22AIE113
ECS-2
ASSIGNMENT-1

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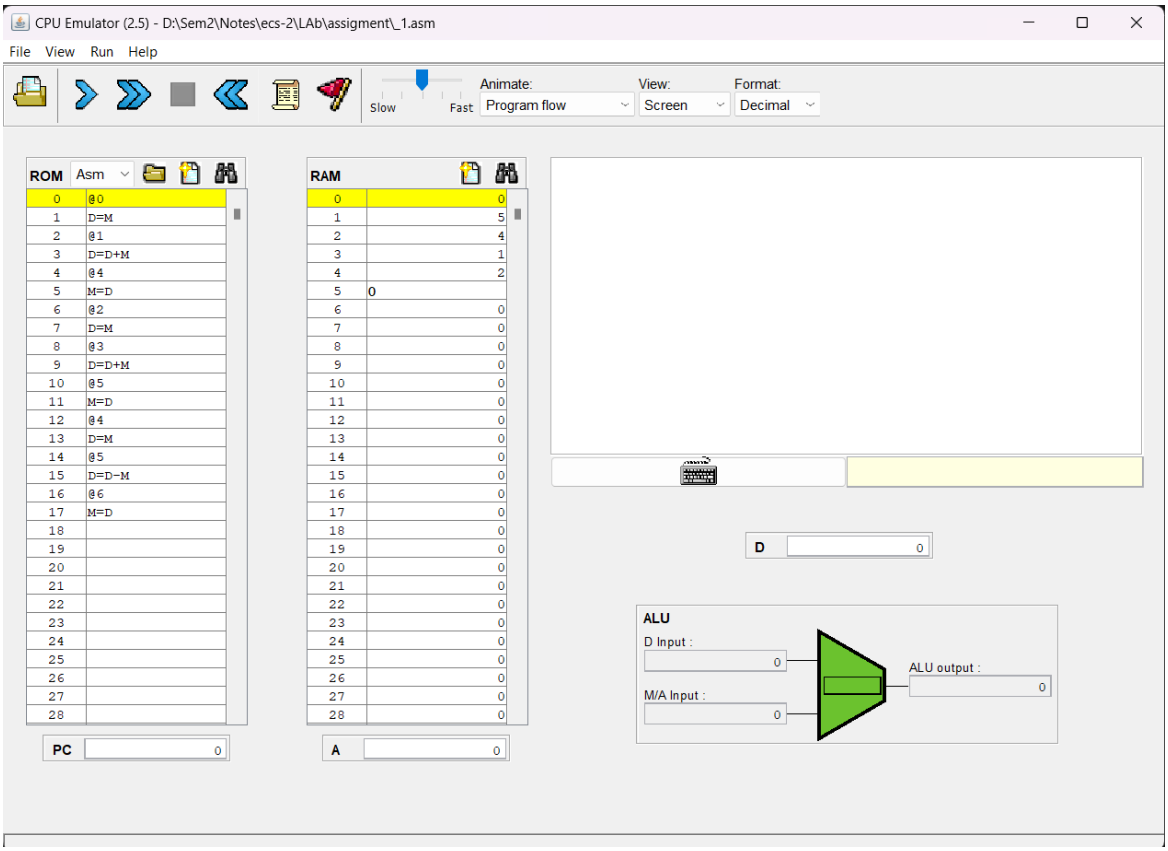
1. Write and execute a hack assembly program for the following C statement k=(a+b)-(c+d)

   CODE:

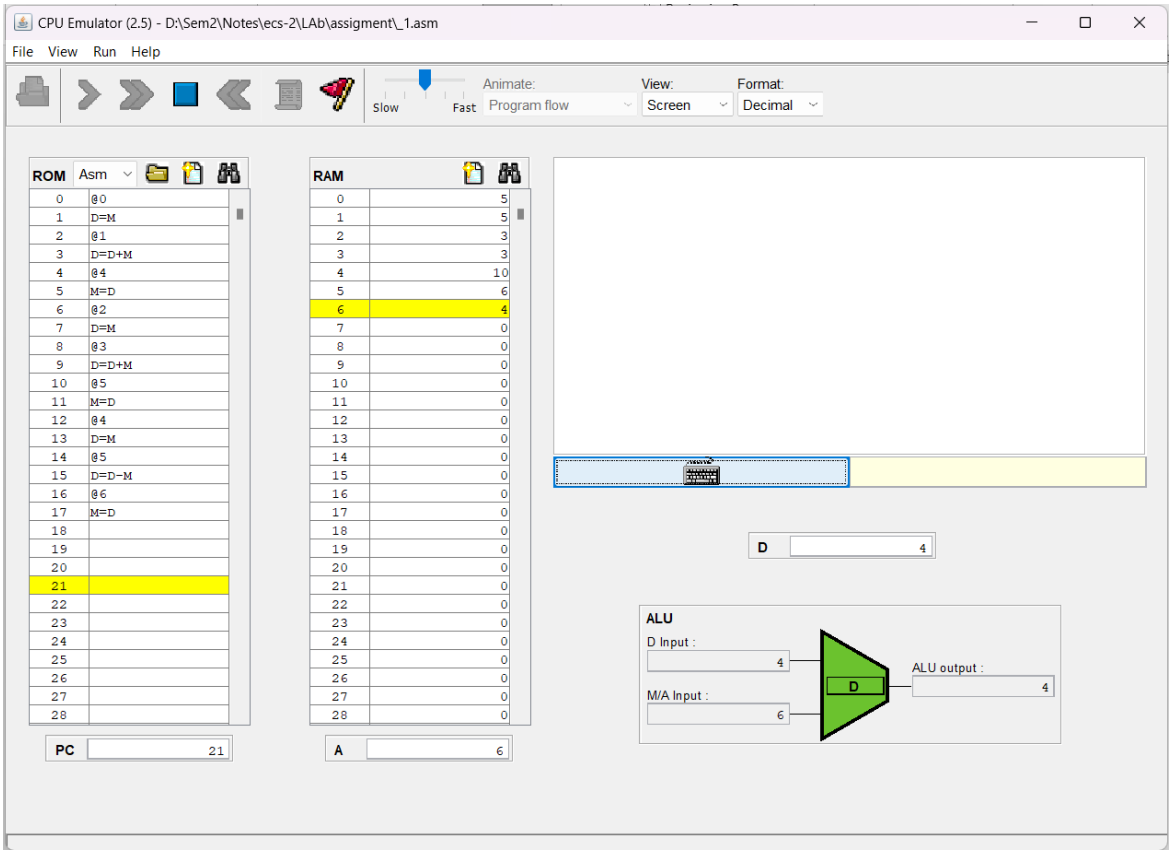
```
// this code is to  evaluate k = (a+b)-(c+d)

//input
//@0 == a
//@1 == b
//@2 == c
//@3 == d

//step1
//@4 == sum1 = a+b
//@5 == sum2 = c+d

//step1
//@6 == k = sum1 - sum2

@0
D = M
@1
D = D + M
@4
M = D

@2
D = M
@3
D = D + M
@5
M = D

@4
D = M
@5
D = D - M
@6
M = D
```

