Reem Ezeddin
IT814 - Fall 2022
Mini project#2-a

White Box Testing

NextDate Program

Project#2-a

11/21/2022

NextDate program is a function that finds the next date for a given date.

This program classifies the months into 3 classes:

> Class #1: Months have 31 days {"January", "March", "May", "July", "August", "October", "December"}.
>
> Class #2: Months have 30 days {"April", "June", "September", "November"}.
>
> Class #3: {"February"}.

It takes a date in format of “MM, DD, YYYY”, and returned output will be one of the following scenarios:

First: the regular incremented date. That happened in any of the following input types:

1- Months class #1, 1 < Day < 30, Any year.
2- Months class #2, 1 < Day < 29, Any year.
3- Months class #3, 1 < Day < 27, Not leap year.
4- Months class #3, Day = 28, Leap year.

Second: Month incremented and the day reassigned to 1. That happened in any of the following input types:

1- Months class #1, Day = 31, Any year.
2- Months class #2, Day = 30, Any year.
3- Months class #3, Day = 28, Not leap year.
4- Months class #3, Day = 29, Leap year.

Third: Month reassigned to January, Day re assigned to 1, and the year incremented by 1. That happened if the interred date was December, 31, Any year.

Fourth: Any other input should return “Impossible”.

In this document, the white box testing will be applied with test cases generated to cover all independent basis paths.

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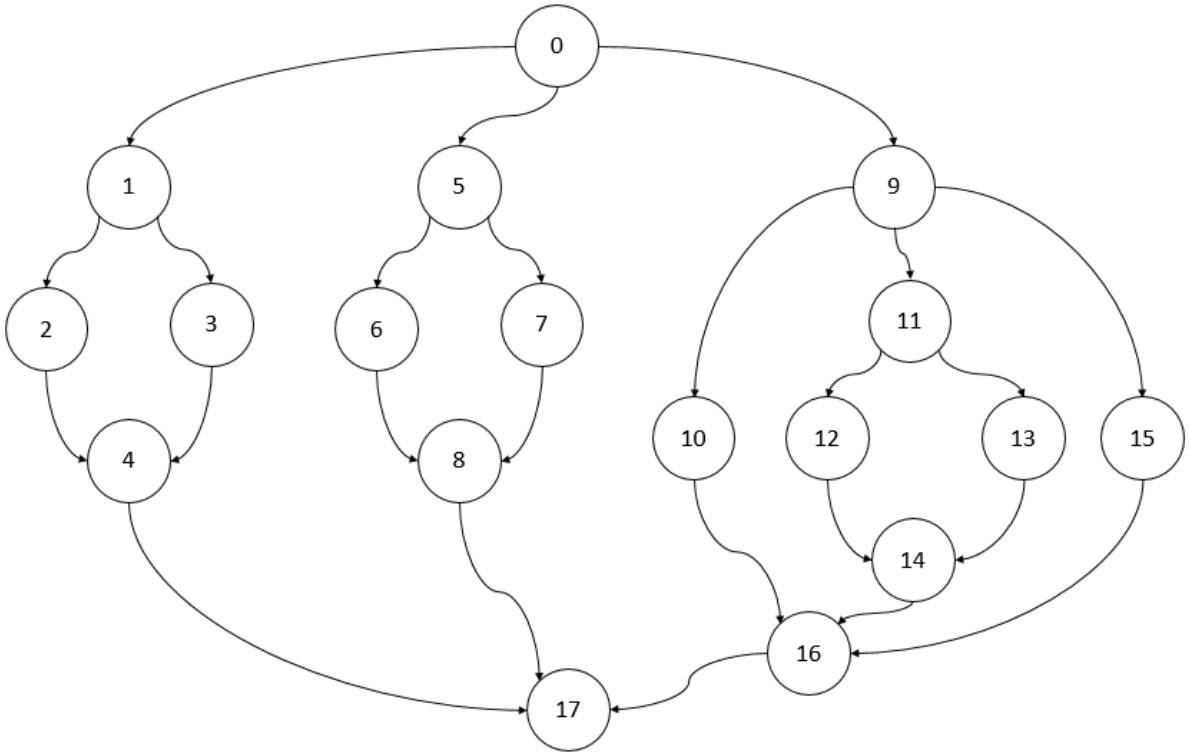
Control Flow Graph:



Number of Independent Paths:

Number of edges – Number of nodes +2 =24 -18 + 2 = 8

Paths are:

1. 0-1-2-4 -17
2. 0-1-3-4 -17
3. 0-5-6-8 -17
4. 0-5-7-8 -17
5. 0-9-10-16-17
6. 0-9-11-12-14-16-17
7. 0-9-11-13-14-16-17
8. 0-9-15-16-17

Test Cases:

The test case number refers to the path number.

