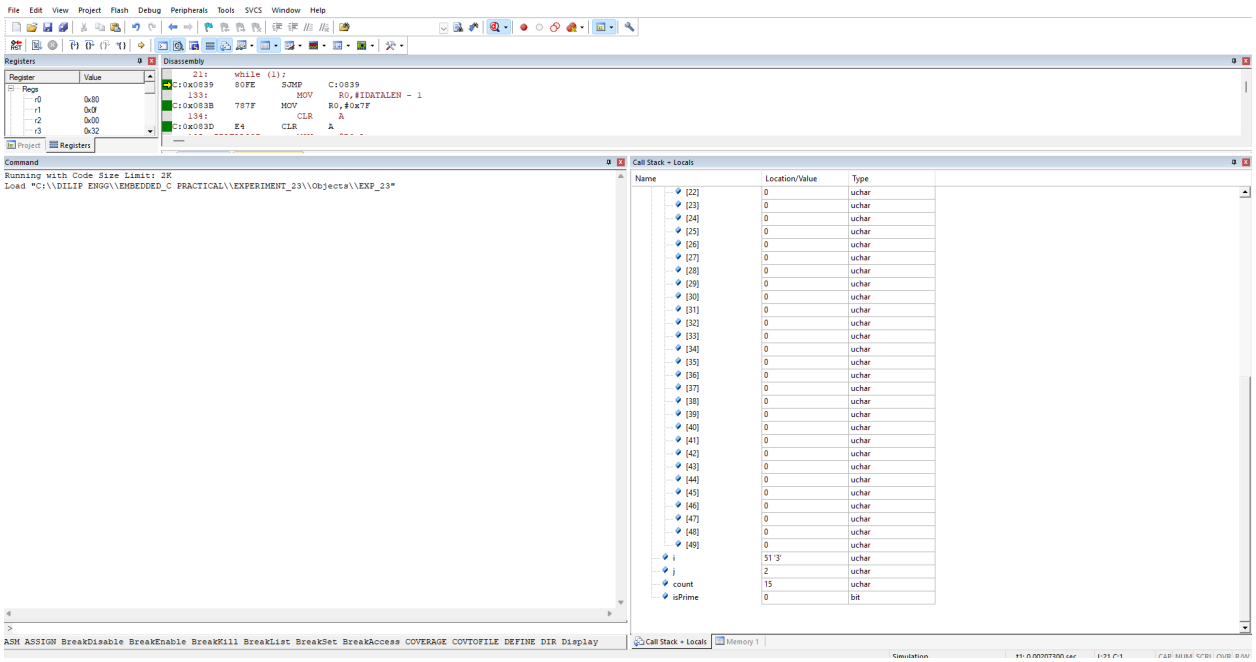
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char primes[50];
   unsigned char i, j, count = 0;
   bit isPrime;

   for (i = 2; i <= 50; i++) {
      isPrime = 1;
      for (j = 2; j * j <= i; j++) {
         if (i % j == 0) {
            isPrime = 0;
```

```
                break;
            }
        }
        if (isPrime) {
            primes[count++] = i;
        }
    }