Screen Shot

INPUT



OUTPUT



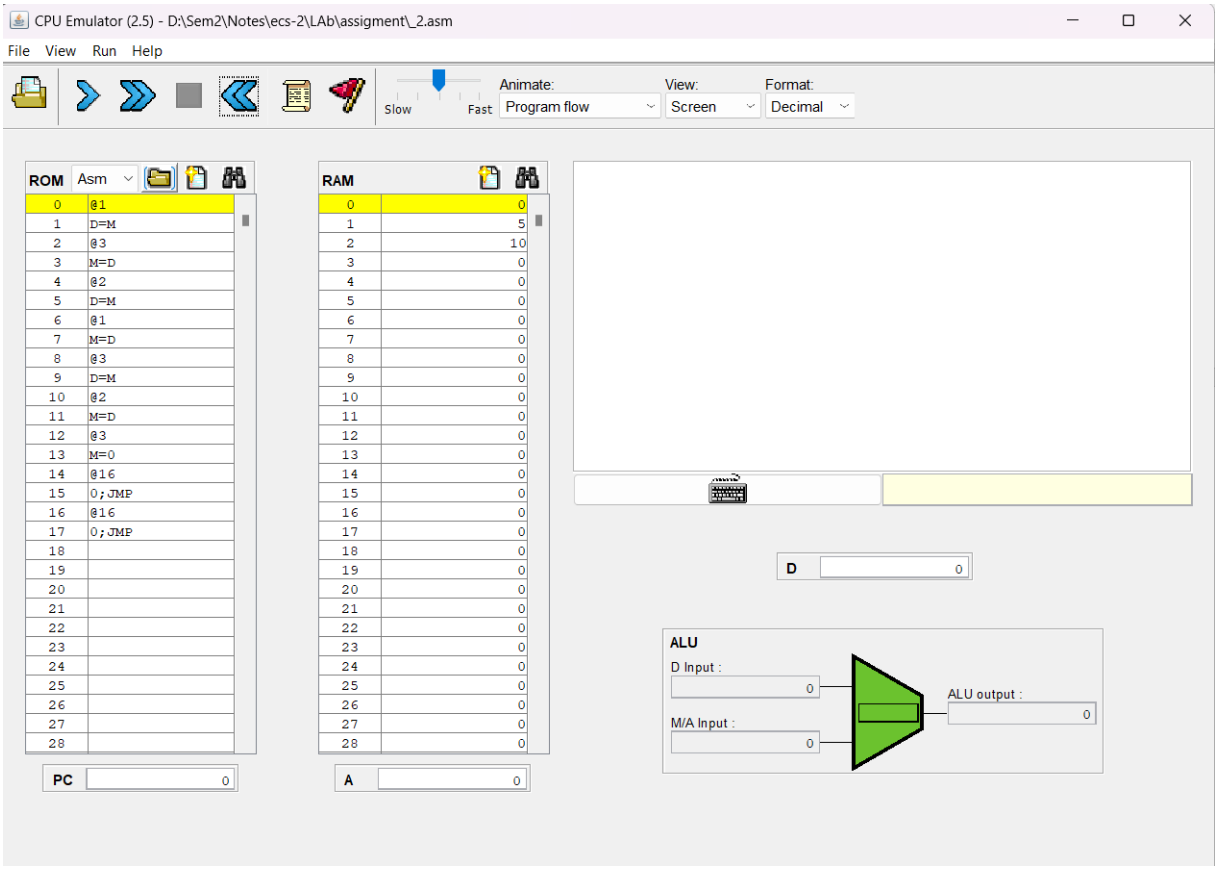
2.Write and execute a hack assembly program to swap two values.

