

Test case

Decision Tables (Cause-Effect table: Number of possible Combinations is given by  $2^n$ )

Cause effect graph

Equivalence class testing (with all variation) -with test case- have format

- equivalence testing,
- weak robust,
- strong robust,
- weak normal,
- strong normal
- plotting graph

The number of test cases for Strong Robust Equivalence Class testing can be calculated using the formula:

$$N = ((k^2) \times (p^m)) + ((k \times q^m) \times (p^{(m-1)}))$$

where:

k is the number of valid input values for each input variable

p is the number of modes (3 in this case)

m is the number of input variables (2 in this case)

q is the number of invalid input values for each input variable (1 in this case)

Boundary value analysis (BVA) (with all variation)- with test case - have format

- robust BVA
- worst case BVA
- robust worst case BVA
- Formula (very important)
- triangle example
- plotting graph

**BVA or Normal BVA =  $4n + 1$**

**Robust BVA =  $6n + 1$**

**Worst case BVA =  $5^n$  =**

**Robust Worst case BVA =  $7^n$  =**

- n = number of inputs
- Here n is 3 (conditions)

Code Based Techniques

- Control Flow
- Data Flow

Graph theory  
McCabe

(optional)

Usage based testing

- Operational Profile
- Reliability Engineered Testing

Based on Engineers experience and intuition

- Exploratory
- Ad-hoc

Q1 :

Question No: 01

This is a subjective question, hence you have to write your answer in the Text-Field given below.

Consider an office email system which is designed based on the following specifications:

- Send email when recipient address has been mentioned, subject is present, and time is before 5:00 pm.
- If recipient address is missing or subject is missing, give warning message.
- If time is after 5:00 pm, then put the email in outbox folder.

a) Identify the conditions and actions for the given case. Also, derive the decision table for the problem.  
b) Design the test cases with values of inputs and outputs. [5+2 = 7 Marks]

A :

C1: recipient address present

C2: subject is present

C3: time < 5:00 PM

A1: send email

A2: warning message

A3: outbox folder

A4: impossible

$2^3(\text{conditions}) = 2 \times 2 \times 2 = 8 \text{ (Rules)}$

Conditions	Rule1	Rule2	Rule3	Rule4	Rule5	Rule6	Rule7	Rule8
C1	F	T	T	T	T	F	F	F
C2	F	T	F	F	T	T	F	T
C3	F	T	F	T	F	T	T	F
Actions								
A1		T						
A2			T	T		T	T	T
A3			T		T			T

A4	T							
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**$2^n$  – n is rules**

$2^3(\text{conditions}) = 2*2*2 = 8$  (Rules)

B:

TC 1: Email should be valid email address

TC 2: Mail should send before 5:00PM

Tc 3: Subject should not be empty

Tc 4: If mail is sent after 5:00 PM, then mail should be stored in outbox

Tc 5:

...

Q2:

03 04 05 Question No: 02

This is a subjective question, hence you have to write your answer in the Text-Field given below.

An organization has following criteria for promotion for its employees.

- Average working hours per day is between 9 to 10.
- His/her minimum experience years should be between 10 and 20
- His/ her age should be in the range of 25 to 50 years.

a) Derive the total numbers of test cases that will be needed for BVA, Robust BVA, Worst Case BVA and Robust Worst case BVA.  
b) Write all the Robust BVA test cases. [4+3= 7 marks]

Sol:

a)

**BVA or Normal BVA =  $4n + 1 = 13$**

**Robust BVA =  $6n + 1 = 19$**

**Worst case BVA =  $5^n = 125$**

**Robust Worst case BVA =  $7^n = 343$**

- n = number of inputs
- Here n is 3 (conditions)

b)

Robust BVA

[https://t4tutorials.com/what-is-robust-case-testing-software-testing/#google\\_vignette](https://t4tutorials.com/what-is-robust-case-testing-software-testing/#google_vignette)

BVA

<https://t4tutorials.com/what-is-simple-boundary-value-testing-software-testing/>

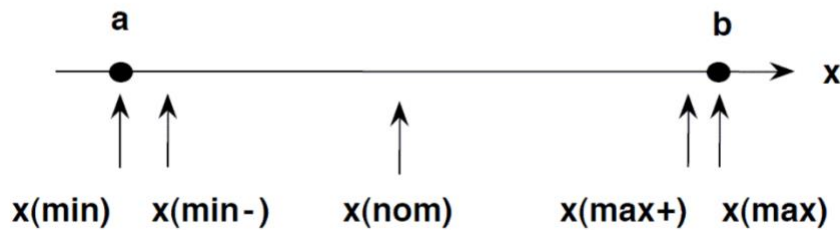
	X (working hours)	Y (experience)	Z (age)
Min-	08:45	9	24
Min	09:00	10	25
Min +	09:15	11	26
Nominal	09:30	15	37
Max-	09:45	19	49
Max	10:00	20	50