Months were classified into 3 classes:

Class #1: Months have 31 days {"January", "March", "May", "July", "August", "October", "December"}.

Class #2: Months have 30 days {"April", "June", "September", "November"}.

Class #3: {"February"}.

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TC #	Test case information	Test case data	
		Input	Expected Output
1	Months class #1, Day < 31, Any year	March,25,1995	March,26,1995
2	Months class #1, Day >= 31, Any year	December,31,2000	January,01,2001
3	Months class #2, Day <31, Any year	June,19,2015	June,20,2015
4	Months class #2, Dar >= 30, Any year	April,31,1995	Invalid
5	Months class #3, Day < 28, Any year	February,05,2021	February,06,2021
6	Months class #3, Day = 28, Any leap year	February,28,2000	February,29,2000
7	Months class #3, Day = 28, Not leap year	February,28,2001	March,01,2001
8	Months class #3, Day > 28, Any year	February,29,1995	Impossible

Test cases execution:

Summary:

Program name: WhiteBox.exe

Number of test cases: 8.

Failure: 4.

Success: 4.

Failure ratio: 50%.

Success ratio: 50%.

Time to generate test cases: 90 minutes.

Time to execute the test cases: 30 minutes.

Time to analyze the results: 4hr.

TC #	Input	Expected Output	Actual Output	Result
1	March,25,1995	March,26,1995	March,26,1995	Pass
2	December,31,2000	January,01,2001	January,01,2000	Fail
3	June,19,2015	June,20,2015	June,20,2015	Pass
4	April,31,1995	Invalid	May,01,1995	Fail
5	February,05,2021	February,06,2021	February,06,2021	Pass
6	February,28,2000	February,29,2000	March,01,2000	Fail
7	February,28,2001	March,01,2001	March,01,2001	Pass
8	February,29,1995	Invalid	March,01,1995	Fail

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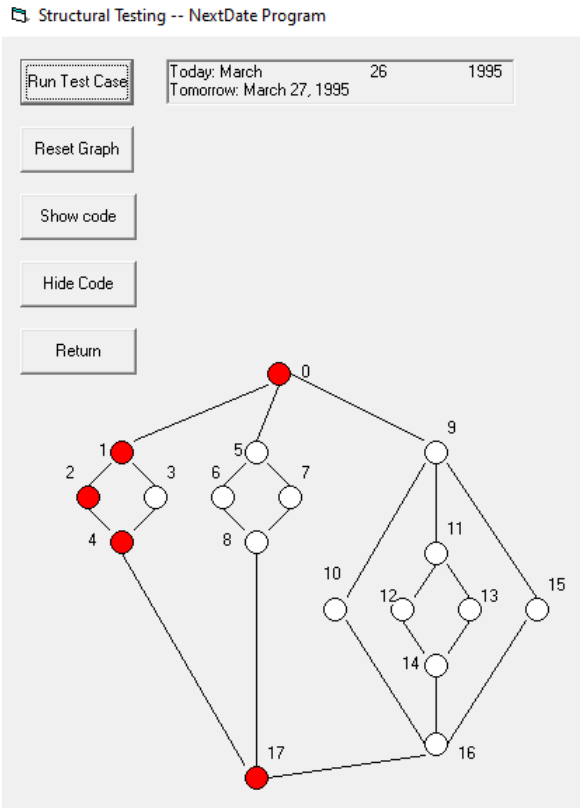
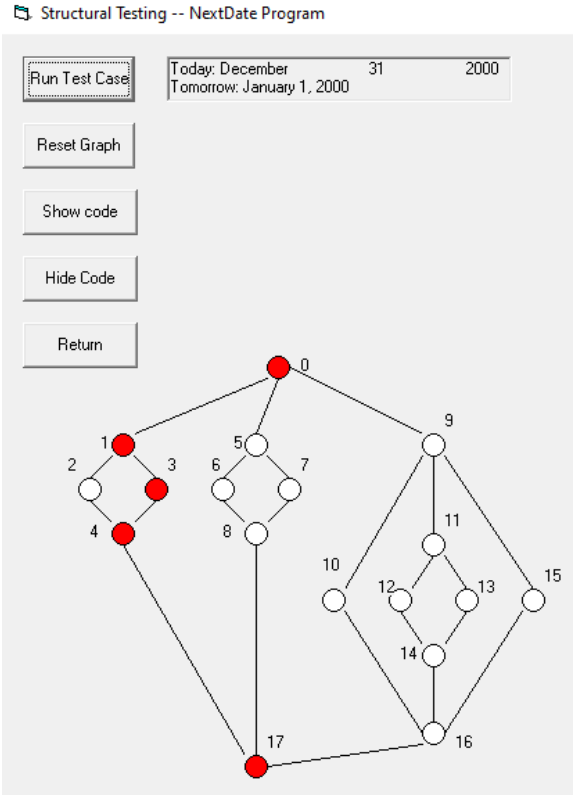
Screenshots:



1: TC#1



2: TC #2

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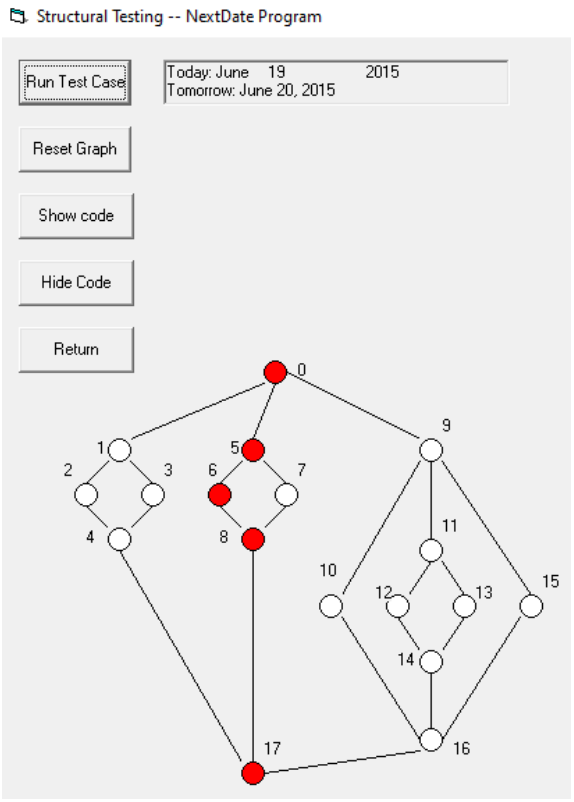
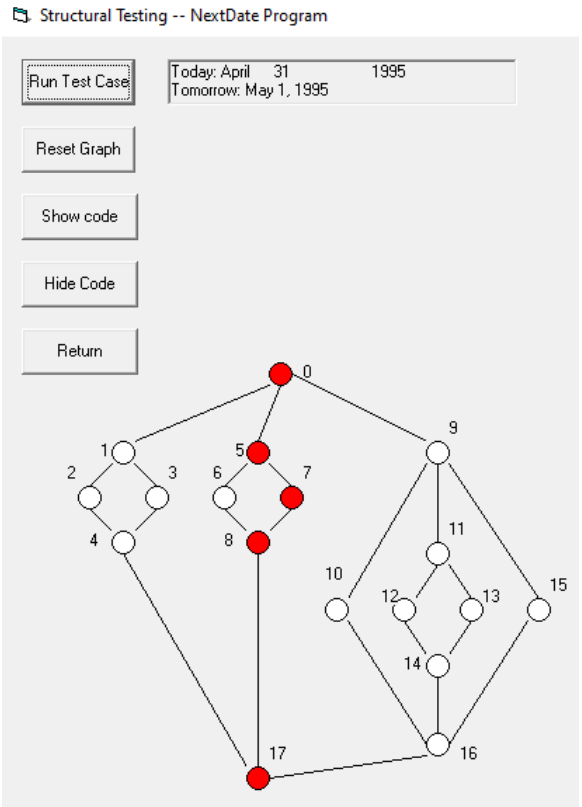