Code:

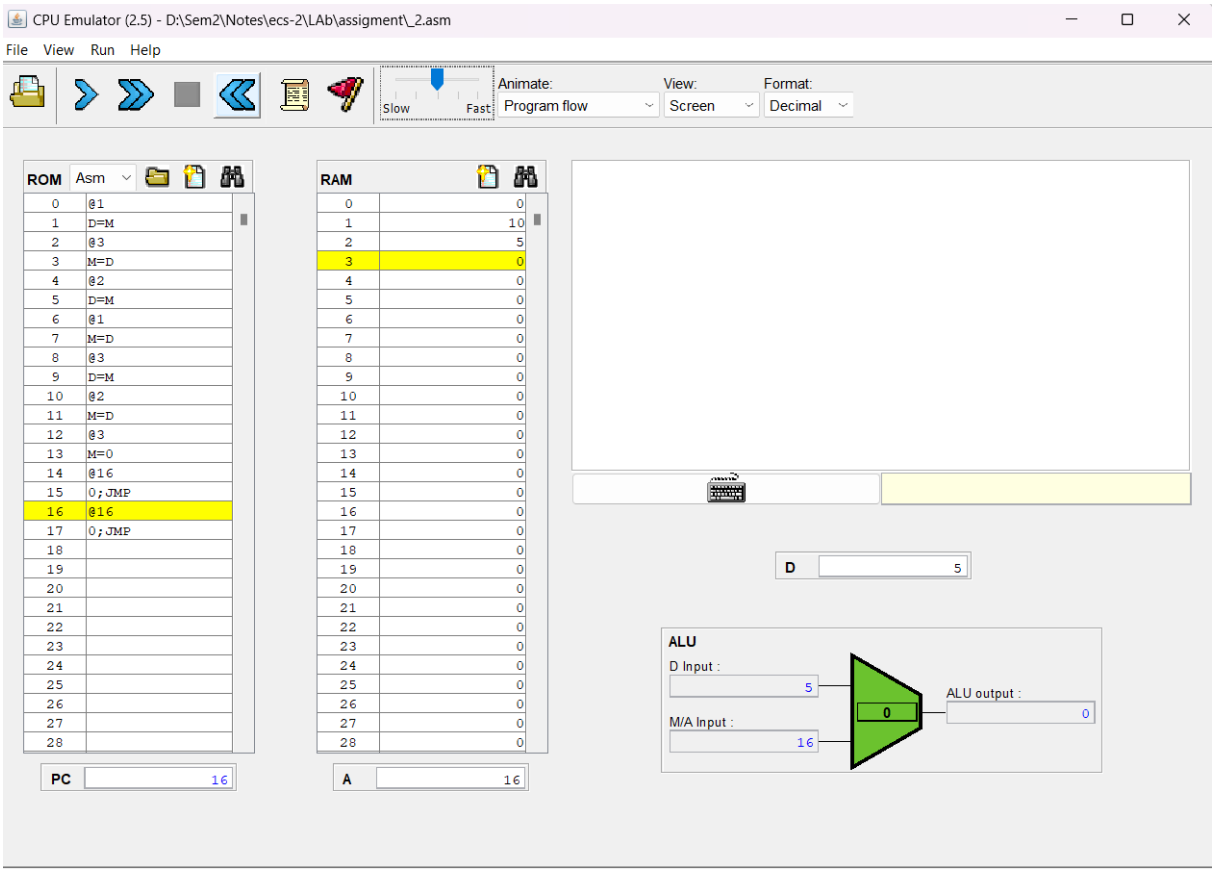
```
// this code will swap 2 variable

//input
//@1 == var1
//@2 == var2

//extra
//@3 == tmp

//steps
// tmp = va1
// var1 = var2
// var2 = tmp
// tmp = 0
//1
@1
D = M
@3
M = D

//2
@2
D = M
@1
M = D

//3
@3
D = M
@2
M = D

//4
@3
M = 0

@END
0;JMP

(END)
    @END
    0;JMP
```