    while (1);
}
```

OUTPUT:



RESULT:

To find and store all prime numbers between 1 and 50 in an array is successful using a C program.

EXPERIMENT 24:

Write a 8051 C program to reverse the digits of a 16-bit number and store the result in memory

AIM:

To reverse the digits of a 16-bit number and store result in memory using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

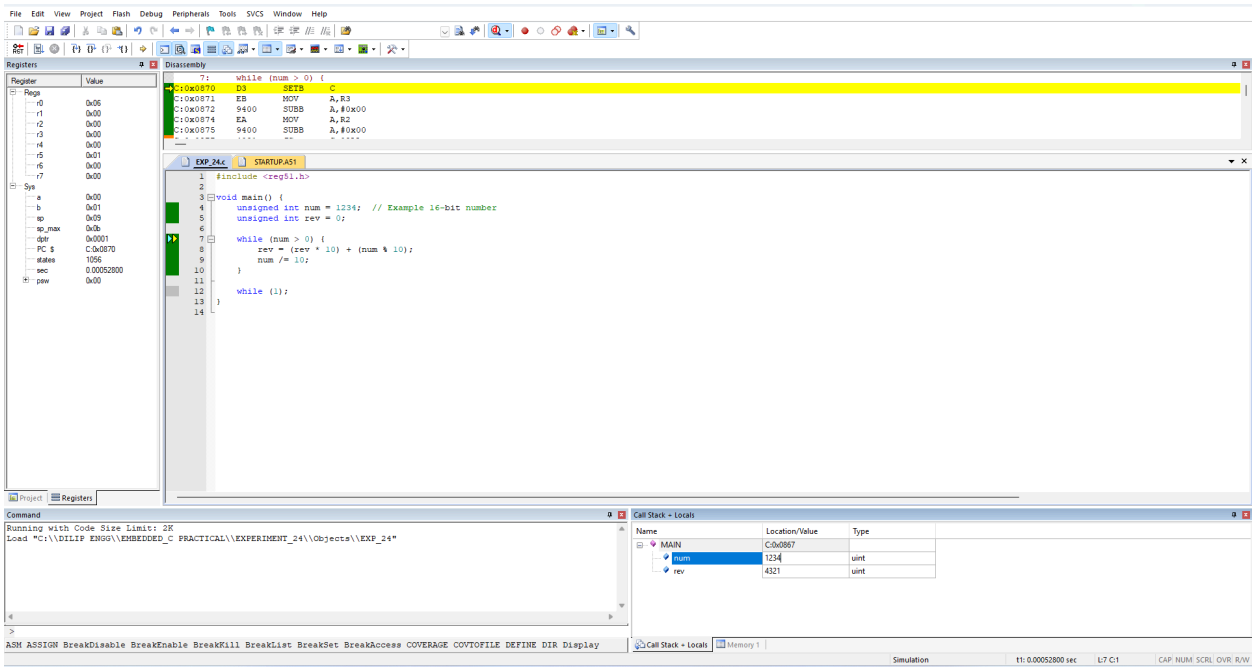
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned int num = 1234;  // Example 16-bit number
   unsigned int rev = 0;

   while (num > 0) {
      rev = (rev * 10) + (num % 10);
      num /= 10;
   }

   while (1);
```

}

OUTPUT:



RESULT:

To reverse the digits of a 16-bit number and store the result in memory is successful using a C program.

EXPERIMENT 25:

Write a 8051 C program to check whether a given 3-digit number is an Armstrong number

AIM:

To check whether a given 3-digit number is an Armstrong number using a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

