# EXERCISES

# Test Case Design –Black Box Testing Techniques Exercises

## Exercise 1

The Electricity bill computed by the service provider has a fixed component as well as a running component. All customers are charged at a rate of $40 flat as a fixed component. In addition to this, they would be changed a running component and/or a fine, depending upon their amount of consumption or usage.

The rules for this are given below:

* If the number of units consumed by the consumer is less than equal to 10 units, then the running cost is not charged for the consumer.
* If the number of units is between 11 and 20, then the running cost is charged at $1 per unit.
* If the number of units is between 21 and 40, then the running cost is charged at $2 per unit.
* If the number of units exceeds 40, then the running cost is charged at $5 per unit.

Use Equivalence class partitioning & Boundary Value Analysis to decide on the test cases to be designed.

Exercise 1 : Solution Using Equivalence Class Partitioning:

|  |  |  |  |
| --- | --- | --- | --- |
| Class ID | Equivalence Classes | Test Data (in units) | Expected Result  Bill Amount = fixed cost + Running cost |
| EC1 | Consumption less than 10 units | 5 | Bill Amount = $40 + 5\*0 = $40 |
| EC2 | Consumption between 11 and 20 units | 15 | Bill Amount = $40 + 15\*1 = $55 |
| EC3 | Consumption between 21 and 40 units | 23 | Bill Amount = $40 + 23\*2 = $86 |
| EC4 | Consumption greater than 40 units | 55 | Bill Amount = $40 + 55\*5 = $315 |

Exercise 1 : Solution Using Boundary Value Analysis:

|  |  |  |  |
| --- | --- | --- | --- |
| Class ID | Equivalence Classes | Test Data | Expected Result  Bill Amount = fixed cost + Running cost |
| EC1 | Consumption less than 10 units | 0 | Bill Amount = $40 + 5\*0 = $40 |
|  |  | 1 | Bill Amount = $40 + 5\*0 = $40 |
|  |  | 10 | Bill Amount = $40 + 5\*0 = $40 |
|  |  | 11 | Bill Amount = $40 + 1\*1 = $ 41 |
| EC2 | Consumption between 11 and 20 units | 10 | Bill Amount = fixed cost + Running cost = $40 + 0\*1 = $40 |
|  |  | 11 | Bill Amount = $40 + 1\*1 = $ 41 |
|  |  | 12 | Bill Amount = $40 + 2\*1 = $ 42 |
|  |  | 20 | Bill Amount = $40 + 10\*1 = $ 50 |
|  |  | 21 | Bill Amount = $40 + 11\*1 = $ 51 |
| EC3 | Consumption between 21 and 40 units | 20 | Bill Amount = fixed cost + Running cost = $40 + 10\*1 = $50 |
|  |  | 21 | Bill Amount = $40 + 11\*2 = $ 62 |
|  |  | 30 | Bill Amount = $40 + 20\*2 = $ 80 |
|  |  | 40 | Bill Amount = $40 + 30\*2 = $ 100 |
|  |  | 41 | Bill Amount = $40 + 31\*5 = $ 195 |
| EC4 | Consumption greater than 40 units | 39 | Bill Amount = $40 + 39\*2 = $ 118 |
|  |  | 40 | Bill Amount = $40 + 30\*2 = $ 100 |
|  |  | 41 | Bill Amount = $40 + 31\*5 = $ 195 |

## Exercise 2

A user in a Small Savings investment bank may have fixed savings of Rs 10,000 invested over a period of 45 days to 5 years. The interest rate computed on the fixed savings is based on the duration of the investment.

The rules for this are given below:

* If the duration of the investment is for 45 days, then the interest rate is 8% pa.
* If the duration of investment is greater than 45 days but less than 1year, then the interest rate is 8.5% pa.
* If the duration of investment is between 1 and 3 years, then the interest rate is 9.5% pa.
* If the duration is greater than 3 years, then the interest rate is 10.5% pa.

Use Equivalence class partitioning & Boundary Value Analysis to decide on the test cases to be designed. (10 marks)

Exercise 2 : Solution Using Equivalence Class Partitioning:

|  |  |  |  |
| --- | --- | --- | --- |
| Class ID | Equivalence Classes | Test Data (in units) | Expected Result |
| EC1 | Investment < 45 Days | 30 days | Interest = 8 % |
| EC2 | Investment > 45 Days and < 1 year | 2 months | Interest = 8.5 % |
| EC3 | Investment > 1 year and < 3 years | 2 Years | Interest = 9.5 % |
| EC4 | Investment > 3 years | 4 years | Interest = 10.5 % |

Exercise 2 : Solution Using Boundary Value Analysis:

|  |  |  |  |
| --- | --- | --- | --- |
| Class ID | Equivalence Classes | Test Data | Expected Result |
| EC1 | Investment < 45 Days | 0 day | Error Message |
|  |  | 1 day | Interest = 8 % |
|  |  | 44 days | Interest = 8 % |
|  |  | 46 days | Interest = 8.5 % |
| EC2 | Investment > 45 Days and < 1 year | 45 days | Interest = 8.5 % |
|  |  | 46 days | Interest = 8.5 % |
|  |  | 6 months | Interest = 8.5 % |
|  |  | 1 year | Interest = 8.5 % |
|  |  | 1 year, 1 month | Interest = 9.5 % |
| EC3 | Investment > 1 year and < 3 years | 11 months | Interest = 8.5 % |
|  |  | 1 year | Interest = 9.5 % |
|  |  | 2 years | Interest = 9.5 % |
|  |  | 3 years | Interest = 9.5 % |
|  |  | 3 years, 2 months | Interest = 10.5 % |
| EC4 | Investment > 3 years | 2 years, 10 months | Interest = 9.5 % |
|  |  | 3 years | Interest = 10.5 % |
|  |  | 3 years, 6 months | Interest = 10.5 % |

**Exercise**:

Consider a leave application system in an organization. An employee can raise a request for a leave, and if he is eligible for a leave (based on the number of days he has already taken etc), the application is sent to the manager for approval. The manager then validates and approves or rejects the leave based on the duration, reason for taking leave.

Use State Transition diagram to represent the scenario and derive the number of test cases for the same. (5 marks)

Solution Using State Transition Diagram

A diagram of a project

Description automatically generated

**Exercise for Assignment**

The following instructions were taken from a University Examination Application Form. Examine them and create a Decision Table to represent the University Rules and thereby decide on the test cases to be designed.

* A candidate appearing for the exam should have a minimum 80% attendance,
* Has attended 3 internal tests with an average of 10 or more marks or
* Has attended 2 internal tests with an average of 15 or more marks and
* Has taken up the external examination and scored more than 35 marks

If the above conditions are fulfilled, then the student can be considered as pass in that subject, else he will be considered as fail.

Use Decision Table to arrive at test cases