Screen Shot

INPUT



OUTPUT



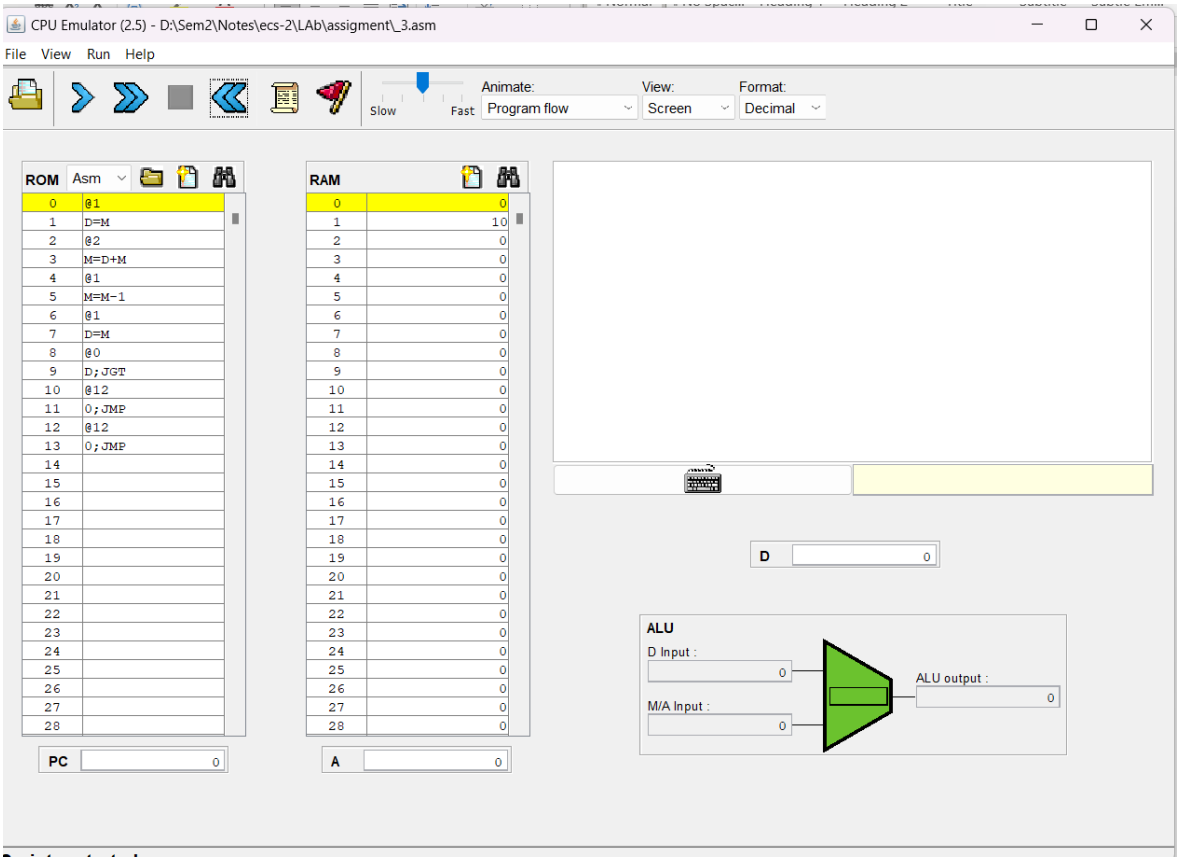
3. Write a hack assembly program to perform the sum of “n” numbers.

code

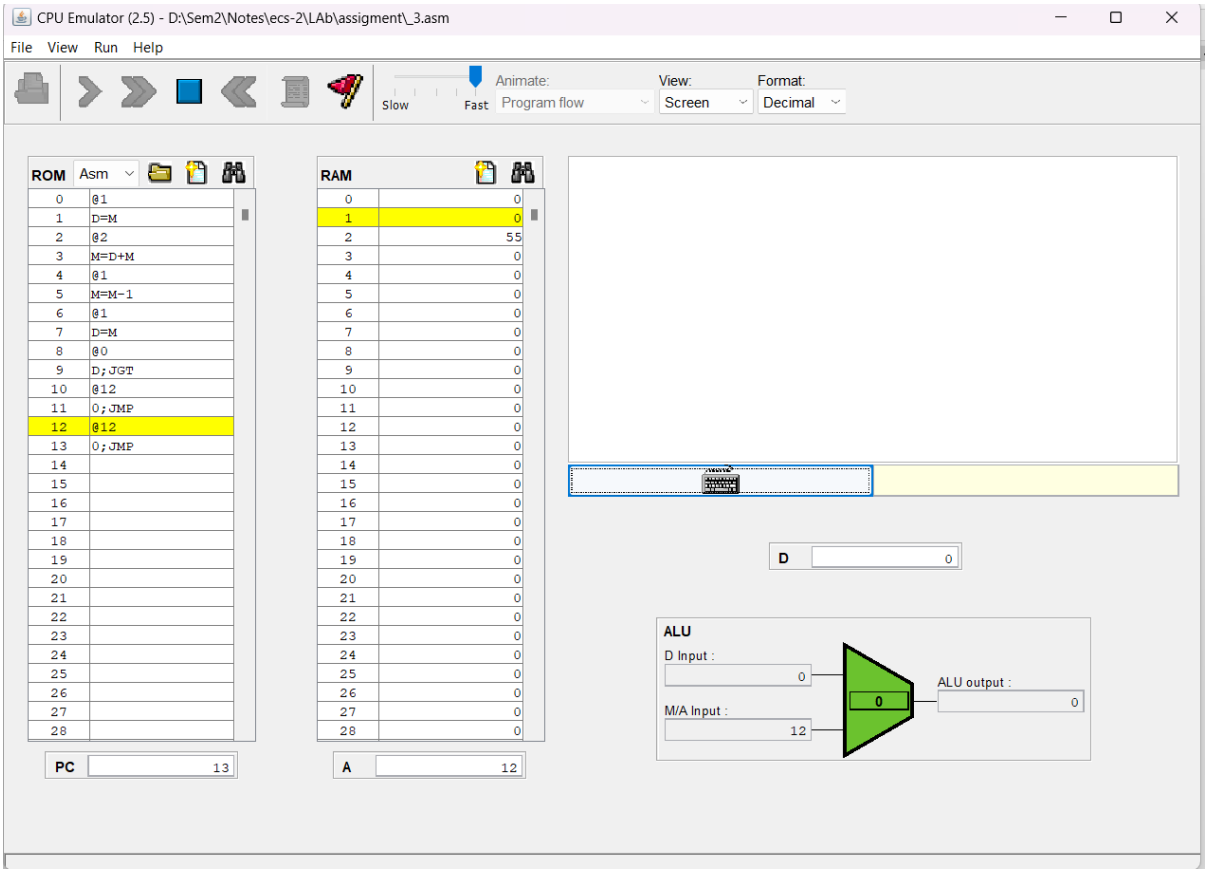
```
// this code will sum of n

//input
// @1 = n

//output
// @2 = sum

//steps
// do
// sum = sum + n
// n = n - 1
// while(n>0)



(LOOP)
    // sum = sum + n
    @1
    D = M
    @2
    M = M + D
    // n = n - 1
    @1
    M = M - 1
    @1
    D = M
    @LOOP
    D;JGT
    @END
    0;JMP
(END)
    @END
    0;JMP
```

