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### Lab 3:-

Q Next date is a function of three variables month date and year it returns the date of the day after the input date. The month, date and year variables have integer values, subject to the following conditions.

$$C_1 : 1 \leq \text{month} \leq 12$$

$$C_2 : 1 \leq \text{day} \leq 31$$

$$C_3 : 1900 \leq \text{year} \leq 2013$$

Derive testcase by equivalence class testing and derive the decision table.

Sol.

Pre-condition :- Month 1 to 12, DAY 1 TO 31 AND YEAR 1812 to 2013

#### Valid Cases

$$M_1 = \{ \text{month} : 1 \leq \text{month} \leq 12 \}$$

$$D_1 = \{ \text{day} : 1 \leq \text{day} \leq 31 \}$$

$$Y_1 = \{ \text{year} : 1812 \leq \text{year} \leq 2013 \}$$

#### Invalid Cases

$$M_2 = \{ \text{month} : \text{month} < 1 \}$$

$$M_3 = \{ \text{month} : \text{month} > 12 \}$$

$$D_2 = \{ \text{day} : \text{day} < 1 \}$$

$$D_3 = \{ \text{day} : \text{day} > 31 \}$$

$$Y_2 = \{ \text{year} : \text{year} < 1812 \}$$

$$Y_3 = \{ \text{year} : \text{year} > 2013 \}$$

Test Case Id	Summary	Pre-condition	Post-Condition	Input	Execution of	Actual v/p	Status
Tc-1 (Normal)	Enter the $M_1$ , $D_1$ , and $Y_1$ valid cases	-	-	$M_1 = 6$ , $D_1 = 15$ , $Y_1 = 1912$	Determine Date of next day	Input $M_2$ , $D_1$ , and $Y_1$ next day	Input $M_2$ , Date of next day
Tc-2	-	-	-	-	-	-	-
Tc-3	Enter $M_2$ , $D_1$ , and $Y_1$ cases	-	-	$M_2 = 6$ , $D_1 = 15$ , $Y_1 = 1912$	Determine date of next date	Input $M_2$ , Date of next day	Input $M_2$ , Date of next day
Tc-4	Enter $M_3$ , $D_1$ , and $Y_1$ cases	-	-	$M_3 = 13$ , $D_1 = 15$ , $Y_1 = 1912$	Determine date of next day	Input $M_2$ , $D_1$ , and $Y_1$ next day	Input $M_2$ , Date of next day
Tc-5	Enter The $M_1$ , $D_2$ , $Y_1$ cases	-	-	$M_1 = 6$ , $D_2 = -1$ , $Y_1 = 1912$	Month not in range	Display error message	Display error message
					Day not in range	Display error message	Display error message

Enters the  $H_1$ , - Day not  
in range  
 $D_3 = 32$ ,  
 $\gamma_1 = 1912$   
cases

Enters the  $H_1$ , - Yes not  
 $D_1 = 15$ ,  
 $\gamma_2 = 1611$   
cases

Input  $H_1$ ,  
Display  
error  
 $D_1$  and  $\gamma_2$   
Message

Enter the  $H_1$ , - Yes not  
in range  
 $\gamma_3 = 2014$

Input  $H_1$ ,  
Display  
error  
 $D_1$  and  $\gamma_3$   
Message

TC-9  
Enters  $H_2$ ,  $D_1$  - Month  
and  $\gamma_1$  cases  
not in  
range  
 $\gamma_1 = 1912$

Input  $H_2$ ,  
Display  
error  
 $D_1$  and  $\gamma_1$   
Message

TC-10  
Enters  $H_1$ ,  $D_1$  - Day not  
in range  
and  $\gamma_1$  cases  
 $\gamma_1 = 1912$

