EAST WEST UNIVERSITY

Department of Computer Science and Engineering

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Assignment 01

Submitted to:

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Question 1

1. A program takes as input a numeric string (4–15 digits) and a single digit (0–9) and checks whether that single digit is present in the numeric string or not.
Design test cases using:
1. Boundary Value Checking (BVC)
2. Robust Testing
3. Worst-Case Testing

Solution

BVC:

Test cases using **BVC** Since there are two inputs the total number of test cases will be $4n+1 = 9$.
The set of boundary values is shown below:

	Numeric string	**Single digit**
Min Value	1234	0
Min+ Value	12345	1
Max Value	012345678912345	9
Max- Value	01234567891234	8
Nominal Value	123456789	5

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

Test id	**Numeric string**	**Single digit**	**Expected Output**
1	1234	5	Not in String
2	12345	5	Present in String
3	123456789012345	5	Present in String
4	12345678901234	5	Present in String
5	123456789	0	Not in String
6	123456789	1	Present in String

7	123456789	9	Present in String
8	123456789	8	Present in String
9	123456789	5	Present in String

Robust Testing:

Test cases using **Robust Testing** Since there are two inputs the total number of test cases will be $6n+1 = 13$. The set of boundary values is shown below:

	Numeric string	**Single digit**
Min- Value	123	-1
Min Value	1234	0
Min+ Value	12345	1
Max- Value	12345678901234	8
Max Value	123456789012345	9
Max+ Value	1234567890123456	10
Nominal Value	123456789	5

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

Test id	**Numeric string**	**Single digit**	**Expected Output**
1	123	5	Invalid Input
2	1234	5	Not in String
3	12345	5	Present in String
4	12345678901234	5	Present in String
5	123456789012345	5	Present in String
6	1234567890123456	5	Invalid Input
7	123456789	-1	Invalid Input
8	123456789	0	Not in String

9	123456789	1	Present in String
10	123456789	8	Present in String
11	123456789	9	Present in String
12	123456789	10	Invalid Input
13	123456789	5	Present in String

Worst case testing:

Test cases using **Worst case testing** Since there are two inputs the total number of test cases will be $5^n = 25$. The set of boundary values is shown below:

	Numeric string	**Single digit**
Min Value	1234	0
Min+ Value	12345	1
Max Value	123456789012345	9
Max- Value	12345678901234	8
Nominal Value	123456789	5

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

Test id	**Numeric string**	**Single digit**	**Expected Output**
1	1234	0	Not in String
2	1234	1	Present in String
3	1234	9	Not in String
4	1234	8	Not in String
5	1234	5	Not in String
6	12345	0	Not in String
7	12345	1	Present in String
8	12345	9	Not in String

9	12345	8	Not in String
10	12345	5	Present in String
11	123456789012345	0	Present in String
12	123456789012345	1	Present in String
13	123456789012345	9	Present in String
14	123456789012345	8	Present in String
15	123456789012345	5	Present in String
16	12345678901234	0	Present in String
17	12345678901234	1	Present in String
18	12345678901234	9	Present in String
19	12345678901234	8	Present in String
20	12345678901234	5	Present in String
21	123456789	0	Not in String
22	123456789	1	Present in String
23	123456789	9	Present in String
24	123456789	8	Present in String
25	123456789	5	Present in String

Question 2

2. 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

BVC:

Test cases using **BVC** Since there are three numbers a, b and c, the total number of test cases will be $4n+1 = 13$. The set of boundary values is shown below:

	A	B	C
Min Value	1	1	1
Min+ Value	2	2	2
Max Value	50	50	50
Max- Value	49	49	49
Nominal Value	25	25	25

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

Test id	A	B	C	Expected Output
1	1	25	25	1
2	2	25	25	1
3	50	25	25	25
4	49	25	25	1
5	25	1	25	1
6	25	2	25	1
7	25	50	25	25
8	25	49	25	1
9	25	25	1	1
10	25	25	2	1

11	25	25	50	25
12	25	25	49	1
13	25	25	25	25

Robust Testing:

Test cases using **Robust Testing** Since there are three numbers a, b and c the total number of test cases will be $6n+1 = 19$. The set of boundary values is shown below:

	A	**B**	**C**
Min- Value	0	0	0
Min Value	1	1	1
Min+ Value	2	2	2
Max- Value	49	49	49
Max Value	50	50	50
Max+ Value	51	51	51
Nominal Value	25	25	25

