**MIS 6308**

**Fall 2017**

**Assignment 4**

1. Consider the following program. (10 points)

Precondition: x is a non-negative integer and y is an integer.

(1) Read x,y

(2) Do case

(3) Case y = 0

(4) {Result = 1

(5) Print Result}

(6) Case y > 0

(7) {counter = 1

(8) Do while (counter <= y)

(9) Result = Result\*x

(10) counter = counter + 1

(11) End Do

(12) Print Result}

(13) Case y < 0

(14) {counter = 1

(15) Repeat

(16) Result = Result\*x

(17) counter = counter + 1

(18) Until (counter > -y)

(19) Result = 1/Result

(20) Print Result}

(21) End

1. Draw the program graph for the above program.

Read x, y

Do Case

y<0

y=0

y>0

Counter = 1

Counter = 1

Result = 1

Do while (counter<=y)

Repeat

Print Result

Result = Result\*x

Result = Result\*x

Counter = Counter+1

Counter = Counter+1

Until (counter>=-y)

End Do

Result = 1/Result

Print Result

Print Result

End

1. What test data will you use to test the above program using statement coverage?

|  |  |
| --- | --- |
| Test data | Statements covered |
| x=1, y=0 | 1->2->3->4->5->21 |
| x=1, y=1 | 1->2->6->7->8->9->10->8->11->12->21 |
| x=1, y=-1 | 1->2->13->14->15->16->17->18->19->20->21 |

1. What test data will you use to test the above program using branch coverage?

|  |  |
| --- | --- |
| Test data | Branch covered |
| x=1, y=0 | 1->2->3->4->5->21 |
| x=1, y=1 | 1->2->6->7->8->9->10->8->11->12->21 |
| x=1, y=-2 | 1->2->13->14->15->16->17->18->19->20->21 |

1. What test data will you use to test the above program using path coverage?

|  |  |
| --- | --- |
| Test data | Branch covered |
| x=1, y=0 | 1->2->3->4->5->21 |
| x=1, y=1 | 1->2->6->7->(8->9->10->8)1->11->12->21 |
| x=1, y=2 | 1->2->6->7->(8->9->10->8)2->11->12->21 |
| x=1, y=-1 | 1->2->13->14->(15->16->17->18)2->19->20->21 |
| x=1, y=-2 | 1->2->13->14->(15->16->17->18)1->19->20->21 |

The number of loops will keep changing as the value of y changes. Thus, if y increases to infinity, the loop will continue to run infinite number of times. So, we cannot cover all possible paths.

2. Consider the following project.

Activity Duration (weeks) Precedence Relationship

1 2 -

2 1 -

3 3 1

4 2 2, 3

5 3 4

6 3 4

7 1 5, 6

8 2 5

9 1 6

10 1 7, 8

11 2 9, 10

1. Draw the project network.

ET = 2 TE = 10 TL = 10

ET = 3 TE = 5 TL = 5

ET = 2 TE = 12 TL = 12

ET = 2 TE = 2 TL = 2

ET = 1 TE = 13 TL = 13

ET = 1 TE = 11 TL = 12

ET = 2 TE = 7 TL = 7

ET = 2 TE = 15 TL = 15

ET = 3 TE = 10 TL = 10

ET = 1 TE = 11 TL = 13

ET = 1 TE = 1 TL = 5

1. Determine the slack for each activity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Activity | Duration | TE | TL | Slack (TL-TE) |
| 1 | 2 | 2 | 2 | 0 |
| 2 | 1 | 1 | 5 | 4 |
| 3 | 3 | 5 | 5 | 0 |
| 4 | 2 | 7 | 7 | 0 |
| 5 | 3 | 10 | 10 | 0 |
| 6 | 3 | 10 | 10 | 0 |
| 7 | 1 | 11 | 12 | 1 |
| 8 | 2 | 12 | 12 | 0 |
| 9 | 1 | 11 | 13 | 2 |
| 10 | 1 | 13 | 13 | 0 |
| 11 | 2 | 15 | 15 | 0 |

1. Identify the critical activities.

Activities with Slack=0 are critical activities.

Thus, Critical Activities are 1, 3, 4, 5, 8, 10 and 11

1. What is the least number of weeks required to complete the project?

15 weeks