Screen Shot

INPUT



OUTPUT



4. Write a hack assembly program for the following C statement.

```
if (a>=b)
        return   a;
else
        return  b;
```

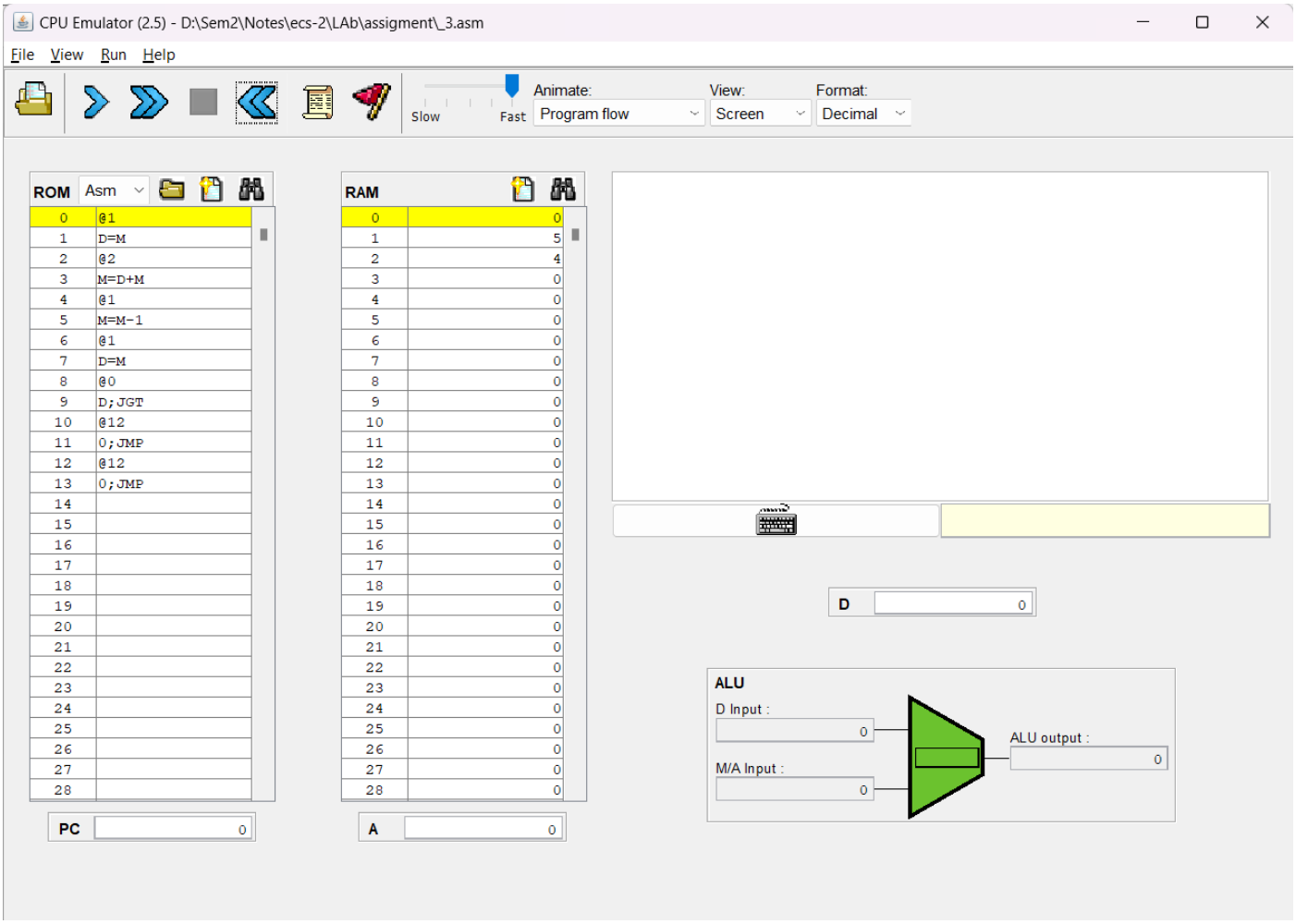
Code

```
// implement if-else
// check cmp a and b and return largest

//input
// @1 == a
// @2 == b

//output
// @5 == result

//code
// if(a>b):
//  return a
// else:
//  return b

// @5 = i
// i = a-b
// i;JGT
// inside if
// @5 == @1
// else:
// @5 == @2

@1
D = M
@2
D = D - M
@3
M = D
@3
D = M

@IF
D;JGT
@ELSE
0;JMP
// if i>=0
(IF)
    @1
    D = M
    @5
    M = D
    @END
    0;JMP
```