Max +	10:15	21	51
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Test case	X (working hours)	Y (experience)	Z (age)	Expected output
1	09:30	15	24	Not promoted
2	09:30	15	25	Promoted
3	09:30	15	26	Promoted
4	09:30	15	37	Promoted
5	09:30	15	49	Promoted
6	09:30	15	50	Promoted
7	09:30	15	51	Not promoted
8	09:30	9	37	Not promoted
9	09:30	10	37	Promoted
10	09:30	11	37	Promoted
11	09:30	19	37	Promoted
12	09:30	20	37	Promoted
13	09:30	21	37	Not promoted
14	08:45	15	37	Not promoted
15	09:00	15	37	Promoted
16	09:15	15	37	Promoted
17	09:45	15	37	Promoted
18	10:00	15	37	Promoted
19	10:15	15	37	Not promoted

Based on below diagram we have to write test case, for eg:

1. Minimum
2. Just above the minimum
3. A nominal value
4. Just below the maximum
5. Maximum



Q3.

Question No: 03

This is a subjective question, hence you have to write your answer in the Text-Field given below.

An electric geyser is to be installed with two-way switches (S1 and S2). Switch S1 is to be installed on ground floor of the house, while switch S2 is to be installed on the first floor of the house. The geyser will be ON only if both the switches S1 and S2 are in ON position or both are in OFF position. The geyser will be OFF for all other positions of S1 and S2. [3+2+2 = 7 Marks]

- a) Identify the conditions and actions for the given case. Also, derive the decision table for the problem.
- b) Design the test cases with values of inputs and outputs.
- c) Draw the cause-effect graph for the same.

Ans:

Condition (C), Action (A)

C1: s1

C2: S2

A1: Geyser is ON

A2: Geyser is OFF

$2^n - n$  is rules  $2^2(\text{conditions}) = 2*2 = 4$  (Rules)

Conditions	Rule1	Rule2	Rule3	Rule4
C1	T	T	F	F
C2	T	F	T	F
Actions				



A1	T			T
A2		F	F	

### B) TC-Test case

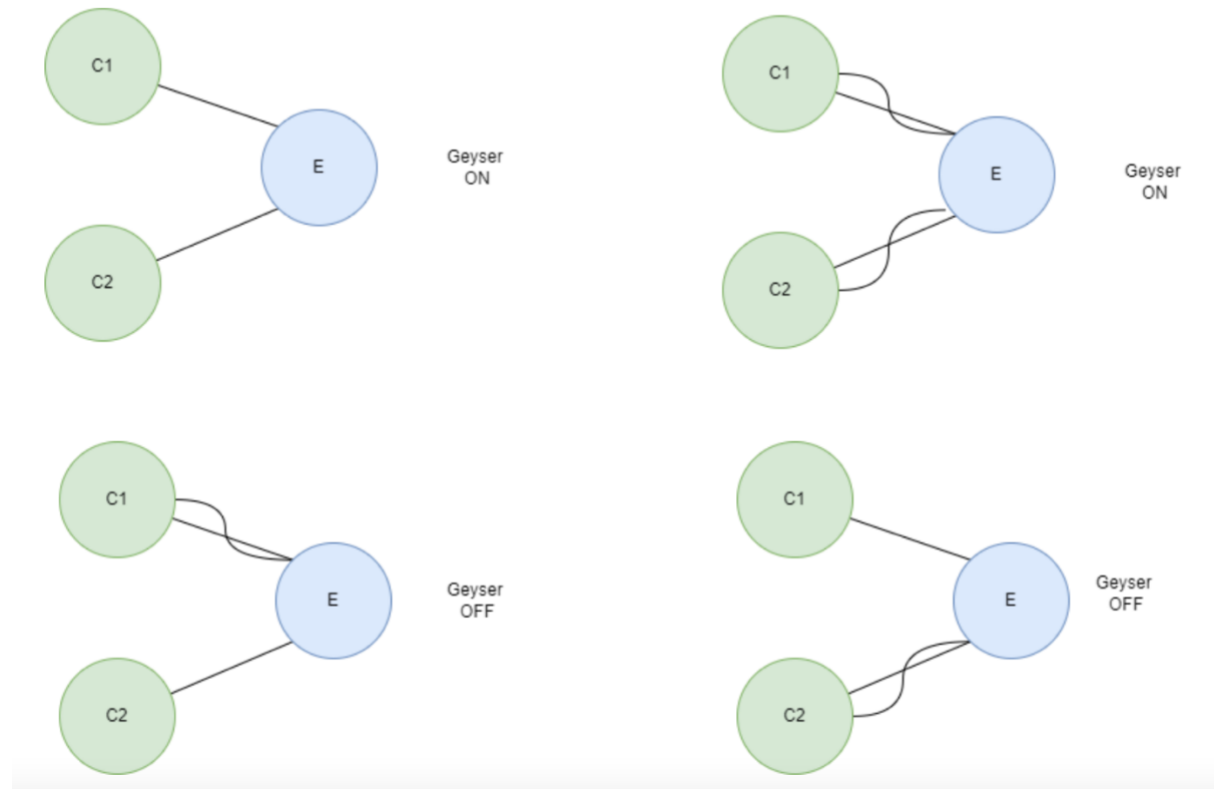
TC 1: S1 – on and S2 – off, then Geyser is OFF