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

Test id	**A**	**B**	**C**	**Expected Output**
1	0	25	25	Invalid Input
2	1	25	25	1
3	2	25	25	1
4	49	25	25	1
5	50	25	25	25
6	51	25	25	Invalid Input
7	25	0	25	Invalid Input

8	25	1	25	1
9	25	2	25	1
10	25	49	25	1
11	25	50	25	25
12	25	51	25	Invalid Input
13	25	25	0	Invalid Input
14	25	25	1	1
15	25	25	2	1
16	25	25	49	1
17	25	25	50	25
18	25	25	51	Invalid Input
19	25	25	25	25

Test cases using **worst-case testing** Since there are three inputs the total number of test cases will be $5^n = 125$. The set of boundary values is shown below:

	A	**B**	**C**
Min Value	1	1	1
Min+ Value	2	2	2
Max Value	50	50	50
Max- Value	49	49	49
Nominal Value	25	25	25

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

Test id	A	B	C	Expected Output
1	1	1	1	1
2	1	1	2	1
3	1	1	50	1
4	1	1	49	1
5	1	1	25	1
6	1	2	1	1
7	1	2	2	1
8	1	2	50	1
9	1	2	49	1
10	1	2	25	1
11	1	50	1	1
12	1	50	2	1
13	1	50	50	1
14	1	50	49	1
15	1	50	25	1
16	1	49	1	1
17	1	49	2	1
18	1	49	50	1
19	1	49	49	1
20	1	49	25	1
21	1	25	1	1
22	1	25	2	1
23	1	25	50	1
24	1	25	49	1
25	1	25	25	1

26	2	1	1	1
27	2	1	2	1
28	2	1	50	1
29	2	1	49	1
30	2	1	25	1
31	2	2	1	1
32	2	2	2	2
33	2	2	50	2
34	2	2	49	1
35	2	2	25	1
36	2	50	1	1
37	2	50	2	2
38	2	50	50	2
39	2	50	49	1
40	2	50	25	2
41	2	49	1	1
42	2	49	2	1
43	2	49	50	1
44	2	49	49	1
45	2	49	25	1
46	2	25	1	1
47	2	25	2	1
48	2	25	50	1
49	2	25	49	1
50	2	25	25	1
51	50	1	1	1
52	50	1	2	1
53	50	1	50	1

54	50	1	49	1
55	50	1	25	1
56	50	2	1	1
57	50	2	2	2
58	50	2	50	2
59	50	2	49	1
60	50	2	25	1
61	50	50	1	1
62	50	50	2	2
63	50	50	50	50
64	50	50	49	1
65	50	50	25	25
66	50	49	1	1
67	50	49	2	1
68	50	49	50	1
69	50	49	49	1
70	50	49	25	1
71	50	25	1	1
72	50	25	2	1
73	50	25	50	25
74	50	25	49	1
75	50	25	25	25
76	49	1	1	1
77	49	1	2	1
78	49	1	50	1
79	49	1	49	1
80	49	1	25	1
81	49	2	1	1

82	49	2	2	1
83	49	2	50	1
84	49	2	49	1
85	49	2	25	1
86	49	50	1	1
87	49	50	2	1
88	49	50	50	1
89	49	50	49	1
90	49	50	25	1
91	49	49	1	1
92	49	49	2	1
93	49	49	50	1
94	49	49	49	49
95	49	49	25	1
96	49	25	1	1
97	49	25	2	1
98	49	25	50	1
99	49	25	49	1
100	49	25	25	1
101	25	1	1	1
102	25	1	2	1
103	25	1	50	1
104	25	1	49	1
105	25	1	25	1
106	25	2	1	1
107	25	2	2	1
108	25	2	50	1
109	25	2	49	1

110	25	2	25	1
111	25	50	1	1
112	25	50	2	1
113	25	50	50	25
114	25	50	49	1
115	25	50	25	25
116	25	49	1	1
117	25	49	2	1
118	25	49	50	1
119	25	49	49	1
120	25	49	25	1
121	25	25	1	1
122	25	25	2	1
123	25	25	50	25
124	25	25	49	1
125	25	25	25	25

Question 3

3. A program reads employee records with the following details and prints a department-wise list containing employee name and their salary:
Employee Name (max. 30 characters)
Department Name (max. 20 characters)
Salary (in BDT, positive value)
The program groups employees by department and displays their names along with them salaries.
Design test cases for this program using BVC, robust testing, and worst-case testing methods.