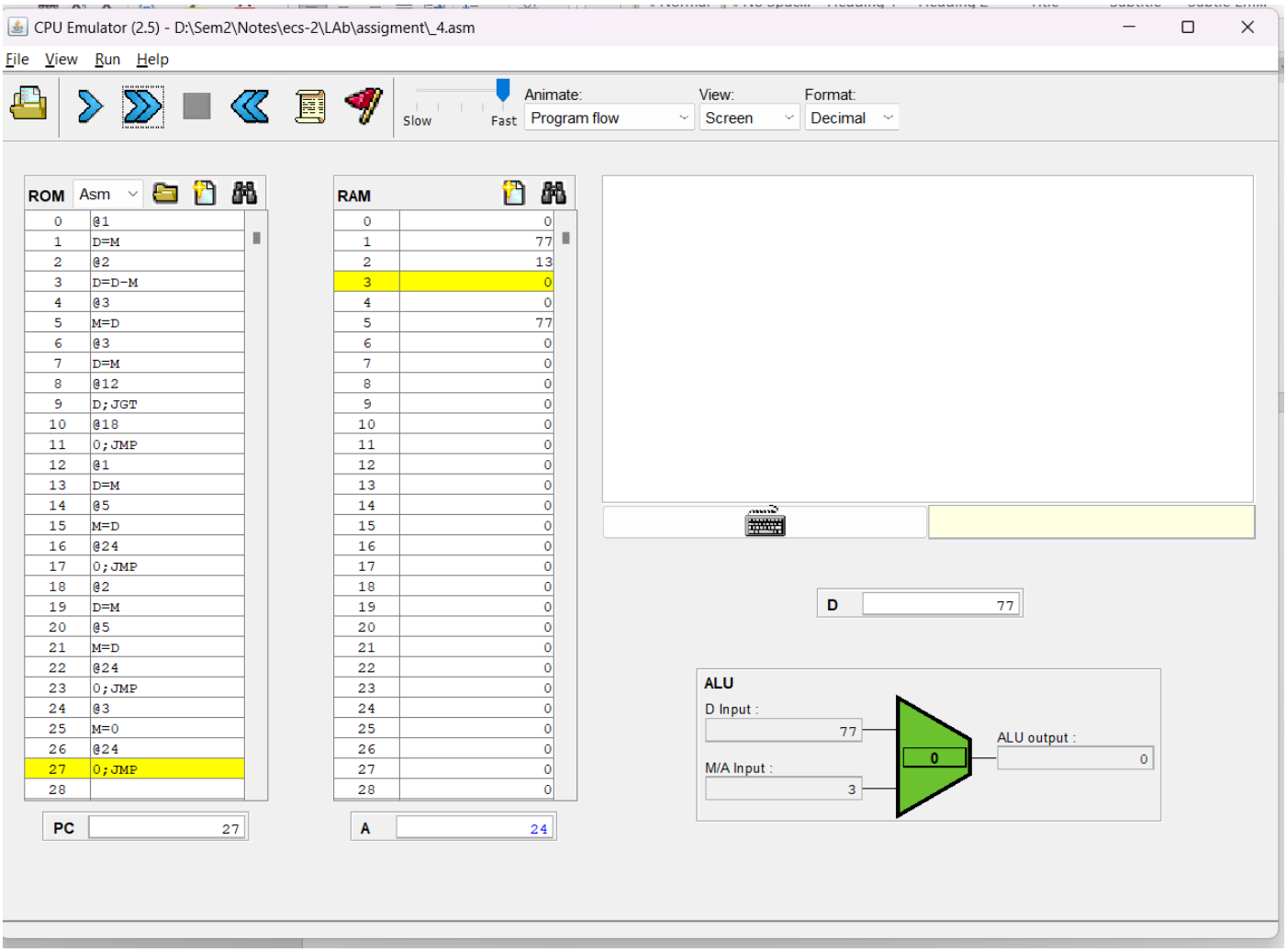
```
// else
(ELSE)
    @2
    D = M
    @5
    M = D
    @END
    0;JMP

(END)
    @3
    M = 0
    @END
    0;JMP
```

Screen Shot

INPUT



OUTPUT


CPU Emulator (2.5) - D:\Sem2\Notes\ecs-2\LAb\assigment_4.asm
File View Run Help
Slow
Fast
Animate:
Program flow
View:
Screen
Format:
Decimal
ROM
Asm
RAM
PC
27
A
24
D
77
ALU
D Input :
77
M/A Input :
3
0
ALU output :
0

