Restoring Division Algorithm

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

int dec_bin(int, int []);
int twos(int [], int []);
int left(int [], int []);
int add(int [], int []);

int main()
{
    int a, b, m[4]={0,0,0,0}, q[4]={0,0,0,0}, acc[4]={0,0,0,0}, m2[4], i, n=4;
    printf("Enter the Dividend: ");
    scanf("%d", &a);
    printf("Enter the Divisor: ");
    scanf("%d", &b);
    dec_bin(a, q);
    dec_bin(b, m);
    twos(m, m2);
    printf("\nA\tQ\tComments\n");
    for(i=3; i>=0; i--)
```

```
{
    printf("%d", acc[i]);
}
printf("\t");
for(i=3; i>=0; i--)
{
    printf("%d", q[i]);
}
printf("\tStart\n");
while(n>0)
{
    left(acc, q);
    for(i=3; i>=0; i--)
    {
        printf("%d", acc[i]);
    }
    printf("\t");
    for(i=3; i>=1; i--)
    {
        printf("%d", q[i]);
    }
    printf("_\tLeft Shift A,Q\n");
    add(acc, m2);
```

```
for(i=3; i>=0; i--)
{
    printf("%d", acc[i]);
}
printf("\t");
for(i=3; i>=1; i--)
{
    printf("%d", q[i]);
}
printf("_\tA=A-M\n");
if(acc[3]==0)
{
    q[0]=1;
    for(i=3; i>=0; i--)
    {
        printf("%d", acc[i]);
    }
    printf("\t");
    for(i=3; i>=0; i--)
    {
        printf("%d", q[i]);
    }
    printf("\tQo=1\n");
    }
    else
    {
        q[0]=0;
        add(acc, m);
        for(i=3; i>=0; i--)
        {
            printf("%d", acc[i]);
        }
        printf("\t");
        for(i=3; i>=0; i--)
        {
            printf("%d", q[i]);
        }
        printf("\tQo=0; A=A+M\n");
    }
    n--;
}
printf("\nQuotient = ");
for(i=3; i>=0; i--)
{
        printf("%d", q[i]);
}
```

```
    printf("\tRemainder = ");
    for(i=3; i>=0; i--)
    {
            printf("%d", acc[i]);
    }
    printf("\n");
    return 0;
}

int dec_bin(int d, int m[])
{
    int b=0, i=0;
    for(i=0; i<4; i++)
    {
        m[i]=d%2;
        d=d/2;
    }
    return 0;
}

int twos(int m[], int m2[])
{
    int i, m1[4];
```

```
for(i=0; i<4; i++)
{
    if(m[i]==0)
    {
        m1[i]=1;
    }
    else
    {
        m1[i]=0;
    }
}
for(i=0; i<4; i++)
{
    m2[i]=m1[i];
}
if(m2[0]==0)
{
    m2[0]=1;
}
else
{
    m2[0]=0;
    if(m2[1]==0)
```