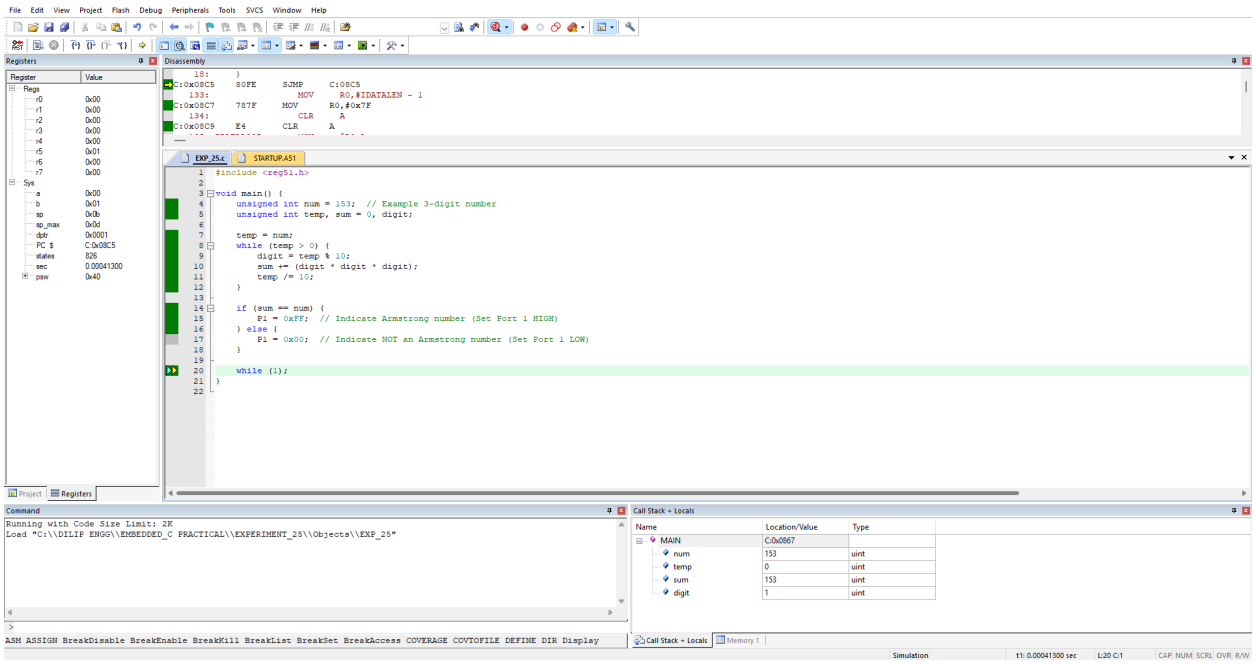
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned int num = 153;  // Example 3-digit number
   unsigned int temp, sum = 0, digit;

   temp = num;
   while (temp > 0) {
      digit = temp % 10;
      sum += (digit * digit * digit);
      temp /= 10;
   }
```

```
    if (sum == num) {
        P1 = 0xFF;  // Indicate Armstrong number (Set Port 1 HIGH)
    } else {
        P1 = 0x00;  // Indicate NOT an Armstrong number (Set Port 1 LOW)
    }

    while (1);
}
```

OUTPUT:



RESULT:

To check whether a given 3-digit number is an Armstrong number is successful using a C program.

EXPERIMENT 26:

Write a 8051 C program to swap the contents of two memory locations using a temporary variable

AIM:

To swap the contents of two memory locations using a temporary variable by a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

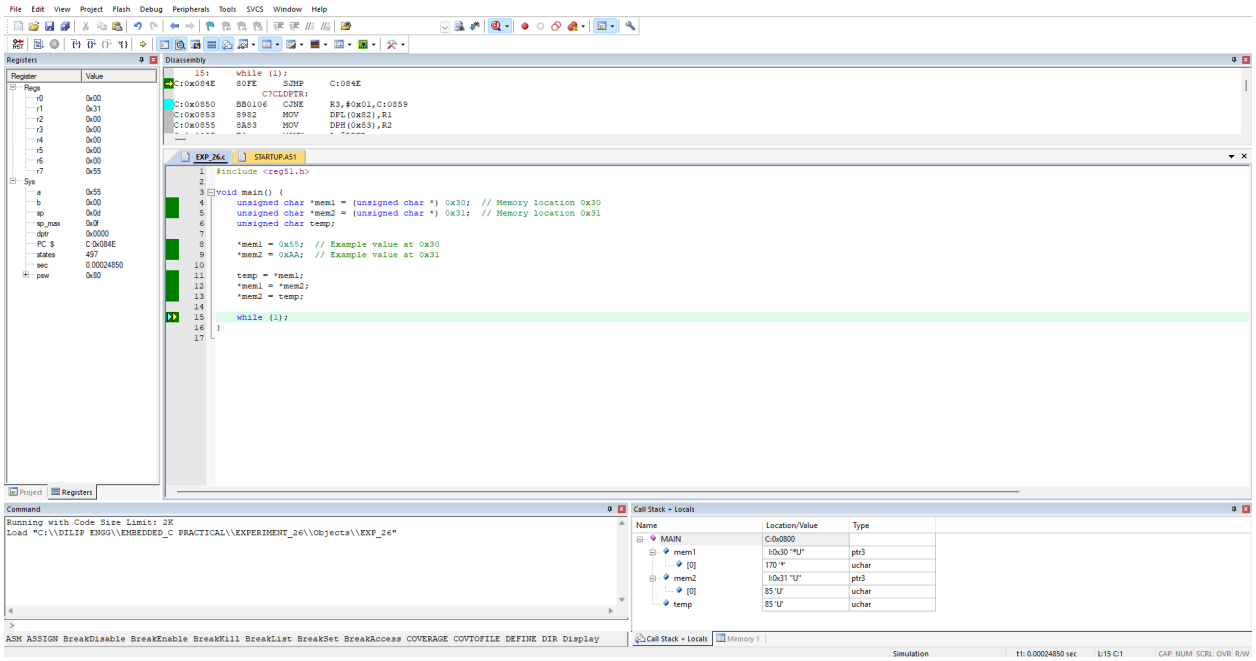
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char *mem1 = (unsigned char *) 0x30;  // Memory location 0x30
   unsigned char *mem2 = (unsigned char *) 0x31;  // Memory location 0x31
   unsigned char temp;

   *mem1 = 0x55;  // Example value at 0x30
   *mem2 = 0xAA;  // Example value at 0x31

   temp = *mem1;
```

```
    *mem1 = *mem2;
    *mem2 = temp;

    while (1);
}
```

