Question 1: A program calculates the GCD of three numbers in the range [1, 50]. Design test cases for this program using BVC, robust testing, and worst-case testing methods.

Solution

(a) Test cases using BVC Since there are three variables, A, B, and C, the total number of test cases will be 4n + 1 = 13. The set of boundaries values is shown below.

Min value = 1

Min^+ value = 2

Max value = 50

Max^- value = 49

Nominal value = 25–30

Using these values, test cases can be designed as shown below:

Test Case ID	A	B	C	Expected Output
1	1	25	27	GCD value is 1
2	2	25	28	GCD value is 1
3	49	25	25	GCD value is 1
4	50	25	29	GCD value is 1
5	25	1	30	GCD value is 1
6	25	2	26	GCD value is 1
7	25	49	27	GCD value is 1
8	25	50	28	GCD value is 1
9	25	28	1	GCD value is 1
10	25	27	2	GCD value is 1
11	25	26	49	GCD value is 1
12	25	26	50	GCD value is 1
13	25	25	25	GCD value is 25

b) Test cases using robust testing Since there are three variables, A, B, and C, the total number of test cases will be 6n + 1 = 19.

The set of boundary values is shown below:

Min value = 1

Min value = 0

Min^+ value = 2

Max value = 50

Max^+ value = 51

Max^- value = 49

Nominal value = 25–30

Using these values, test cases can be designed as shown below:

Test Case ID	A	B	C	Expected Output
1	0	25	27	Invalid input
2	1	25	27	GCD value is 1
3	2	25	28	GCD value is 1
4	49	25	25	GCD value is 1
5	50	25	29	GCD value is 1
6	51	27	25	Invalid input
7	25	0	26	Invalid input
8	25	1	30	GCD value is 1
9	25	2	26	GCD value is 1
10	25	49	27	GCD value is 1
11	25	50	28	GCD value is 1
12	26	51	25	Invalid input
13	25	25	0	Invalid input
14	25	28	1	GCD value is 1
15	25	27	2	GCD value is 1
16	25	26	49	GCD value is 1
17	25	26	50	GCD value is 1
18	25	29	51	Invalid input
19	25	25	25	GCD value is 25

(c) Test cases using worst-case testing Since there are three variables, A, B, and C, the total number of test cases will be $5^n = 125$.

The set of boundary values is shown below:

Min value = 1

Min^+ value = 2

Max value = 50

Max^- value = 49

Nominal value = 25–30

There may be more than one variable at extreme values in this case. Therefore, test cases can be design as shown below:

Test Case ID	A	B	C	Expected Output
1	1	1	1	GCD value is 1
2	1	1	2	GCD value is 1
3	1	1	25	GCD value is 1
4	1	1	49	GCD value is 1
5	1	1	50	GCD value is 1
6	1	2	1	GCD value is 1
7	1	2	2	GCD value is 1
8	1	2	25	GCD value is 1
9	1	2	49	GCD value is 1
10	1	2	50	GCD value is 1
----------	----	----	-----	----------
----------	----	----	-----	----------

Questions 2: A program takes as input a string (5–20 characters) and a single character and checks whether that single character is present in the string or not. Design test cases for this program using BVC, robust testing, and worst-case testing methods.

Solution

(a) Test cases using BVC Since there is one string variable, the total number of test cases will be 4n + 1 = 5.

the set of minimum and maximum values is shown for 1 variable below:

Min value = 5 character

Min^{+} value = 6 character

Max value = 20 character

Max^{-} value = 19 character

Nominal value = 12 character

Using these values, test cases can be designed as shown below:

Test Case ID	Input String	String length	Input Alphabet	Expected Output
1	rahat	5	a	Gotcha!! Input alphabet is present the input string
2	heyguy	6	c	Ops !! Input alphabet is not present the input string
3	howareyouhowareyouri	20	y	Gotcha!! Input alphabet is present the input string
4	howareyouhowareyour	19	z	Ops !! Input alphabet is not present the input string
5	hellohihello	12	k	Ops !! Input alphabet is not present the input string

(b) Test cases using robust testing Since there is one string variable, the total number of test cases will be 6n + 1 = 7. The set of boundary values is shown below:

Min value = 5 character

Min^{-} value = 4 character

Min^{+} value = 6 character

Max value = 20 character

Max^{-} value = 19 character

Max^{+} value = 21 character

Nominal value = 12 character

Using these values, test cases can be designed as shown below:

Test Case ID	Input String	String length	Input Alphabet	Expected Output
1	rahat	5	a	Gotcha!! Input alphabet is present the input string
2	heyguy	6	c	Ops !! Input alphabet is not present the input string
3	howareyouhowareyouri	20	y	Gotcha!! Input alphabet is present the input string
4	howareyouhowareyour	19	z	Ops !! Input alphabet is not present the input string
5	hellohihello	12	k	Ops !! Input alphabet is not present the input string
6	hell	4	j	Invalid Input
7	howareyouhowareyourio	21	j	Invalid Input

(c) Test cases using worst-case testing Since there is one string variable, the total number of test cases will be $5^n = 5$. Therefore, the number of test cases will be same as BVC.

Question 3: A program reads the data of employees in a company by taking the following inputs and prints them:

Name of Employee (Max. 15 valid characters A–Z, a–z, space)

Employee ID (10 characters)

Designation (up to 20 characters)

Design test cases for this program using BVC, robust testing, and worst-case testing methods.