Input  $H_1$ ,  
Display  
error  
 $D_1$  and  $\gamma_1$   
Message

Input  $H_1$ ,  
Display  
error  
 $D_2$  and  $\gamma_1$   
Message

$H_1 = 6$ ,  
 $D_3 = 32$ ,  
 $\gamma_1 = 1912$

TC-11

Enter  $M_2$ ,  $D_1$   
and  $Y_2$  cases

Input  $M_1$ ,  
Display error  
Message

$M_1 = 6$ ,  
 $D_1 = 15$ ,  
 $Y_1 = 1811$

TC-12

Enter  $M_2$ ,  $D_2$   
 $Y_1$  cases

Month, day  
not in range  
 $Y_1 = 1912$

Input  $M_2$ ,  
 $D_2$  and  $Y_1$

Display error  
Message

TC-13

Enter  $M_2$ ,  
 $D_2$  and  $Y_2$   
cases

Month, day  
not in  
range  
 $M_2 = -1$ ,  
 $D_2 = -1$ ,  
 $Y_2 = 1811$

Input  $M_2$ ,  
 $D_2$  and  $Y_2$   
cases

Display error  
Message

TC-14

Enter  $M_2$ ,  
 $D_1$  and  $Y_1$   
cases

Month, year  
not in range  
 $M_2 = -1$ ,  
 $D_1 = 15$ ,  
 $Y_1 = 1811$

Input  $M_2$ ,  
 $D_1$  and  $Y_1$

Display error  
Message

TC-15

Enter  $M_2$ ,  
 $D_2$  and  $Y_2$   
cases

Month, day  
and year not  
in range  
 $M_2 = -1$ ,  
 $D_2 = -1$ ,  
 $Y_2 = 1811$

Input  $M_2$ ,  
 $D_2$ ,  $Y_2$   
Message

## Terminologies:-

$M_1 = \text{month} : 1..12 | \text{days/month} = 30 \}$

$M_2 = \text{month} : 1..12 | \text{days} = 31 \wedge \text{month} \neq 12 \}$

$M_3 = \text{month} : \{ 12 \}$

$M_4 = \text{month} : \{ 2 \}$

$D_1 = \text{day} : 1..27 \}$

$D_2 = \text{day} : \{ 28 \}$

$D_3 = \text{day} : \{ 29 \}$

$D_4 = \text{day} : \{ 30 \}$

$D_5 = \text{day} : \{ 31 \}$

$\gamma_1 = \text{year} : 1812..2012 | \text{leap-year(year)} \}$

$\gamma_2 = \text{year} : 1812..2012 | \text{common-year(year)} \}$

Decision Table :-

	11	12	13	14	15	16	17	18	19	20	21	22
C1 : month in.	M <sub>3</sub>	M <sub>4</sub>										
C2 : day in	D <sub>2</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>
C3 : year in	-	-	-	-	-	-	-	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>1</sub>	-	-
A <sub>1</sub> : Impossible										X	X	X
A <sub>2</sub> : Insert day	X	X	X	X	X	X	X					
A <sub>3</sub> : Rest day					X							
A <sub>4</sub> : Increment month						X	X					
A <sub>5</sub> : Rest month					X							
A <sub>6</sub> : Increment year					X							

Lab:-2

The commission problem includes a sales person. The sales person sold rifle locks, stocks and barrels made by a gunsmith, cost of locks is \$5, stocks is \$30 and barrels is \$25. The sales person had to sell at least one complete rifle per month and the production limits were such that the most the sales person could sell in a month was 70 locks, 80 stocks, 90 barrels. After each town visit, the sales person sent a telegram to the gunsmith with the no. of locks, stocks and barrels sold in each town. At the end of the month, the sales person sent a very short telegram, showing 1 lock sold. When the gunsmith got this message, he knew that the sales for the month's were complete and compute the salesperson's commission. It is as follows:-

$$\text{On sales upto (and including) } \$1000 = 10\%$$

$$\text{On sales upto (and including) } \$1800 - 15\%$$

$$\text{On sales in excess of } \$1300 = 20\%$$

From that the constraints, extract test cases using boundary value analysis

Summary	Dependency	The Condition	Post-Condition	Input	Execution Step	Expected Output	Actual Output	Status
TC-1 Locks sold are at boundary, stocks and barrels are valid	-	-	Commission amount	$L=1$ $S=79$ $B=89$	Input the no. of locks sold	708		
TC-2 Stocks sold are at boundary, locks and barrels are valid	-	-	Commission amount	$L=2$ $S=1$ $B=2$	Input the no. of locks, stocks, barrels sold	63		
TC-3 Barrels are at boundary, locks and stocks are valid	-	-	Commission amount	$L=2$ $S=2$ $B=1$	Input the no. of locks, stocks and barrels	152.5		
(SN) TC-4 Lock is at boundary, stock is at boundary, barrels are valid	-	-	Commission amount	$L=1$ $S=1$ $B=2$	Input the no. of locks, stocks and barrels.	57.5		
TC-5 Lock is at boundary, stock is valid and barrels are at boundary	-	-	Commission amount	$L=1$ $S=2$ $B=1$	Input the no. of locks, stocks and barrels	67		

95.5

Input the  
 $L = 2$   
 no. of locks,  
 $S = 1$   
 stocks and  
 $B = 1$   
 barrels sold

TC - 6  
 locks is valid  
 stocks and  
 barrels are at  
 boundary

TC - 7  
 locks is at  
 boundary stock  
 is at boundary  
 and barrel is  
 at boundary