OUTPUT:



RESULT:

To swap the contents of two memory locations using a temporary variable is successful by a C program.

EXPERIMENT 27:

Write a 8051 C program to shift the contents of an array to the left by one position (cyclic shift)

AIM:

To shift the contents of an array to the left by one position (cyclic shift) by a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

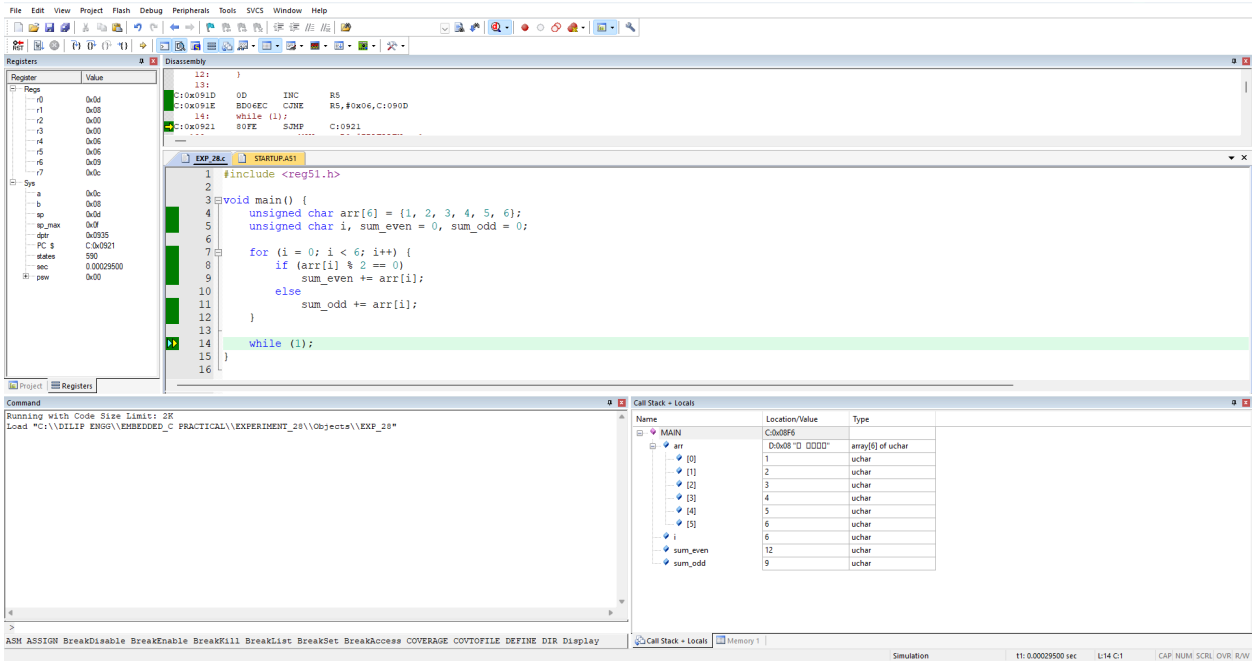
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char arr[5] = {1, 2, 3, 4, 5};
   unsigned char temp, i;