Solution

BVC

Test cases using **BVC** Since there are three variable departments, employee name and salary, the total number of test cases will be $4n+1= 13$. The set of boundary values is shown below:

	Employee name	Department	Salary
Min Value	a	C	10000
Min+ Value	ab	CA	10001
Max Value	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	50000
Max- Value	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	49999
Nominal Value	B. M. Shahria Alam	Information	25000

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

Test id	Employee name	Department	Salary	Expected Output
1	a	Information	25000	a, Information,25000
2	ab	Information	25000	ab, Information, 25000
3	abcdefghijklmnopqrstuvwxyzabcd	Information	25000	abcdefghijklmnopqrstuvwxyzabcd, Information, 25000
4	abcdefghijklmnopqrstuvwxyzabc	Information	25000	abcdefghijklmnopqrstuvwxyzabc, Information, 25000
5	B. M. Shahria Alam	C	25000	B. M. Shahria Alam, C, 25000

6	B. M. Shahria Alam	CA	25000	B. M. Shahria Alam, CA, 25000
7	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
8	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
9	B. M. Shahria Alam	Information	10000	B. M. Shahria Alam, Information, 10000
10	B. M. Shahria Alam	Information	10001	B. M. Shahria Alam, Information, 10001
11	B. M. Shahria Alam	Information	50000	B. M. Shahria Alam, Information, 50000
12	B. M. Shahria Alam	Information	49999	B. M. Shahria Alam, Information, 49999
13	B. M. Shahria Alam	Information	25000	B. M. Shahria Alam, Information, 25000

Robust Testing:

Test cases using **Robust Testing** Since there are three variable departments, employee name and salary. the total number of test cases will be $6n+1 = 19$. The set of boundary values is shown below:

	Employee name	**Department**	**Salary**
Min- Value	(Empty)	(Empty)	-9999
Min Value	a	C	10000
Min+ Value	ab	CA	10001
Max- Value	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	49999
Max Value	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	50000
Max+ Value	abcdefghijklmnopqrstuvwxyzabcde	Chartered Accountings	0
Nominal Value	B. M. Shahria Alam	Information	25000

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

Test id	Employee name	Department	Salary	Expected Output
1	(Empty)	Information	25000	Invalid Input
2	a	Information	25000	a, Information, 25000
3	ab	Information	25000	ab, Information, 25000
4	abcdefghijklmnopqrstuvwxyzabcd	Information	25000	abcdefghijklmnopqrstuvwxyzabcd, Information, 25000
5	abcdefghijklmnopqrstuvwxyzabc	Information	25000	abcdefghijklmnopqrstuvwxyzabc, Information, 25000
6	abcdefghijklmnopqrstuvwxyzabcde	Information	25000	Invalid Input
7	B. M. Shahria Alam	(Empty)	25000	Invalid Input
8	B. M. Shahria Alam	C	25000	B. M. Shahria Alam, C, 25000
9	B. M. Shahria Alam	CA	25000	B. M. Shahria Alam, CA, 25000
10	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
11	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
12	B. M. Shahria Alam	Chartered Accountings	25000	Invalid Input
13	B. M. Shahria Alam	Information	-9999	Invalid Input
14	B. M. Shahria Alam	Information	10000	B. M. Shahria Alam, Information,10000
15	B. M. Shahria Alam	Information	10001	B. M. Shahria Alam, Information, 10001
16	B. M. Shahria Alam	Information	50000	B. M. Shahria Alam, Information, 50000
17	B. M. Shahria Alam	Information	49999	B. M. Shahria Alam, Information, 49999
18	B. M. Shahria Alam	Information	0	Invalid Input
19	B. M. Shahria Alam	Information	25000	B. M. Shahria Alam, Information, 25000

Worst-case testing

Test cases using **worst-case testing** Since there are three inputs the total number of test cases will be $5^n = 125$. The set of boundary values is shown below:

	Employee name	Department	Salary
Min Value	a	C	10000
Min+ Value	ab	CA	10001
Max Value	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	50000
Max- Value	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	49999
Nominal Value	B. M. Shahria Alam	Information	25000