(w/R)  
 TC - 8  
 locks are  
 invalid, stocks  
 and barrels  
 are valid

TC - 9

locks is valid  
 stocks and  
 barrels are at  
 boundary

(w/R)

Commission  
 amount  
 $L = 1$   
 $S = 1$   
 $B = 1$

locks is at  
 boundary stock  
 is at boundary  
 and barrel is  
 at boundary

(w/R)

TC - 8

locks are  
 invalid, stocks  
 and barrels  
 are valid

Commission  
 amount  
 $L = 0$   
 $S = 1$   
 $B = 2$

locks are  
 invalid, stocks  
 and barrels  
 are valid

Commission  
 amount  
 $L = 0$   
 $S = 0$   
 $B = 2$

TC - 9

locks are  
 invalid, stocks  
 and barrels  
 are valid

Commission  
 amount  
 $L = 1$   
 $S = 0$   
 $B = 1$

locks are  
 invalid, stocks  
 and barrels  
 are valid

Commission  
 amount  
 $L = 1$   
 $S = 0$   
 $B = 2$

10

Input the  
 no. of locks,  
 stocks and  
 barrels sold

S - 3

Input the  
 no. of locks,  
 stocks and  
 barrels sold

54.5

Input the  
 no. of locks,  
 stocks and  
 barrels.

lock is valid

stock is at

boundary

horse is

invalid

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=2$

Input the

92.5

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

2.5

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

3

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

4.5

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

5

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

6

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

7

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

8

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-11

lock is at

invalid,

stock is

invalid and

boat is at

boundary

TC-12

lock is

invalid, stock

is at boundary

and boat is

invalid

TC-13

lock is

valid, stock

and boat

are invalid

commission

$L=0$

Input the

9

$S=0$  no. of locks,

stocks and

$B=1$  bonds sold.

R)

\$0

TC-14

locks is  
invalid,  
stock is  
invalid and  
barrel is  
invalid

(commission  
amount)

$$I = 0 \\ S = 0 \\ B = 0$$

Input the  
no. of locks,  
stocks and  
barrels sold.

0

Code

Program Commission (Input, Output)

Dim locks, stocks, total as integers

Dim lockPrice, stockPrice, bonusPrice As Real

Dim totalLocks, totalStocks, totalBonuses as integers

Dim locksSales, stockSales, bonusSales As Real

Dim sales, commission : REAL

lockPrice = 95.0

stockPrice = 30.0

bonusPrice = 25.0

totalLocks = 0

totalStocks = 0

totalBonuses = 0

Input (locks)

While NOT (locks=-1) 'Input device was -1 to indicate end of data'

Input (stocks, bonuses)

totalLocks = totalLocks + locks

totalStocks = totalStocks + stocks

Input (locks)

End While

Output (" Locks Sold ", totalLocks)

Output (" Stock Sales ", totalStocks)

Output (" Bonus Sales ", totalBonuses)

locksSales = lockPrice \* totalLocks

stocksSales = stockPrice \* totalStocks

bonusesSales = bonusPrice \* totalBonuses

Output (" Total Sales ", sales)

$\text{Sales} > 1800.0$ ) Then

$\text{commission} = 0.10 * 1000.0$

$\text{commission} = \text{commission} + 0.15 * 800.0$

$\text{commission} = \text{commission} + 0.20 * (\text{Sales} - 1800.0)$

Else if ( $\text{Sales} > 1000.0$ ) Then

$\text{commission} = 0.10 * 1000.0$

$\text{commission} = \text{commission} + 0.15 * (\text{Sales} - 1000.0)$

Else  $\text{commission} = 0.10 * \text{Sales}$

End If

End If  
Output ("Commission is \$", commission)

End Commission

Generate testcases using equivalence class testing technique to calculate standard deduction on standard income. The standard deduction is higher for tax payers who are 65 or older or blind. Use the method given below to calculate tax : The first factor that determines standard deduction is the filing status. The basic standard deduction for various filing states are :

Single Rs 4750

Married, filing a joint return Rs 9500

Married, filing a separate return Rs 7000

If a married couple is filing separate returns and one spouse is not taking standard deduction, the other spouse also is not eligible for standard deduction, if either the filer is 65 yrs or the spouse is 65 yrs or older. An additional Rs 1000 is allowed as standard deduction, if either the filer is blind or the spouse is blind.

(\*)

Equivalence classes ?