   temp = arr[0];
   for (i = 0; i < 4; i++) {
      arr[i] = arr[i + 1];
   }
   arr[4] = temp;
```

```
    while (1);
}
```

OUTPUT:



RESULT:

To shift the contents of an array to the left by one position (cyclic shift) is successful by a C program.

EXPERIMENT 28:

Write a 8051 C program to find the sum of even and odd elements in an array separately

AIM:

To find the sum of even and odd elements in an array separately by a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

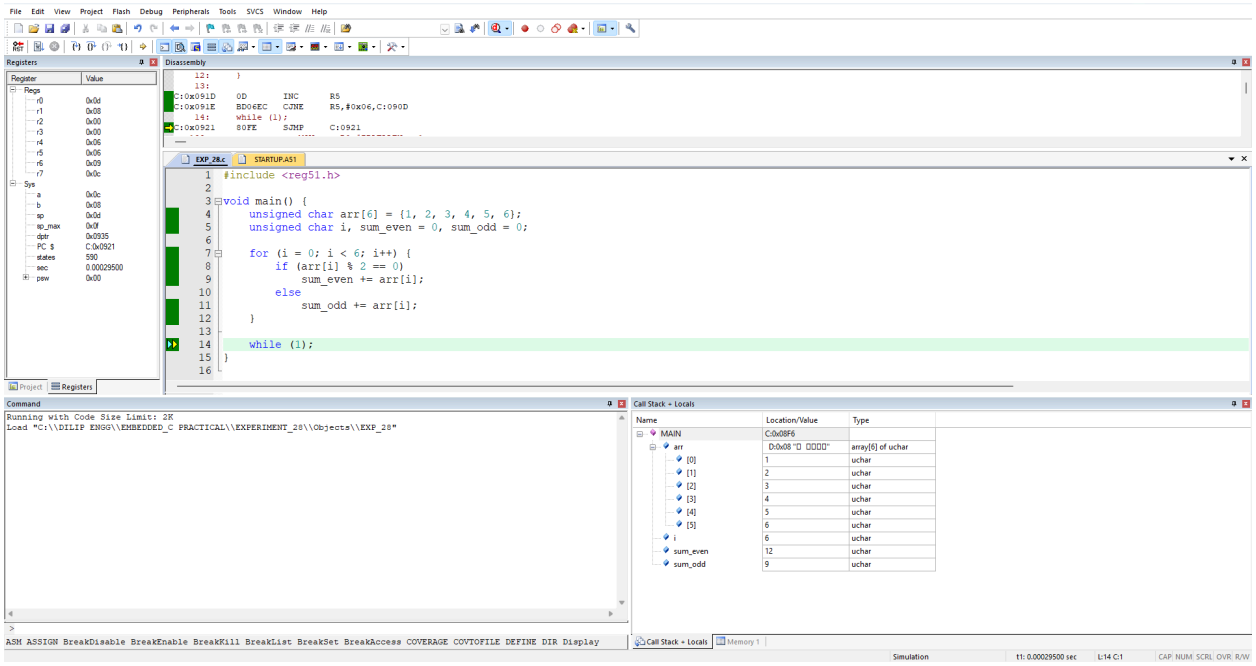
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char arr[6] = {1, 2, 3, 4, 5, 6};
   unsigned char i, sum_even = 0, sum_odd = 0;

   for (i = 0; i < 6; i++) {
      if (arr[i] % 2 == 0)
         sum_even += arr[i];
      else
         sum_odd += arr[i];
   }
```

```
    while (1);
}
```