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

Test id	Employee name	Department	Salary	Expected Output
1	a	C	10000	a, C, 10000
2	a	C	10001	a, C, 10001
3	a	C	50000	a, C, 50000
4	a	C	49999	a, C, 49999
5	a	C	25000	a, C, 25000
6	a	CA	10000	a, CA, 10000
7	a	CA	10001	a, CA, 10001
8	a	CA	50000	a, CA, 50000
9	a	CA	49999	a, CA, 49999
10	a	CA	25000	a, CA, 25000
11	a	Chartered Accounting	10000	a, Chartered Accounting, 10000
12	a	Chartered Accounting	10001	a, Chartered Accounting, 10001
13	a	Chartered Accounting	50000	a, Chartered Accounting, 50000
14	a	Chartered Accounting	49999	a, Chartered Accounting, 49999
15	a	Chartered Accounting	25000	a, Chartered Accounting, 25000
16	a	Chartered Accounting	10000	a, Chartered Accounting, 10000

17	a	Chartered Accounting	10001	a, Chartered Accounting, 10001
18	a	Chartered Accounting	50000	a, Chartered Accounting, 50000
19	a	Chartered Accounting	49999	a, Chartered Accounting, 49999
20	a	Chartered Accounting	25000	a, Chartered Accounting, 25000
21	a	Information	10000	a, Information, 10000
22	a	Information	10001	a, Information, 10001
23	a	Information	50000	a, Information, 50000
24	a	Information	49999	a, Information, 49999
25	a	Information	25000	a, Information, 25000
26	ab	C	10000	ab, C, 10000
27	ab	C	10001	ab, C, 10001
28	ab	C	50000	ab, C, 50000
29	ab	C	49999	ab, C, 49999
30	ab	C	25000	ab, C, 25000
31	ab	CA	10000	ab, CA, 10000
32	ab	CA	10001	ab, CA, 10001
33	ab	CA	50000	ab, CA, 50000
34	ab	CA	49999	ab, CA, 49999
35	ab	CA	25000	ab, CA, 25000
36	ab	Chartered Accounting	10000	ab, Chartered Accounting, 10000
37	ab	Chartered Accounting	10001	ab, Chartered Accounting, 10001
38	ab	Chartered Accounting	50000	ab, Chartered Accounting, 50000
39	ab	Chartered Accounting	49999	ab, Chartered Accounting, 49999
40	ab	Chartered Accounting	25000	ab, Chartered Accounting, 25000
41	ab	Chartered Accounting	10000	ab, Chartered Accounting, 10000
42	ab	Chartered Accounting	10001	ab, Chartered Accounting, 10001
43	ab	Chartered Accounting	50000	ab, Chartered Accounting, 50000
44	ab	Chartered Accounting	49999	ab, Chartered Accounting, 49999
45	ab	Chartered Accounting	25000	ab, Chartered Accounting, 25000
46	ab	Information	10000	ab, Information,10000
47	ab	Information	10001	ab, Information, 10001
48	ab	Information	50000	ab, Information, 50000

49	ab	Information	49999	ab, Information, 49999
50	ab	Information	25000	ab, Information, 25000
51	abcdefghijklmnopqrstuvwxyzabcd	C	10000	abcdefghijklmnopqrstuvwxyzabcd, C, 10000
52	abcdefghijklmnopqrstuvwxyzabcd	C	10001	abcdefghijklmnopqrstuvwxyzabcd, C, 10001
53	abcdefghijklmnopqrstuvwxyzabcd	C	50000	abcdefghijklmnopqrstuvwxyzabcd, C, 50000
54	abcdefghijklmnopqrstuvwxyzabcd	C	49999	abcdefghijklmnopqrstuvwxyzabcd, C, 49999
55	abcdefghijklmnopqrstuvwxyzabcd	C	25000	abcdefghijklmnopqrstuvwxyzabcd, C, 25000
56	abcdefghijklmnopqrstuvwxyzabcd	CA	10000	abcdefghijklmnopqrstuvwxyzabcd, CA, 10000
57	abcdefghijklmnopqrstuvwxyzabcd	CA	10001	abcdefghijklmnopqrstuvwxyzabcd, CA, 10001
58	abcdefghijklmnopqrstuvwxyzabcd	CA	50000	abcdefghijklmnopqrstuvwxyzabcd, CA, 50000
59	abcdefghijklmnopqrstuvwxyzabcd	CA	49999	abcdefghijklmnopqrstuvwxyzabcd, CA, 49999
60	abcdefghijklmnopqrstuvwxyzabcd	CA	25000	abcdefghijklmnopqrstuvwxyzabcd, CA, 25000
61	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	10000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 10000
62	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	10001	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 10001
63	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	50000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 50000
64	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	49999	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 49999
65	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	25000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 25000
66	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	10000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 10000
67	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	10001	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 10001
68	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	50000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 50000