TC 2: S1 – off and S2 – on, then Geyser is OFF

TC 3: S1 – on and S2 – on, then Geyser is ON

TC 4: S1 – off and S2 – off, then Geyser is ON

C)



Q4.

This is a subjective question, hence you have to write your answer in the Text-Field given below.

Function Point estimation is a technique used in the early stages of the project to determine the size of the project based on software requirements. The calculation of size is based on functions supported by the software and the data files used by the software. Data files are of 2 types: Internal Logical Files (ILF) and External Interface Files (EIF). Complexity of files is determined based on 2 characteristics of the file namely - Data Element Types (DET) and Record Element Types (RET), based on the matrix given below: [2+2+3 = 7 Marks]

ILF/EIF	1-19 DETs	20-50 DETs	51+ DETs
1 RET	Low	Low	Average
2- 5 RETs	Low	Average	High
6+ RET	Average	High	High

Software is designed to automate the process of calculating the complexity of the ILF based on the number of DETs and RETs.

- Derive the valid and invalid sub-domains for the input variables. Justify any specific choice you make for the sub-domains.
- Calculate the number of test cases for Strong Robust Equivalence Class testing. State clearly the sub-domains chosen.
- Write down all the test cases for Strong Robust Equivalence Class testing.

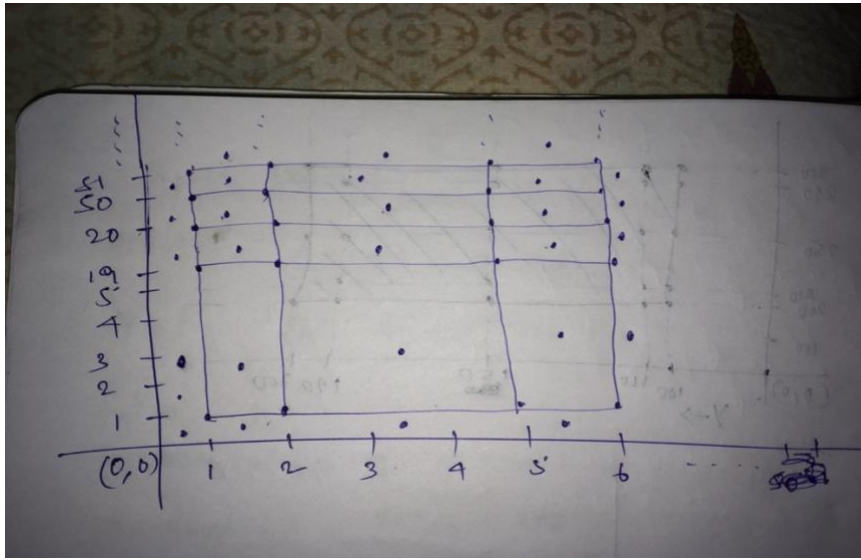
a.) Valid subdomains:

Sl.no	Input parameters	Valid subdomains	Invalid Subdomains
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1	RET	1=RET	RET<1
		2<=RET<=5	1<RET<2
		6<=RET	5<RET<6
2	DET	1<=DET<=19	DET<1
		20<=DET<=50	19<DET<20
		51<=DET	50<DET<51

b.) Number of test cases for Strong robust:

27



c.) Given my assumption i.e. considering discrete values of RET and DET.

if values are continuous then we will have in between values also like between 1 and 2, 5 and 6 for RET and between 19 and 20, 50 and 51 for DET. these will be invalid input EC and will increase test cases by 14

Strong Robust EC				
Q4	Test Case	RET	DET	RESULT
	T-1	1	2	LOW
	T-2	1	40	LOW
	T-3	1	55	AVERAGE
	T-4	3	2	LOW
	T-5	3	40	AVERAGE
	T-6	3	55	HIGH
	T-7	7	2	AVERAGE
	T-8	7	40	HIGH
	T-9	7	55	HIGH
	T-10	0	2	INVALID INPUT
	T-11	0	40	INVALID INPUT
	T-12	0	55	INVALID INPUT
	T-13	0	65	INVALID INPUT
	T-14	1	65	INVALID INPUT
	T-15	3	65	INVALID INPUT
	T-16	7	65	INVALID INPUT
	T-17	11	65	INVALID INPUT
	T-18	11	55	INVALID INPUT
	T-19	11	40	INVALID INPUT
	T-20	11	2	INVALID INPUT
	T-21	11	0	INVALID INPUT
	T-22	7	0	INVALID INPUT
	T-23	3	0	INVALID INPUT
	T-24	1	0	INVALID INPUT
	T-25	0	0	INVALID INPUT

RET Range 1 to 10  
DET Range 1 to 60

Assumptions  
RET high value = 10  
DET high value = 60

RET has discrete values 1,2,3,4.....10 and no in between float values like 1.1, 2.5 etc  
DET also has discrete values 1,2,3,4....60 and no in between float values like 1.2, 1.25, 1.22667 etc

Graphically (For understanding only)



Q. 05

Question No: 05

Suppose a user can operate a typical washing machine motor in three different modes namely Soft, Normal and Strong. Before starting the motor in any mode, the values of two parameters namely 'A' and 'B' are to be set. The range (maximum and minimum) of values that parameter 'A' and 'B' can take in various modes is shown in the following table:

[2+3+2 = 7 marks]

Mode	Possible ranges of A	Possible ranges of B
Soft	$40 \leq A \leq 70$	$10 \leq B \leq 15$
Normal	$70 < A < 80$	$15 < B < 25$
Strong	$80 < A < 90$	$25 < B < 35$

(a) Derive the valid and invalid sub-domains for the input variables. Justify any specific choice you make for the sub-domains.

(b) Calculate the number of test cases for Strong Robust Equivalence Class testing. State clearly the sub-domains chosen.

(c) Write down all the test cases for Strong Robust Equivalence Class testing.

Ans:

Number of test cases of Strong robust equivalence class testing as below.

$$N = (k^{(t+1)} - k) / (k - 1)$$

N- number of test cases

k-number of values in each parameter in equivalence class

t- number of parameters



R

Suppose a user can operate a typical washing machine motor in three different modes namely Soft, Normal and Strong. Before starting the motor in any mode, the values of two parameters namely 'A' and 'B' are to be set. The range (maximum and minimum) of values that parameter 'A' and 'B' can take in various modes is shown in the following table:

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Possible ranges of A

Possible ranges of B

Soft

$40 \leq A \leq 70$

$10 \leq B \leq 15$

Normal

$70 < A \leq 80$

$15 < B \leq 25$

Strong

$80 < A \leq 90$

$25 < B \leq 35$

- Derive the valid and invalid sub-domains for the input variables. Justify any specific choice you make for the sub-domains
- Calculate the number of test cases for Strong Robust Equivalence Class testing. State clearly the sub-domains chosen.
- Write down all the test cases for Strong Robust Equivalence Class testing



(a) The valid and invalid sub-domains for the input variables are as follows:

- Valid sub-domains for parameter 'A' are:
  - Soft mode:  $40 \leq A \leq 70$
  - Normal mode:  $70 < A \leq 80$
  - Strong mode:  $80 < A \leq 90$

Any value of 'A' outside these ranges would be invalid for the respective modes.
- Valid sub-domains for parameter 'B' are:
  - Soft mode:  $10 \leq B \leq 15$
  - Normal mode:  $15 < B \leq 25$
  - Strong mode:  $25 < B \leq 35$

Any value of 'B' outside these ranges would be invalid for the respective modes.