OUTPUT:



RESULT:

To find the sum of even and odd elements in an array separately is successful by a C program.

EXPERIMENT 29:

Write a C program to convert a decimal number to binary (without built-in conversion functions)

AIM:

To convert a decimal number to binary(without build-in conversion function) by a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

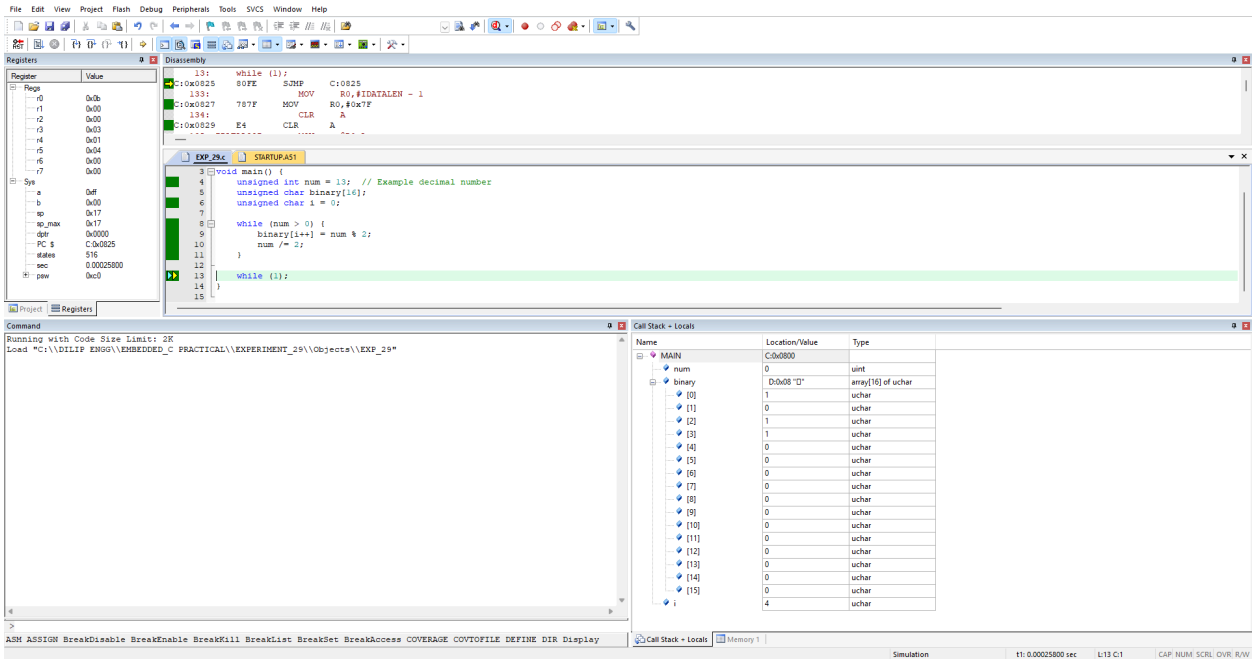
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned int num = 13;  // Example decimal number
   unsigned char binary[16];
   unsigned char i = 0;