69	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	49999	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 49999
70	abcdefghijklmnopqrstuvwxyzabcd	Chartered Accounting	25000	abcdefghijklmnopqrstuvwxyzabcd, Chartered Accounting, 25000
71	abcdefghijklmnopqrstuvwxyzabcd	Information	10000	abcdefghijklmnopqrstuvwxyzabcd, Information, 10000
72	abcdefghijklmnopqrstuvwxyzabcd	Information	10001	abcdefghijklmnopqrstuvwxyzabcd, Information, 10001
73	abcdefghijklmnopqrstuvwxyzabcd	Information	50000	abcdefghijklmnopqrstuvwxyzabcd, Information, 50000
74	abcdefghijklmnopqrstuvwxyzabcd	Information	49999	abcdefghijklmnopqrstuvwxyzabcd, Information, 49999
75	abcdefghijklmnopqrstuvwxyzabcd	Information	25000	abcdefghijklmnopqrstuvwxyzabcd, Information, 25000
76	abcdefghijklmnopqrstuvwxyzabc	C	10000	Abcdefghijklmnopqrstuvwxyzabc, C, 10000
77	abcdefghijklmnopqrstuvwxyzabc	C	10001	abcdefghijklmnopqrstuvwxyzabc, C, 10001
78	abcdefghijklmnopqrstuvwxyzabc	C	50000	abcdefghijklmnopqrstuvwxyzabc,C,50000
79	abcdefghijklmnopqrstuvwxyzabc	C	49999	abcdefghijklmnopqrstuvwxyzabc,C,49999
80	abcdefghijklmnopqrstuvwxyzabc	C	25000	abcdefghijklmnopqrstuvwxyzabc,C,25000
81	abcdefghijklmnopqrstuvwxyzabc	CA	10000	abcdefghijklmnopqrstuvwxyzabc,CA, 10000
82	abcdefghijklmnopqrstuvwxyzabc	CA	10001	abcdefghijklmnopqrstuvwxyzabc,CA, 10001
83	abcdefghijklmnopqrstuvwxyzabc	CA	50000	abcdefghijklmnopqrstuvwxyzabc,CA, 50000
84	abcdefghijklmnopqrstuvwxyzabc	CA	49999	abcdefghijklmnopqrstuvwxyzabc,CA, 49999
85	abcdefghijklmnopqrstuvwxyzabc	CA	25000	abcdefghijklmnopqrstuvwxyzabc,CA, 25000
86	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	10000	abcdefghijklmnopqrstuvwxyzabc,Chartered Accounting,10000
87	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	10001	abcdefghijklmnopqrstuvwxyzabc,Chartered Accounting,10001
88	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	50000	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 50000

89	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	49999	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 49999
90	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	25000	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 25000
91	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	10000	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 10000
92	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	10001	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 10001
93	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	50000	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 50000
94	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	49999	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 49999
95	abcdefghijklmnopqrstuvwxyzabc	Chartered Accounting	25000	abcdefghijklmnopqrstuvwxyzabc, Chartered Accounting, 25000
96	abcdefghijklmnopqrstuvwxyzabc	Information	10000	abcdefghijklmnopqrstuvwxyzabc, Information, 10000
97	abcdefghijklmnopqrstuvwxyzabc	Information	10001	abcdefghijklmnopqrstuvwxyzabc, Information, 10001
98	abcdefghijklmnopqrstuvwxyzabc	Information	50000	abcdefghijklmnopqrstuvwxyzabc, Information, 50000
99	abcdefghijklmnopqrstuvwxyzabc	Information	49999	abcdefghijklmnopqrstuvwxyzabc, Information, 49999
100	abcdefghijklmnopqrstuvwxyzabc	Information	25000	abcdefghijklmnopqrstuvwxyzabc, Information, 25000
101	B. M. Shahria Alam	C	10000	B. M. Shahria Alam, C, 10000
102	B. M. Shahria Alam	C	10001	B. M. Shahria Alam, C, 10001
103	B. M. Shahria Alam	C	50000	B. M. Shahria Alam, C, 50000
104	B. M. Shahria Alam	C	49999	B. M. Shahria Alam, C, 49999
105	B. M. Shahria Alam	C	25000	B. M. Shahria Alam, C, 25000
106	B. M. Shahria Alam	CA	10000	B. M. Shahria Alam, CA, 10000
107	B. M. Shahria Alam	CA	10001	B. M. Shahria Alam, CA, 10001
108	B. M. Shahria Alam	CA	50000	B. M. Shahria Alam, CA, 50000
109	B. M. Shahria Alam	CA	49999	B. M. Shahria Alam, CA, 49999
110	B. M. Shahria Alam	CA	25000	B. M. Shahria Alam, CA, 25000
111	B. M. Shahria Alam	Chartered Accounting	10000	B. M. Shahria Alam, Chartered Accounting, 10000