3: TC #3



4: TC #4

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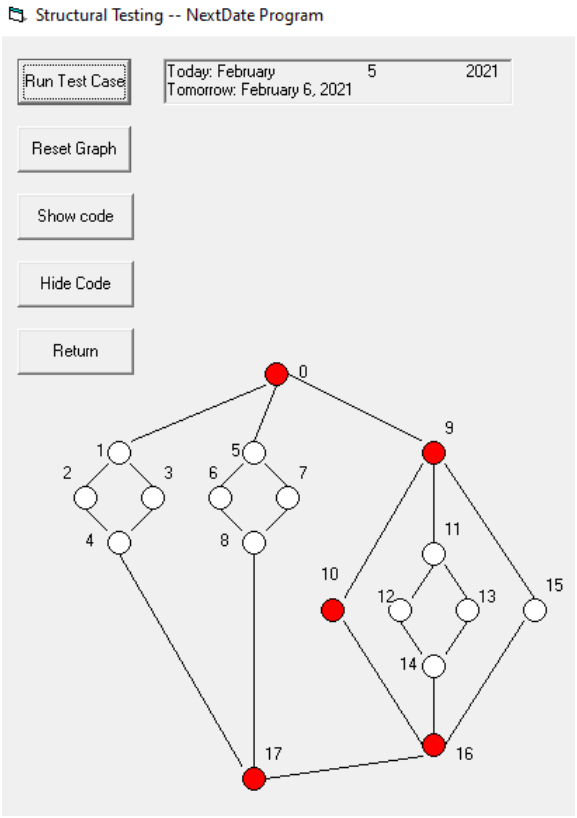
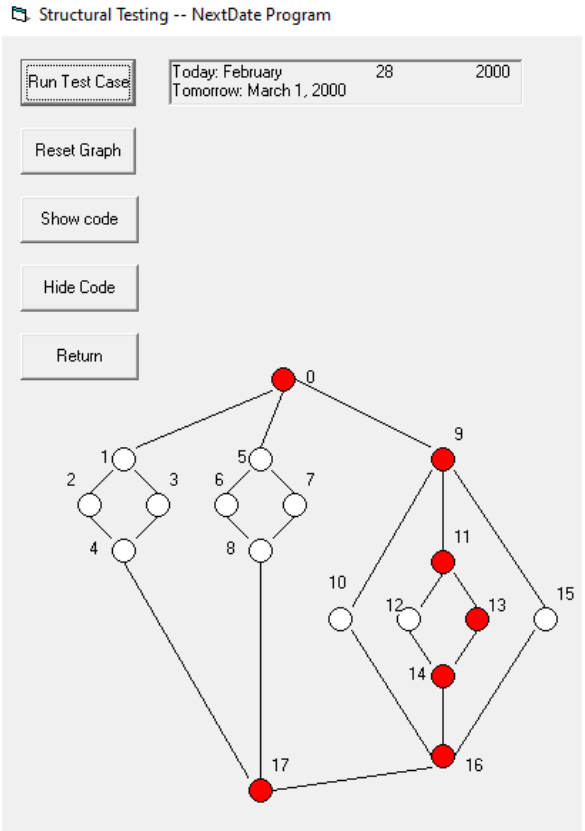