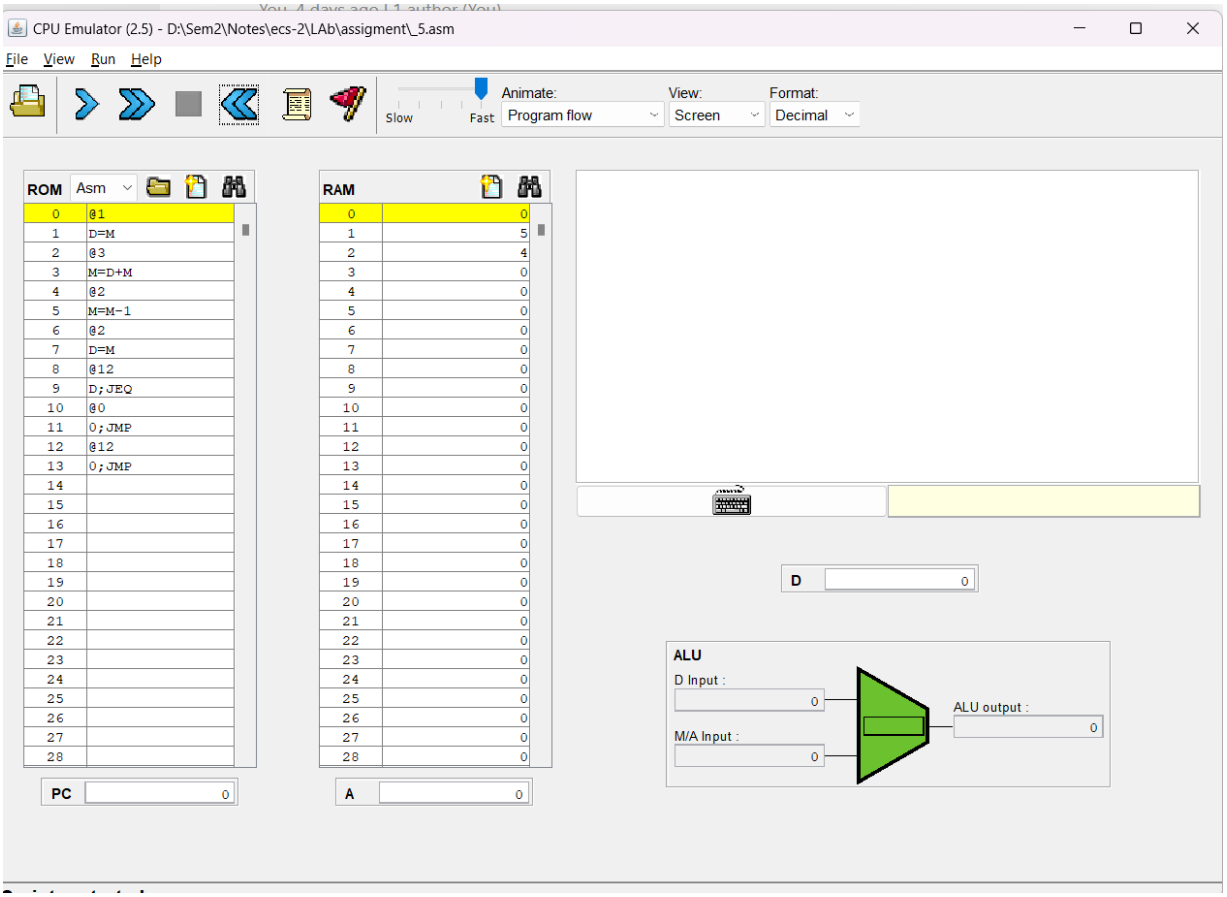
5. Write and execute a hack assembly program to perform multiplication of two operands.

CODE

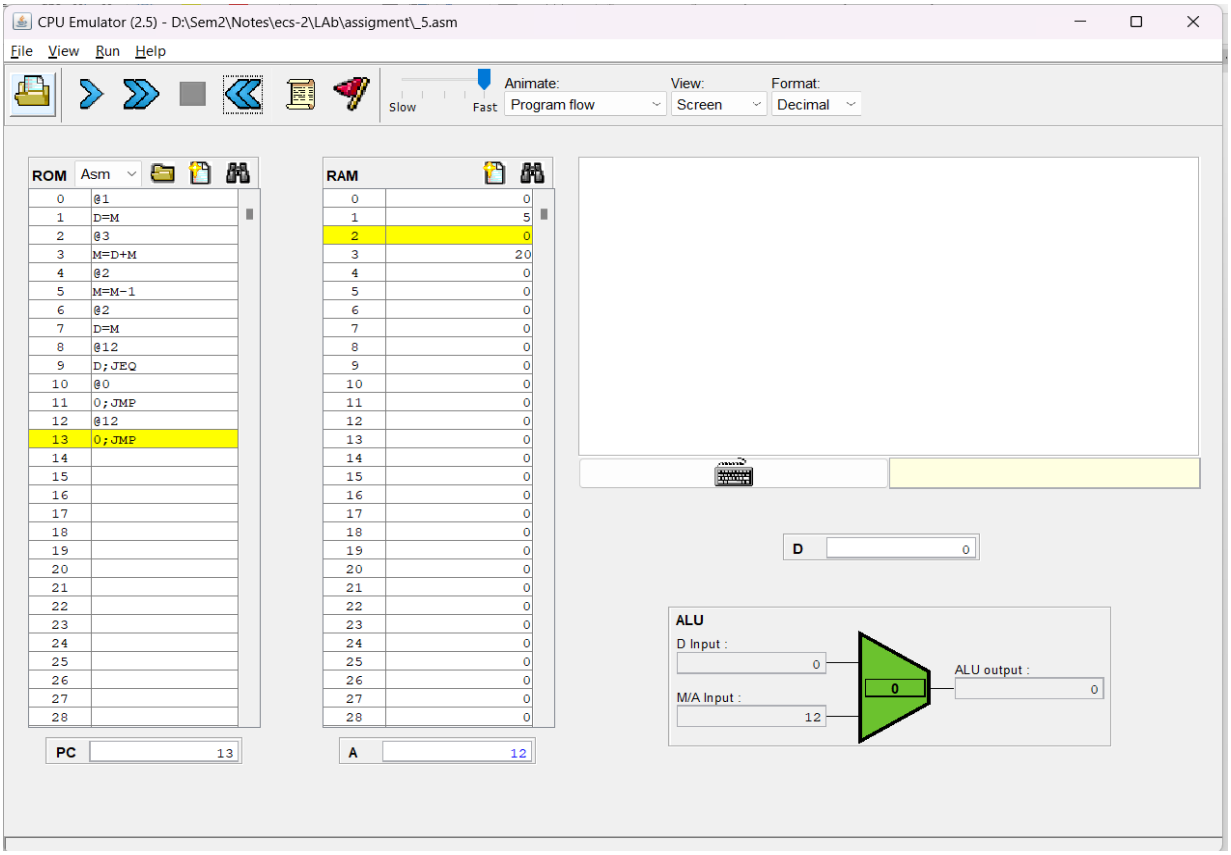
```
// this one to multiplication of a*b

// input
// @1 == a
// @2 == b

// output
// @3 == sum = a*b

// do
// @3 = @3 + a
// @2 = @2 - 1
// @2
// D = M
// @LOOP
// D;JEQ
// @END
// 0;JMP

(LOOP)
    @1
    D = M
    @3
    M = M + D
    @2
    M = M - 1
    @2
    D = M
    @END
    D;JEQ
    @LOOP
    0;JMP
(END)
    @END
    0;JMP
```