112	B. M. Shahria Alam	Chartered Accounting	10001	B. M. Shahria Alam, Chartered Accounting, 10001
113	B. M. Shahria Alam	Chartered Accounting	50000	B. M. Shahria Alam, Chartered Accounting, 50000
114	B. M. Shahria Alam	Chartered Accounting	49999	B. M. Shahria Alam, Chartered Accounting, 49999
115	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
116	B. M. Shahria Alam	Chartered Accounting	10000	B. M. Shahria Alam, Chartered Accounting, 10000
117	B. M. Shahria Alam	Chartered Accounting	10001	B. M. Shahria Alam, Chartered Accounting, 10001
118	B. M. Shahria Alam	Chartered Accounting	50000	B. M. Shahria Alam, Chartered Accounting, 50000
119	B. M. Shahria Alam	Chartered Accounting	49999	B. M. Shahria Alam, Chartered Accounting, 49999
120	B. M. Shahria Alam	Chartered Accounting	25000	B. M. Shahria Alam, Chartered Accounting, 25000
121	B. M. Shahria Alam	Information	10000	B. M. Shahria Alam, Information, 10000
122	B. M. Shahria Alam	Information	10001	B. M. Shahria Alam, Information, 10001
123	B. M. Shahria Alam	Information	50000	B. M. Shahria Alam, Information, 50000
124	B. M. Shahria Alam	Information	49999	B. M. Shahria Alam, Information, 49999
125	B. M. Shahria Alam	Information	25000	B. M. Shahria Alam, Information, 25000

Question 4

A university is admitting students in a professional course subject to the following conditions:
(a) Marks in Java ≥ 70
(b) Marks in C++ ≥ 60
(c) Marks in OOAD ≥ 60
(d) Total in all three subjects ≥ 220 OR Total in Java and C++ ≥ 150
If the aggregate mark of an eligible candidate is more than 240, he will be eligible for scholarship course, otherwise he will be eligible for normal course. The program reads the marks in the three subjects and generates the following outputs:
(i) Not eligible
(ii) Eligible for scholarship course
(iii) Eligible for normal course

Solution:

First, we partition the domain of input in terms of valid input values and invalid values, getting the following classes:

I1 = {<Java, C++, OOAD>: Java ≥ 70}
I2 = {<Java, C++, OOAD>: C++ ≥ 60}
I3 = {<Java, C++, OOAD>: OOAD ≥ 60}
I4 = {<Java, C++, OOAD>: Java < 70}
I5 = {<Java, C++, OOAD>: C++ < 60}
I6 = {<Java, C++, OOAD>: OOAD< 60}
I7 = {<Java, C++, OOAD>: Total in all three subjects ≥ 220 OR Total in Java and C++ ≥ 150}
I8 = {<Java, C++, OOAD>: Total in all three subjects < 220 OR Total in Java and C++ < 150}
I9 = {<Java, C++, OOAD>: Aggregate marks > 240}
I10 = {<Java, C++, OOAD>: Aggregate marks ≤ 240}

The test cases can be designed from the above-derived classes, taking one test case from each class such that the test case covers maximum valid input classes and separate test cases for each invalid class. The test cases are shown below:

Test ID	Java	C++	OOAD	Aggregate Marks	Expected Output	Classes Covered by the test case
1	70	75	60	224	Eligible for normal course	I1, I2, I3, I7, I10
2	75	75	70	220	Eligible for normal course	I1, I2, I3, I7, I10
3	75	74	91	242	Eligible for scholarship course	I1, I2, I3, I7, I9
4	76	77	89	242	Eligible for scholarship course	I1, I2, I3, I7, I9

5	68	78	80	226	Not eligible	I4, I8
6	78	45	78	201	Not eligible	I5, I8
7	80	80	50	210	Not eligible	I6, I8
8	70	72	70	212	Not eligible	I1, I2, I3, I8
9	75	75	70	220	Eligible for normal course	I1, I2, I3, I7, I10
10	76	80	85	241	Eligible for scholarship course	I1, I2, I3, I7, I9