5: TC #5



6: TC #6

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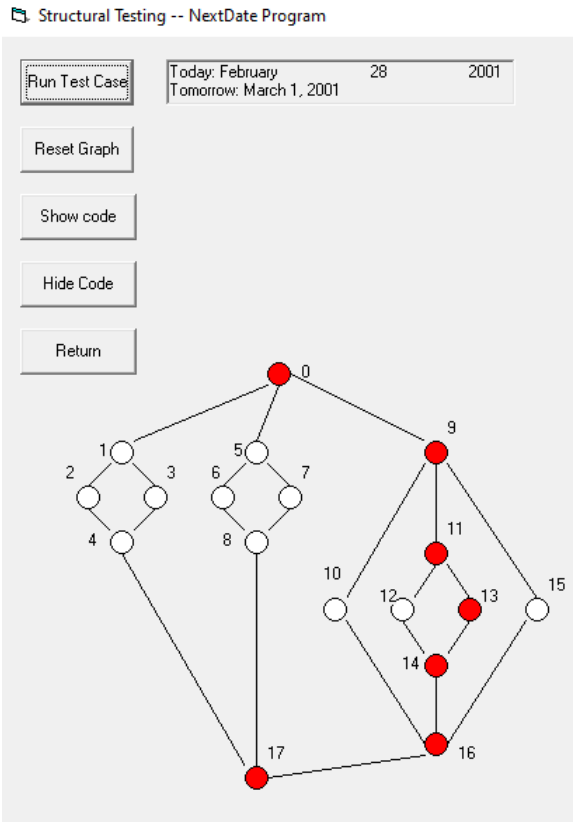
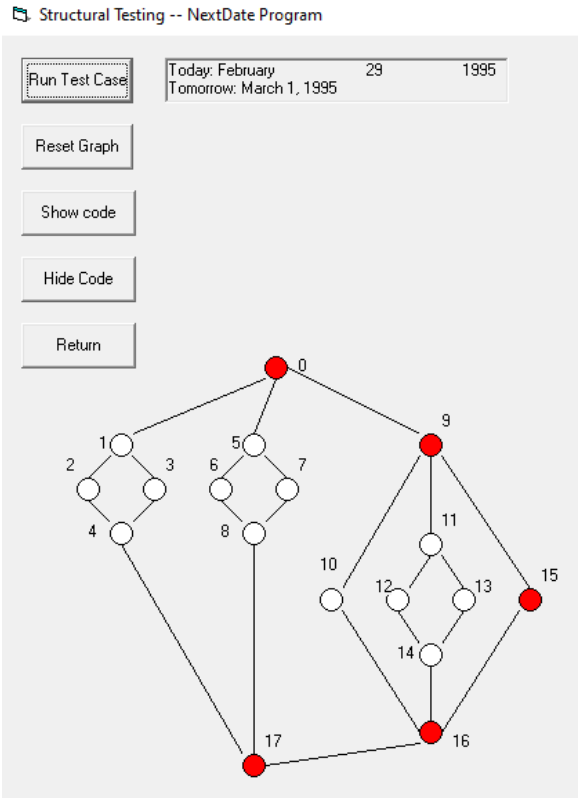


7: TC #7



8 : TC #8

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Analysis:

Success full paths are:

- 0-1-2-4-17: where the input was months' class #1, Day < 31, any year "March 25, 1995".
- 0-5-6-8-17: where the input was months' class #2, Day <31, any year "June 19, 2015".
- 0-9-10-16-17: where the input was months' class #3, Day < 28, any year "February 05, 2001".
- 0-9-11-013-14-16-17: where the input months' class #3, Day = 28, not leap year "February 28, 2001".

Failure full paths are:

- 0-1-3-4-17: where the input was months' class #1, Day >= 31, any year "December,31,2000", and the output was "January,01,2000".
  We can see that the month and day have been incremented correctly. But in case of December 31, we need to focus also on incrementing the year. This can be handled in a special condition.
- 0-5-7-8-17: where the input was months' class #2, Day >= 30, Any year "April,31,1995" and the output was "May,01,1995".
  The case of having a day > 30 in months in class #2 is not handled well. We need to fix the condition by adding a nested if condition to show that it is invalid to have day >= 31.
- 0-9-11-12-14-16-17: where the input was months' class #3, Day = 28, Any leap year "February,28,2000", and the output was "March,01,2000".
  We can see that the leap your processing branch is not accessible properly. By checking the code, we can notice that the condition of the leap year is not correct. We can fix it by changing the "<>" by "==" in "((InYear Mod 4) = 0) And ((InYear Mod 400) <> 0)".
  In this case, we can also realize that other test cases that cover path #7 "0-9-11-13-14-16-17" like (February, 28, 1700) will fail if this bug has not been fixed.
- 0-9-15-16-17: where the input was months' class #3, Day > 28, any year "February,29,1995" and the output was "March,01,1995".
  Day 29 in the case of February is not at all addressed. If the day is 29, the month is February, and the year is a leap year or not, there needs to be more logic to show that this input is impossible.