We choose these sub-domains because they represent the valid input ranges for each mode, and any values outside these ranges would be considered invalid and may result in incorrect operation or failure of the washing machine.

(b) The number of test cases for Strong Robust Equivalence Class testing can be calculated using the formula:



We choose these sub-domains because they represent the valid input ranges for each mode, and any values outside these ranges would be considered invalid and may result in incorrect operation or failure of the washing machine.

(b) The number of test cases for Strong Robust Equivalence Class testing can be calculated using the formula:

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$$N = (k^{(t+1)} - k) / (k - 1)$$

where N is the number of test cases, k is the number of values in each parameter's equivalence class, and t is the number of parameters.

For this problem, we have t = 2 (parameters A and B) and k = 3 (values in each equivalence class - minimum, typical, and maximum). Therefore,

SCSS Copy code

$$N = (3^{(2+1)} - 3) / (3 - 1) = 13$$

So the number of test cases required for Strong Robust Equivalence Class testing is 13.

(c) The test cases for Strong Robust Equivalence Class testing are as follows:

- CSS Copy code
1. Soft mode, A = 70-10%, B = 15-10%
  2. Soft mode, A = 70+10%, B = 15-10%
  3. Soft mode, A = 70-10%, B = 15+10%
  4. Soft mode, A = 70+10%, B = 15+10%
  5. Normal mode, A = 80-10%, B = 25-10%
  6. Normal mode, A = 80+10%, B = 25-10%
  7. Normal mode, A = 80-10%, B = 25+10%
  8. Normal mode, A = 80+10%, B = 25+10%
  9. Strong mode, A = 90-10%, B = 35-10%
  10. Strong mode, A = 90+10%, B = 35-10%
  11. Strong mode, A = 90-10%, B = 35+10%
  12. Strong mode, A = 90+10%, B = 35+10%
  13. Invalid mode, A = 0, B = 0

In each test case, we choose values that are close to the boundaries of the valid sub-domains to test how the washing machine behaves when the input values are at the extreme ends of the range. The last test case is an invalid input case where both 'A' and 'B' are outside their respective valid sub-domains.



Regenerate response



R

Suppose a user can operate a typical washing machine motor in three different modes namely Soft, Normal and Strong. Before starting the motor in any mode, the values of two parameters namely 'A' and 'B' are to be set. The range (maximum and minimum) of values that parameter 'A' and 'B' can take in various modes is shown in the following table:

Mode

Possible ranges of A

Possible ranges of B

Soft

$40 \leq A \leq 70$

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$70 < A \leq 80$

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$80 < A \leq 90$

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- Derive the valid and invalid sub-domains for the input variables. Justify any specific choice you make for the sub-domains
- Calculate the number of test cases for Strong Robust Equivalence Class testing. State clearly the sub-domains chosen.
- Write down all the test cases for Strong Robust Equivalence Class testing



(a) The valid and invalid sub-domains for the input variables are as follows:

- Valid sub-domains for parameter 'A' are:
  - Soft mode:  $40 \leq A \leq 70$
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Any value of 'A' outside these ranges would be invalid for the respective modes.
- Valid sub-domains for parameter 'B' are:
  - Soft mode:  $10 \leq B \leq 15$
  - Normal mode:  $15 < B \leq 25$
  - Strong mode:  $25 < B \leq 35$

Any value of 'B' outside these ranges would be invalid for the respective modes.

We choose these sub-domains because they represent the valid input ranges for each mode, and any values outside these ranges would be considered invalid and may result in incorrect operation or failure of the washing machine.

(b) The number of test cases for Strong Robust Equivalence Class testing can be calculated using the formula:



[https://www.softwaretestinggenius.com/boundary-value-analysis-bva-a-black-box-testing-technique/#:~:text=If%20we%20have%20a%20function,4n%20%2B%201\)%20test%20cases.](https://www.softwaretestinggenius.com/boundary-value-analysis-bva-a-black-box-testing-technique/#:~:text=If%20we%20have%20a%20function,4n%20%2B%201)%20test%20cases.)

<https://t4tutorials.com/what-is-robust-case-testing-software-testing/>

<https://t4tutorials.com/what-is-simple-boundary-value-testing-on-3-variables-software-testing/>

<https://www.guru99.com/equivalence-partitioning-boundary-value-analysis.html>

<https://www.geeksforgeeks.org/boundary-value-test-cases-robust-cases-and-worst-case-test-cases/>