   while (num > 0) {
      binary[i++] = num % 2;
      num /= 2;
   }
```

```
    while (1);
}
```

OUTPUT:



RESULT:

To convert a decimal number to binary(without a built-in conversion function) is successful by a C program.

EXPERIMENT 30:

Write a 8051 C program to remove duplicate elements from an array of integers

AIM:

To remove duplicate elements from an array of integers by a C program.

SOFTWARE REQUIRED:

KEIL µ Vision 5 Software

PROCEDURE:

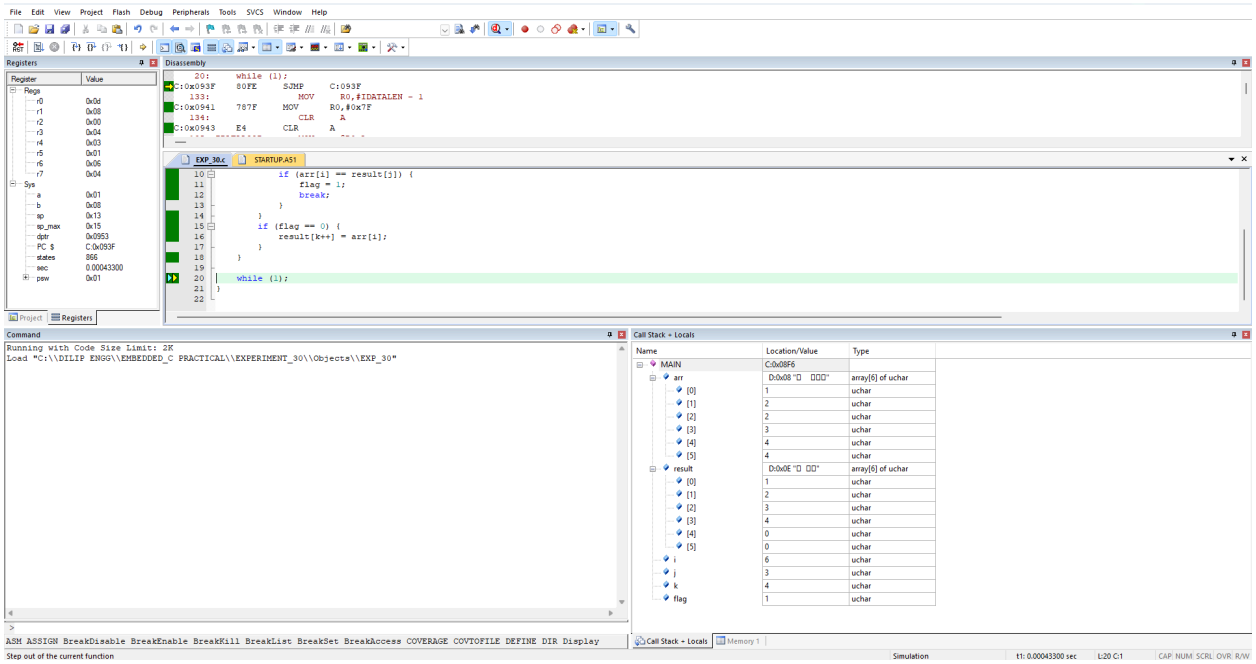
- Launch Keil µVision 5 software.
- Navigate to the Project tab and select New Project, then save it in a desired folder.
- Choose AT89C51 as the target device and create a new C file.
- Write the C program and build the target.
- If errors occur, rectify them and rebuild the target.
- If no errors are detected, debug the program and verify the output.

PROGRAM:

```
#include <reg51.h>

void main() {
   unsigned char arr[6] = {1, 2, 2, 3, 4, 4};
   unsigned char result[6], i, j, k = 0, flag;

   for (i = 0; i < 6; i++) {
      flag = 0;
      for (j = 0; j < k; j++) {
         if (arr[i] == result[j]) {
            flag = 1;
            break;
```

```
            }
        }
        if (flag == 0) {
            result[k++] = arr[i];
        }
    }

    while (1);
}
```

OUTPUT:



RESULT:

To remove duplicate elements from an array of integers is successful by a C program.