```
{
    m2[1]=1;
}
else
{
    m2[1]=0;
    if(m2[2]==0)
    {
        m2[2]=1;
    }
    else
    {
        m2[2]=0;
        if(m2[3]==0)
        {
          m2[3]=1;
        }
        else
        {
          m2[3]=0;
        }
    }
}
```

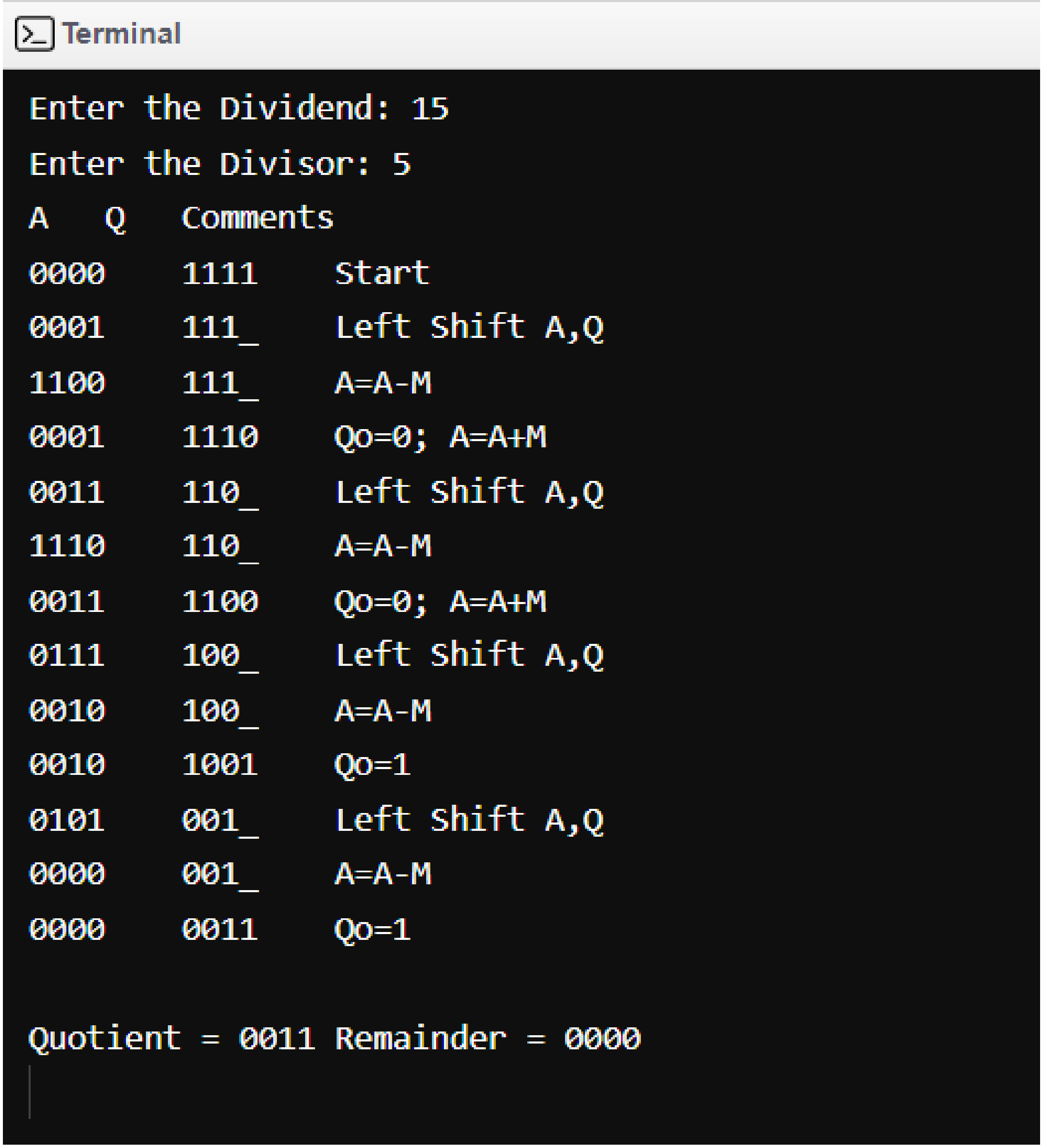
```
    }
    return 0;
}

+int left(int acc[], int q[])
{
    int i;
    for(i=3; i>0; i--)
    {
        acc[i]=acc[i-1];
    }
    acc[0]=q[3];
    for(i=3; i>0; i--)
    {
        q[i]=q[i-1];
    }
}

int add(int acc[], int m[])
{
  int i, carry=0;
  for(i=0; i<4; i++)
  {
```

```
  if(acc[i]+m[i]+carry==0)
  {
    acc[i]=0;
    carry=0;
  }
  else if(acc[i]+m[i]+carry==1)
  {
    acc[i]=1;
    carry=0;
  }
  else if(acc[i]+m[i]+carry==2)
  {
    acc[i]=0;
    carry=1;
  }
  else if(acc[i]+m[i]+carry==3)
  {
    acc[i]=1;
    carry=1;
  }
}
return 0;
```

Output:



```
Enter the Dividend: 15
Enter the Divisor: 5
A   Q   Comments
0000    1111    Start
0001    111_    Left Shift A,Q
1100    111_    A=A-M
0001    1110    Qo=0; A=A+M
0011    110_    Left Shift A,Q
1110    110_    A=A-M
0011    1100    Qo=0; A=A+M
0111    100_    Left Shift A,Q
0010    100_    A=A-M
0010    1001    Qo=1
0101    001_    Left Shift A,Q
0000    001_    A=A-M
0000    0011    Qo=1

Quotient = 0011 Remainder = 0000
```