Screen Shot

INPUT



OUTPUT



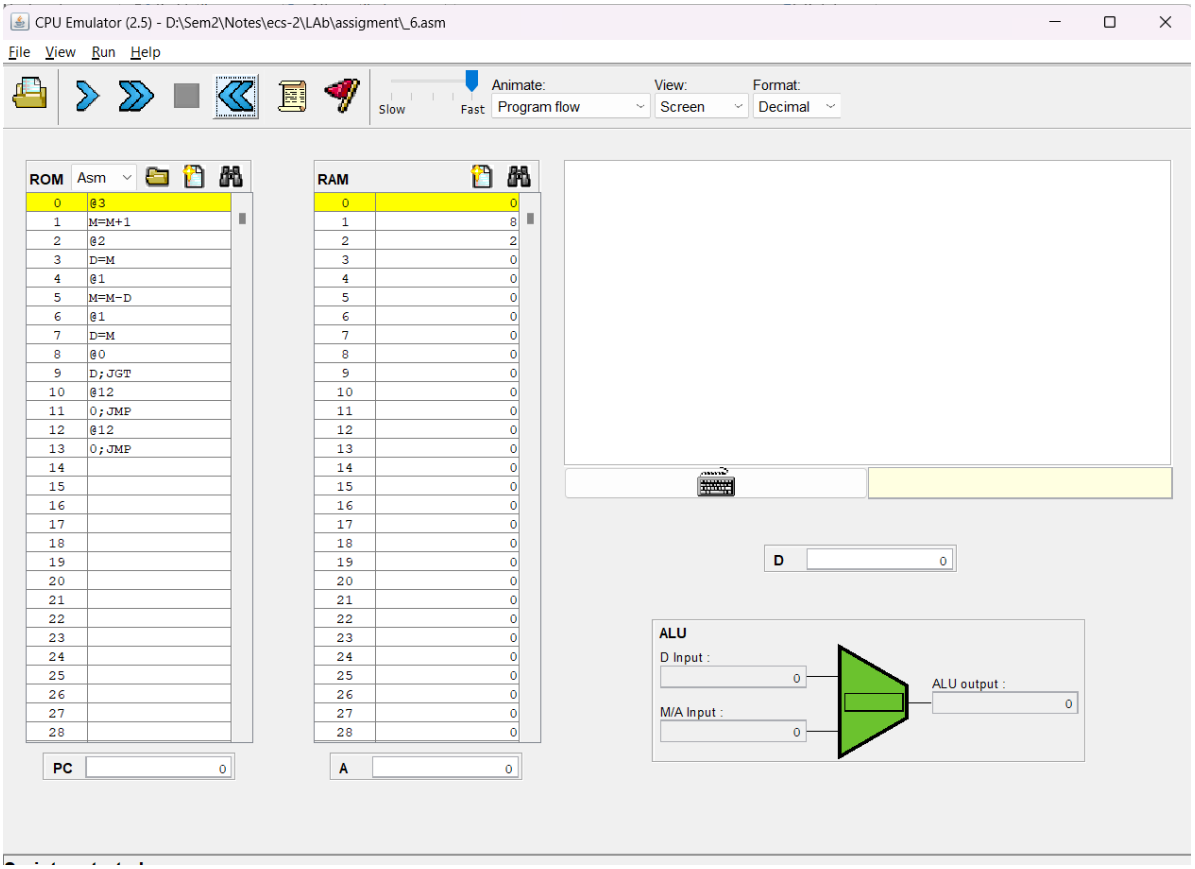
6.Write and execute a hack assembly program to perform division of two operands

CODE

```
// this one to divison of a/b

// input
// @1 ==> a
// @2 ==> b

// output
// @3 == c = a/b
//
//steps
//while(a-b>0)
//c++;
//a = a - b

(LOOP)
    @3
    M = M + 1
    @2
    D = M
    @1
    M = M - D
    @1
    D = M
    @LOOP
    D;JGT
    @END
    0;JMP
(END)
    @END
    0;JMP
```

Screen Shot

INPUT



OUTPUT