$C_1 = \text{Status } \{ \text{Single} \sqcup \text{married} \}$

$C_2 = \text{Age } \{ >= 65 \sqcup < 65 \}$

$C_3 = \text{eye sight } \{ \text{blind} \sqcup \text{not blind} \}$

$C_4 = \text{class } \{ \text{Separate} \sqcup \text{Joint} \}$

<u>Test Case Id</u>	<u>Summary</u>	<u>Dependency</u>	<u>Pre-condition</u>	<u>Post-condition</u>	<u>I/P</u>	<u>Execution Step</u>	<u>expected O/P</u>	<u>status</u>
WN TG - 1	Single is Biling	-	-	Tax value	9000	Enter status, eyesight, class, Age	4250	
TG - 2	Age < 65, single	-	Kidney	Tax value	9000	enter status, eyesight, class, Age	4250	
TG - 3	Blind	TC - 2 Yes	Age < 65 Single	Tax value	9000	Enter status, eyesight, Age	3250	

TC - 4

Separate

return,

married

Tax amount 9000

Input,

age,

weight,

status,

class

WR

TC-S

Status

-

Status is 9000

Input

Error

neither

single nor

-

invalid

age,

weight,

status,

message

married

-

class

TC - 6

Age is

-

Age is

9000

Input

Error

not

valid

age,

weight,

status,

message

class.

TC-7

eyesight is -  
neither blind  
nor not blind

eyesight is  
not valid

class

TC-8  
class is -  
metters separate  
not joint

class is

not valid

Input  
eye,  
message.

status,  
class

SN

TC-9

status is -  
single,  
age is >65

Tax amount

10000 Input

4250

age,  
eyesight,  
status,  
class

9000 Input  
error

age,  
eyesight,  
status,

class

message.

TC-10 Status is - Tax amount 10000 Input 4250  
single,  
person is.  
blind

TC-11 Status is - Tax amount 10000 Input 3000  
married,  
class is  
separate

TC-12 Age is >65 - Tax amount 10000 Input age, 3250  
Filer is  
blind

TC - 13

Age < 65,

Filing a  
separate  
return

-> invalid -

Tax amount

10000

Input age,  
eyesight,  
status,  
class

3000

TC - 14

Filer is  
blind,  
filing a  
joint  
return

-

Status is  
invalid

10000

Input age,  
eyesight,  
status,  
class

Error  
Message

SR

TC - 15

Status is  
neither single,  
nor married

-

Status is  
invalid

10000

Input age,  
eyesight,  
status,  
class

Error  
Message

TC - 16

Age is  
0

-

Age is  
invalid

20000

Input age,  
eyesight,  
status, class

Error  
Message

TC- 17

eye sight is  
neither blind  
nor not  
blind

eyesight is  
invalid

10000

input age,  
eyesight,  
status,  
class

Error  
message.

TC- 18

Class is neither  
separate nor  
joint

Class is  
invalid

10000

input age,  
eyesight,  
status,  
class

Error  
message

TC- 19

Status is  
invalid , age.  
is 0

Status is  
invalid, age  
is invalid

10000

input age,  
eyesight,  
status,  
class

Error  
message

TC- 20

Status is  
invalid ,  
eyesight is  
invalid

Status is  
invalid ,  
eye sight is  
invalid

10000

input age,  
eyesight,  
status,  
class

Error  
message.

TC - 21

Status is invalid,  
class is invalid

Status is invalid, class  
is invalid

10000 Input age, eyesight, status, class

Error message.

TC - 22

Age is 0, eye sight is invalid

Status is invalid, eye sight is invalid

10000 Input age, eyesight, status, class

Error message

TC - 23

Age is 20, class is invalid

Age is invalid, class is invalid

10000 Input age, eyesight, status, class

Error message

TC - 24

eyesight is invalid, class is invalid

eyesight is invalid, class is invalid

10000 Input age, eyesight, status, class

Error message.

TC - 25

Status is

neither single

nor married.

Age is 0,

eyesight is

neither blind

nor not blind

Status is

invalid, age

is invalid,

eyesight is

invalid

10000 input age,

Error

eyesight,

Message

Status,

class

TC - 26

Status is

neither single,

nor married,

Age is 0, class is

neither separate

nor joint

Status is

10000 Input age,

Error

invalid, age

is invalid,

class is

invalid

eyesight,

Message

Status,

class

TC - 27

Age is 0,

eye sight is

neither blind

nor not blind,

class is invalid

Age is invalid,

eyesight is

invalid, class

is invalid

10000 Input age,

Error

eyesight,

Message

Status,

class

TC - 28

Status is

Age is

10000

Output age,

Error

neither single

invalid,

status is

status,

message.

nor married,

invalid,

status,

class

age is 0,

invalid,

class

eyesight is

eyesight is

invalid,

class

neither blind

invalid,

class is

nor not blind,

invalid

class is neither

separate nor  
joint.