Bài tập

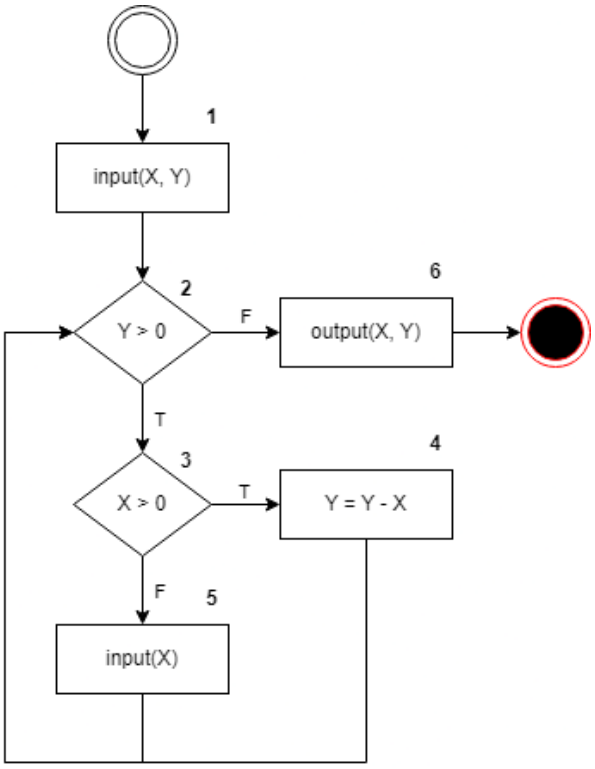
Bài 1:

Quy trình tổng quát của kiểm thử dòng dữ liệu động:

- Vẽ đồ thị luồng điều khiển (CFG)
- Lựa chọn tiêu chí kiểm thử luồng dữ liệu
- Xác định các đường đi trên CFG thoả mãn tiêu chí kiểm thử đã chọn
- Sinh các ca kiểm thử tương ứng

Bài 2:

```
1 input(X, Y)
2 while (Y > 0) {
3     if (X > 0)
4         Y := Y - X
5     else
6         input(X)
7 }
8 output(X, Y)
```



Biến X:

- def(X) = {1, 5}
- c-use(X) = {4, 6}
- p-use(X) = {3}

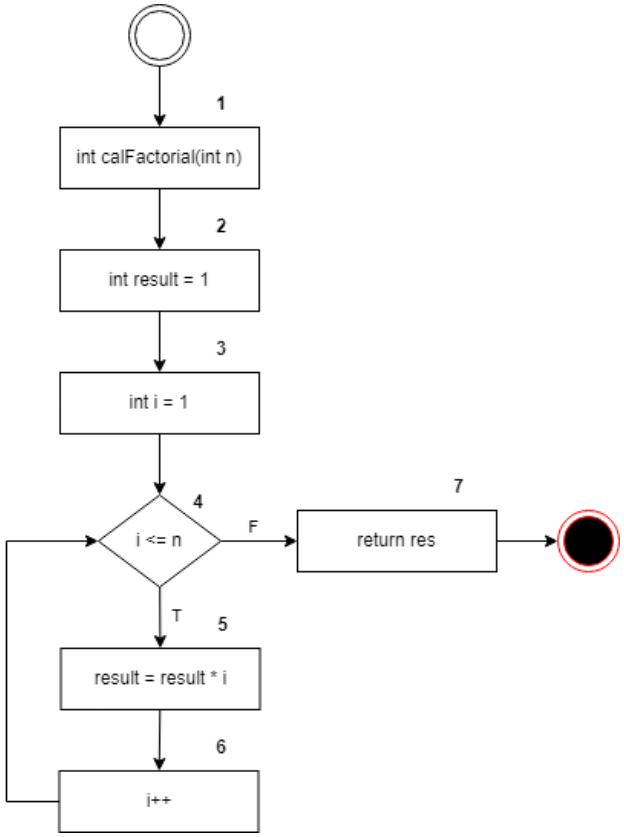
Biến Y:

- def(Y) = {1, 4}
- c-use(Y) = {4, 6}
- p-use(Y) = {2}

Variable	Du-pair	Def-clear path	Complete path	X	Y
X	(1, 3(T))	1, 2(T), 3(T)	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}
	(1, 3(F))	1, 2(T), 3(F)	1, 2(T), 3(F), 5, 2(T), 3(T), 4, 2(F), 6	{0, 1}	{1}
	(1, 4)	1, 2(T), 3(T), 4	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}
	(1, 6)	1, 2(F), 6	1, 2(F), 6	{1}	{0}
	(5, 3(T))	5, 2(T), 3(T)	1, 2(T), 3(F), 5, 2(T), 3(T), 4, 2(F), 6	{0, 1}	{1}
	(5, 3(F))	5, 2(T), 3(F)	1, 2(T), 3(F), 5, 2(T), 3(F), 5, 2(T), 3(T), 4, 2(F), 6	{0, 0, 1}	{1}
	(5, 4)	5, 2(T), 3(T), 4	1, 2(T), 3(F), 5, 2(T), 3(T), 4, 2(F), 6	{0, 1}	{1}
	~~(5, 6)~~	~~5, 2(F), 6~~	~~1, 2(T), 3(F), 5, 2(F), 6~~		
Y	(1, 2(T))	1, 2(T)	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}
	(1, 2(F))	1, 2(F)	1, 2(F), 6	{1}	{0}
	(1, 4)	1, 2(T), 3(T), 4	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}
	(1, 6)	1, 2(F), 6	1, 2(F), 6		{0}
	(4, 2(T))	4, 2(T)	1, 2(T), 3(T), 4, 2(T), 3(T), 4, 2(F), 6	{1}	{2}
	(4, 2(F))	4, 2(F)	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}
	(4, 4)	4, 2(T), 3(T), 4	1, 2(T), 3(T), 4, 2(T), 3(T), 4, 2(F), 6	{1}	{2}
	(4, 6)	4, 2(F), 6	1, 2(T), 3(T), 4, 2(F), 6	{1}	{1}

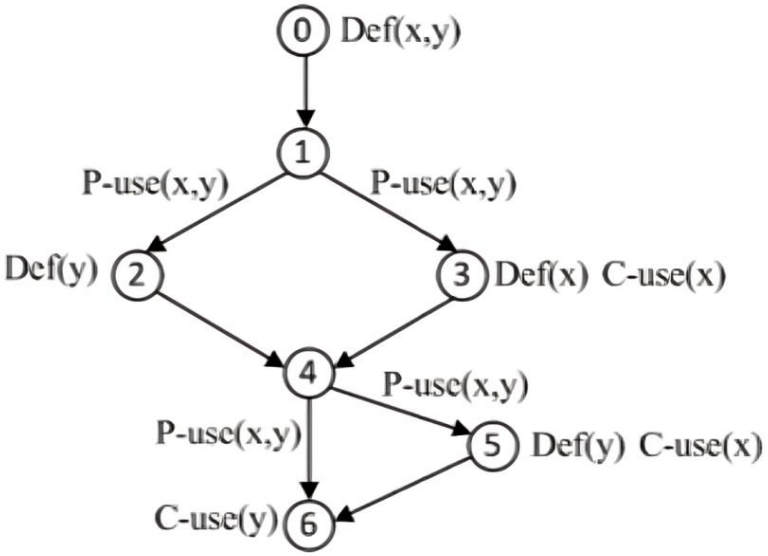
Bài 3:

```
int calFactorial (int n){
    int result = 1;
    int i = 1;
    while (i <= n){
        result = result * i;
        i++;
    } // end while
    return result;
} // the end
```



Variable	def	c-use	p-use
n	int calFactorial(int n)	i <= n	
result	int result = 1		result = result * i
	result = result * i		return result
i	int i = 1	result = result * i	i <= n
	i++	i++	

Bài 4:

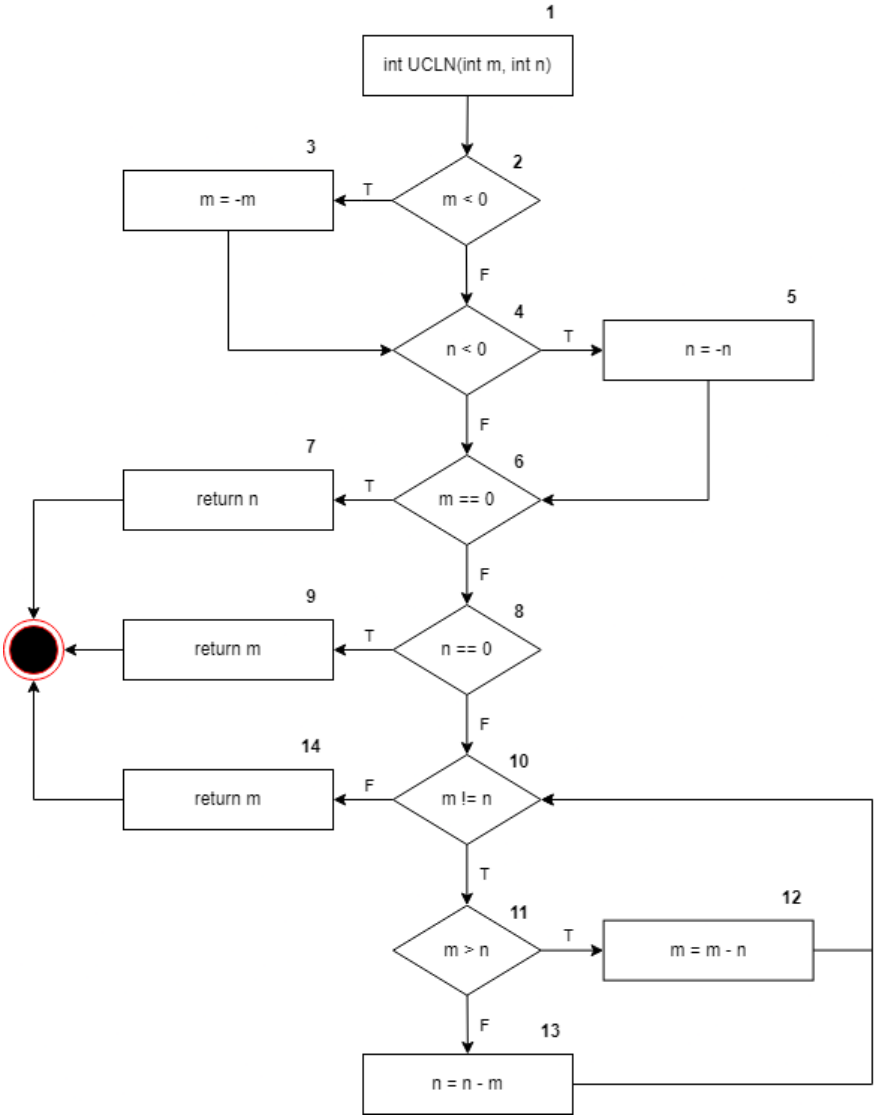


Variable	Def-clear path
X	0
	0, 1
	0, 1, 2
	0, 1, 2, 4
	0, 1, 2, 4, 5
	0, 1, 2, 4, 5, 6
	0, 1, 2, 4, 6
	0, 1, 3
	3
	3, 4
	3, 4, 5
	3, 4, 5, 6

	3, 4, 6
Y	0
	0, 1
	0, 1, 2
	0, 1, 3
	0, 1, 3, 4
	0, 1, 3, 4, 5
	0, 1, 3, 4, 6
	2
	2, 4
	2, 4, 5
	2, 4, 6
	5
	5, 6

Bài 5:

1. CFG cho hàm UCLN (C2)



2. Đường đi và các ca kiểm thử với độ đo C2

P: 1, 2(T), 3, 4(T), 5, 6(F), 8(F), 10(T), 11(T), 12, 10(T), 11(F), 13, 10(F), 14

T: m = -3, n = -2

P: 1, 2(F), 4(F), 6(T), 7

T: m = 0, n = 0

P: 1, 2(F), 4(F), 6(F), 8(T), 9

T: m = 2, n = 0

3. Đường đi và các ca kiểm thử với độ đo all-def coverage

Biến m: def(m) = {1, 3, 12}, c-use(m) = {3, 9, 12, 13, 14}, p-use(m) = {2, 6, 10, 11}

Biến n: def(n) = {1, 5, 13}, c-use(n) = {5, 7, 12, 13}, p-use(n) = {4, 8, 10, 11}

Variable	Du-pair	Def-clear path	Complete path	m	n
m	(1, 3)	1, 2(T), 3	1, 2(T), 3, 4(F), 6(F), 8(T), 9	-2	0
	(3, 6(F))	3, 4(F), 6(F)	1, 2(T), 3, 4(F), 6(F), 8(T), 9	-4	0
	(12, 10(F))	12, 10(F)	1, 2(F), 4(F), 6(F), 8(F), 10(T), 11(T), 12, 10(F), 14	4	2
n	(1, 5)	1, 2(F), 4(T), 5	1, 2(F), 4(T), 5, 6(T), 7	0	-1
	(5, 7)	5, 6(T), 7	1, 2(F), 4(T), 5, 6(T), 7	0	-3
	(13, 10(F))	13, 10(F)	1, 2(F), 4(F), 6(F), 8(F), 10(T), 11(F), 13, 10(F), 14	3	6