Solution:

(a) Test cases using BVC Since there are three variables, name, employee ID, and designation, the total number of test cases will be 4n + 1 = 13. The set of boundaries values is shown below.

For name variable

Min value = 1 character

Min^+ value = 2 character

Max value = 15 character

Max^- value = 14 character

Nominal value = 7 character

For employee ID

Min value = 10 character

Min^+ value = 11 character

Max value = 10 character

Max^- value = 9 character

Nominal value = 10 character

For Designation

Min value = 1 character

Min^{+} value = 2 character

Max value = 20 character

Max^{-} value = 19 character

Nominal value = 10 character

Using these values, test cases can be designed as shown below:

Test Case ID	Input Employee Name	Length (Name)	Input Employee ID	Length (ID)	Input Employee Designation	Length (Designation)	Expected Output
1	K	1	Id12345678	10	qwerngtmyu	10	Print details
2	Ra	2	Id34567234	10	pqerlkmtrt	10	Print details
3	abababababababa	15	Id12345678	10	asbfntmymr	10	Print details
4	abababababbab	14	Id56712345	10	ashbfnrklosjf	11	Print details
5	rahataz	7	Id12089867	10	abdnrheytsklplo	14	Print details
6	absdhfr	7	Id236759098	11	mnvfhytr	8	Invalid Input
7	adfghjhu	8	Id09786954	10	okiuytgrgb	10	Print details
8	asdfgbh	7	Id0978940	9	aslpoiuytr	10	Invalid Input
9	asdfghjqw	9	Id12345678	10	A	1	Print details
10	asdcvbh	7	Id12345678	10	Aa	2	Print details
11	rrttyhj	7	Id12345678	10	amnbhyjklopouythgbt	20	Print details
12	rtyuiop	7	Id12345678	10	dfgbhyjikmnokoiuyt	19	Print details
13	qwertyu	7	Id12345678	10	asbnmjkoiu	10	Print details

(b) **Test cases using BVC** Since there are three variables, name, employee ID, and designation, the total number of test cases will be 6n + 1 = 19.

The set of boundary values is shown below:

For name

Min value = 1 character

Min^{-} value = 0 or null character

Min^{+} value = 2 character

Max value = 15 character

Max^{+} value = 16 character

Max^{-} value = 14 character

Nominal value = 7 character

For employee ID

Min value = 10 character

Min^{-} value = 9 or null character

Min^{+} value = 11 character

Max value = 10 character

Max^{+} value = 11 character

Max^{-} value = 9 character

Nominal value = 10 character

For Designation

Min value = 1 character

Min^{-} value = 0 or null character

Min^{+} value = 2 character

Max value = 20 character

Max^{+} value = 21 character

Max^{-} value = 19 character

Nominal value = 10 character

Using these values, test cases can be designed as shown below:

Test Case ID	Input Employee Name	Length (Name)	Input Employee ID	Length (ID)	Input Employee Designation	Length (Designation)	Expected Output
0		0	Id12395678	10	qwerngtmyu	10	Invalid input
1	K	1	Id12345678	10	qwerngtmyu	10	Print details
2	Ra	2	Id34567234	10	pqerlkmtrt	10	Print details
3	abababababababa	15	Id12345678	10	asbfntmymr	10	Print details
4	abababababbab	14	Id56712345	10	ashbfnrklosjf	11	Print details
5	abababababababab	16	Id30989898	10	asbfntmymr	10	Invalid input
6	amnsbdh	7		0	anamanamnagh	12	Invalid input
7	rahataz	7	Id12089867	10	abdnrheytsklplo	14	Print details
8	absdhfr	7	Id236759098	11	mnvfhytr	8	Invalid Input
9	adfghjhu	8	Id09786954	10	okiuytgrgb	10	Print details
10	asdfgbh	7	Id0978940	9	aslpoiuytr	10	Invalid Input
11	asdfghjqw	9	Id12345678	10	A	1	Print details
12	asdcvbh	7	Id12345678	10	Aa	2	Print details
13	rrttyhj	7	Id12345678	10	amnbhyjklopouythgbt	20	Print details
14	mnmnmna	7	Id12345678	11	amnbhyjklopouythgbt	20	Invalid input

15	rtyuiop	7	Id12345678	10	dfgbhyjikmnokoiuyt	19	Print details
16	qwertyu	7	Id12345678	10	asbnmjkoiu	10	Print details
17	rahatud	7	Id12345678	10		0	Invalid Input
18	rahatud	7	Id12345678	10	Anmnmnmnm naghjuioklk1	21	Invalid Input

(c) Test cases using worst-case testing Since there are three variables, name, employee ID, and designation, the total number of test cases will be $5^n = 125$

Test Case ID	Input Employee Name	Length (Name)	Input Employee ID	Length (ID)	Input Employee Designation	Length (Designation)	Expected Output
1	R	1	Id01029340	10	D	1	Print details
2	R	1	Id01029340	10	De	2	Print details
3	R	1	Id01029340	10	designatio	10	Print details
4	R	1	Id01029340	10	designtionanmklkasd	19	Print details
6	Rr	2	Id0198987	9	designtionanmklkasd	19	Invalid Input
7	Rr	2	Id01029340	10	designtionanmklkasdl	20	Print details
8	rahatuddinrahat	15	Id010293404	11	designtionanmklkasdl	20	Invalid Input
……..	----------	-----	-------	-----	----------	----------	----------
……..	----------	-----	-------	-----	----------	----------	----------
……..	----------	-----	-------	-----	----------	----------	----------