**INTEGER RESTORING DIVISION**

**EXP NO: 33**

**AIM:** To write a C program to implement integer restoring division.

**ALGORITHM:**

Step 1: Start.
Step 2: Declare necessary variables: acum[], q[], and b[] to store the accumulator, quotient, and divisor in binary form.
Step 3: Prompt the user to enter two integers (dividend and divisor).
Step 4: Convert the dividend (x) and divisor (y) into binary and store them in q[] and b[] respectively.
Step 5: Form the two's complement of the divisor b[] and store it in bc[].
Step 6: Perform the division using the restoring method.
Step 7: For each iteration: a. Shift the accumulator (acum[]) left by one bit. b. Shift the quotient (q[]) left by one bit. c. Subtract the divisor from the accumulator. If the accumulator is negative, restore the accumulator by adding the divisor back and set the current quotient bit to 0. d. If the accumulator is positive or zero, set the current quotient bit to 1. Step 8: After all iterations, display the quotient and remainder in binary form.
Step 9: End.

**PROGRAM:**

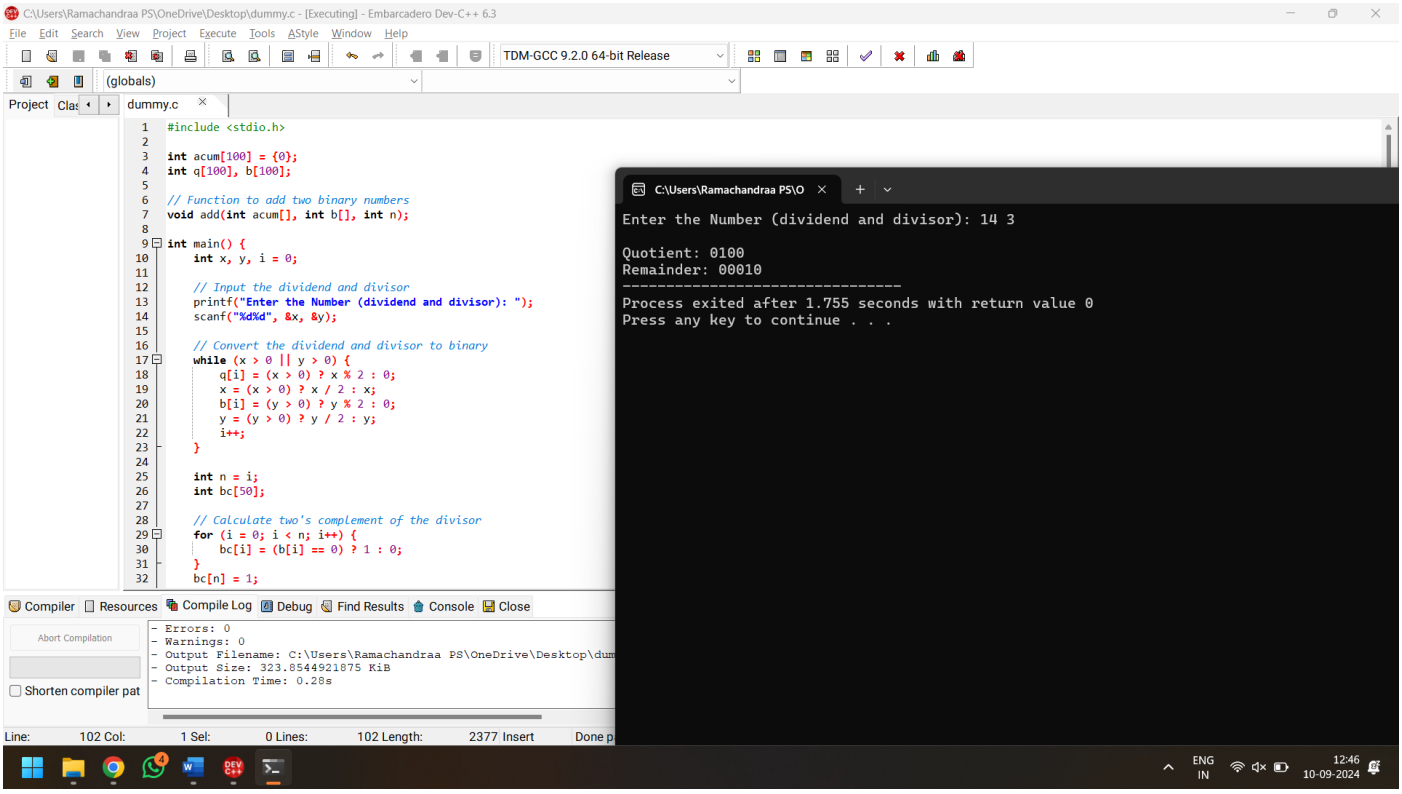
```
#include <stdio.h>


int acum[100] = {0};

int q[100], b[100];


// Function to add two binary numbers

void add(int acum[], int b[], int n);


int main() {

   int x, y, i = 0;


   // Input the dividend and divisor

   printf("Enter the Number (dividend and divisor): ");

   scanf("%d%d", &x, &y);


   // Convert the dividend and divisor to binary

   while (x > 0 || y > 0) {

      q[i] = (x > 0) ? x % 2 : 0;

      x = (x > 0) ? x / 2 : x;

      b[i] = (y > 0) ? y % 2 : 0;

      y = (y > 0) ? y / 2 : y;

      i++;
```

```
}

int n = i;
int bc[50];

// Calculate two's complement of the divisor
for (i = 0; i < n; i++) {
   bc[i] = (b[i] == 0) ? 1 : 0;
}
bc[n] = 1;

// Add 1 to the two's complement of the divisor
for (i = 0; i <= n; i++) {
   if (bc[i] == 0) {
      bc[i] = 1;
      break;
   } else {
      bc[i] = 0;
   }
}

// Perform restoring division
for (i = n; i != 0; i--) {
   // Shift accumulator left
   for (int j = n; j > 0; j--) {
      acum[j] = acum[j - 1];
   }
   acum[0] = q[n - 1];

   // Shift quotient left
   for (int j = n - 1; j > 0; j--) {
      q[j] = q[j - 1];
   }
```

```
        // Subtract divisor
        add(acum, bc, n + 1);

        if (acum[n] == 1) {  // If accumulator is negative
            q[0] = 0;
            add(acum, b, n + 1);  // Restore the accumulator
        } else {
            q[0] = 1;  // Set quotient bit to 1
        }
    }

    // Output quotient and remainder
    printf("\nQuotient: ");
    for (int l = n - 1; l >= 0; l--) {
        printf("%d", q[l]);
    }

    printf("\nRemainder: ");
    for (int l = n; l >= 0; l--) {
        printf("%d", acum[l]);
    }

    return 0;
}

// Function to add two binary numbers
void add(int acum[], int bo[], int n) {
    int temp = 0;
    for (int i = 0; i < n; i++) {
        int sum = acum[i] + bo[i] + temp;
        if (sum == 0) {
            acum[i] = 0;
            temp = 0;
        } else if (sum == 1) {
```

```
            acum[i] = 1;
            temp = 0;
        } else if (sum == 2) {
            acum[i] = 0;
            temp = 1;
        } else if (sum == 3) {
            acum[i] = 1;
            temp = 1;
        }
    }
}
```

**INPUT & OUTPUT:**




**RESULT:** Thus, the program was executed successfully using DevC++.