

# BOUNDARY VALUE ANALYSIS

Test Case ID	Feature/Module	Condition	Boundary Values	Lower Bound Value	Upper Bound Value	Expected Result
TC-01	User Authentication	Password length during login	Min: 8 characters	-	8 characters	System rejects less than 7 characters; accepts 8 characters
TC-02	Employee Records	Employee ID validation	Positive integer	1	Max ID limit	System accepts valid positive IDs; rejects negative or zero ID.
TC-03	Attendance Tracking	Working hours recording (daily)	0 to 24 hours	0	24	System records 0-24 hours accurately; rejects out of bounds
TC-04	Payroll Calculation	Salary computation with deductions	Non-negative integers	40000	400000	Salary processed correctly at boundary; errors out of bounds.
TC-05	Leave Management	Leave balance validation	Non-negative integers	0	Max leave balance	System allows leave if balance >0; rejects if balance is 0.
TC-06	User Login Attempts	Maximum login	3 attempts	2	3	System locks

		attempts before lockout				account at 3rd failed attempt; permits up to 2.
TC-07	Hardware Resource - Storage	Available storage space for system logs	500 MB minimum	499MB	500 MB	System fails below 500 MB; functions properly at 500 MB.
TC-08	User Records	Aadhaar number length	12 digits	11 digits	12 digits	System accepts 12 digits; rejects 11 or fewer.
TC-09	User Records	Phone number length	10 digits	9 digits	10 digits	System accepts 10 digits; rejects 9 or fewer.

### 1. Password Length (TC-01)

- **Purpose:** Ensures that users create secure passwords by enforcing a minimum length.
- **Boundary Values:**
  - **Lower Bound:** 7 characters (one character below the minimum).
  - **Upper Bound:** 8 characters (minimum acceptable length).
- **Expected Outcome:** The system should reject a password shorter than 8 characters, while accepting one that is exactly 8 characters or more. This enforces the security policy and prevents weaker passwords.

### 2. Employee ID Validation (TC-02)

- **Purpose:** Confirms that each Employee ID is a valid positive integer, as required for unique identification within the system.
- **Boundary Values:**
  - **Lower Bound:** 1 (smallest valid ID).

- **Upper Bound:** Maximum integer or predefined ID limit, depending on the system's ID range.
- **Expected Outcome:** Any ID equal to or above 1 is valid, while 0 or negative numbers should be rejected. This prevents invalid or duplicate entries in employee records.

### 3. Working Hours Recording (TC-03)

- **Purpose:** Ensures the system correctly records daily working hours, which can range between 0 and 24 hours.
- **Boundary Values:**
  - **Lower Bound:** 0 hours (no hours worked).
  - **Upper Bound:** 24 hours (maximum hours in a day).
- **Expected Outcome:** The system should accept any entry from 0 to 24 hours. Negative values or values exceeding 24 hours should be rejected to maintain realistic data.

### 4. Salary Computation with Deductions (TC-04)

- **Purpose:** Validates that salary calculations are performed on non-negative integers only, supporting accurate payroll processing.
- **Boundary Values:**
  - **Lower Bound:** 40000
  - **Upper Bound:** 400000
- **Expected Outcome:** The system should handle salaries starting from 40000 up to the 400000, ensuring all calculated values are non-negative and within the budgetary constraints.

### 5. Leave Balance Validation (TC-05)

- **Purpose:** Ensures that the leave balance remains within acceptable, non-negative limits.
- **Boundary Values:**
  - **Lower Bound:** 0 (no leave remaining).
  - **Upper Bound:** Maximum leave balance, based on the organization's leave policy.
- **Expected Outcome:** A leave balance of 0 should prevent further leave requests. The system must only permit leave requests if there's sufficient balance, maintaining proper leave accounting.

### 6. Phone Number Length (TC-06)

- **Purpose:** Confirms that the phone number field contains exactly 10 digits for consistent data format.
- **Boundary Values:**
  - **Lower Bound:** 9 digits.

- **Upper Bound:** 10 digits.
- **Expected Outcome:** The system should accept a 10-digit phone number but reject numbers with fewer than 10 digits. This ensures accurate contact information.

#### 7. Aadhaar Number Length (TC-07)

- **Purpose:** Ensures the Aadhaar number length is precisely 12 digits, following identification regulations.
- **Boundary Values:**
  - **Lower Bound:** 11 digits.
  - **Upper Bound:** 12 digits.
- **Expected Outcome:** The system should only accept an Aadhaar number with 12 digits. This prevents data inconsistencies in identity verification.

#### 8. Available Storage Space for System Logs (TC-09)

- **Purpose:** Ensures adequate storage (500 MB minimum) for system logs and data files, preventing data overflow.
- **Boundary Values:**
  - **Lower Bound:** 499 MB.
  - **Upper Bound:** 500 MB.
- **Expected Outcome:** The system should require at least 500 MB of storage, allowing logging only if this limit is met, which prevents unexpected system behavior due to insufficient storage.

#### 9. Maximum Login Attempts (TC-10)

- **Purpose:** Prevents security risks by capping the number of failed login attempts.
- **Boundary Values:**
  - **Lower Bound:** 2 failed attempts.
  - **Upper Bound:** 3 failed attempts.
- **Expected Outcome:** After 3 failed attempts, the system should lock the user out. This guards against unauthorized access attempts.

# REQUIREMENT TRACEABILITY MATRIX

REQUIREMENT ID	DESCRIPTION	PRIORITY	TEST CONDITIONS	TEST CASE IDs	PHASE OF TESTING
1.1	User Authentication - Registration and Login	High	1. Verify user can register with valid credentials.2. Verify confirmation email sent.3. Verify login functionality.	TC_1.1.1, TC_1.1.2	Unit Testing
2.1	Employee Records Management	High	1. Verify secure storage of employee data.2. Verify accurate data retrieval.3. Verify data synchronization.	TC_2.1.1 - TC_2.1.3	System Testing
3.1	Attendance Tracking - Daily Recording	High	1. Verify check-in and check-out recorded accurately.2. Verify absence marked correctly.3. Verify overtime logging.	TC_3.1.1 - TC_3.1.3	Integration Testing
3.2	Payroll Management - Salary Calculation	High	1. Verify correct salary calculation based on attendance.2. Verify deductions and bonuses.3. Validate pay accuracy.	TC_3.2.1 - TC_3.2.3	Integration Testing
3.3	Leave Management - Request Submission	Medium	1. Verify leave request submission.2. Verify leave status updates.3. Verify notifications for managers and employees.	TC_3.3.1 - TC_3.3.3	System Testing
4.1	User Interfaces - Web GUI Accessibility	High	1. Verify all modules accessible through web GUI.2. Verify responsive design for different screen sizes.	TC_4.1.1, TC_4.1.2	User Acceptance Testing
5.1	Performance Requirements - Load Handling	Medium	1. Verify system performance under load.2. Ensure response time <2s under peak load.	TC_5.1.1, TC_5.1.2	Performance Testing
6.1	Security - Data Encryption and Protection	High	1. Verify data encryption for sensitive information.2. Verify session management and logout.	TC_6.1.1 - TC_6.1.2	Security Testing
7.1	Operational Scenario - Employee Registration & Login	High	1. Verify employee registration.2. Verify email confirmation and login.	TC_7.1.1 - TC_7.1.2	End-to-End Testing
8.1	Operational Scenario - Employee Onboarding	Medium	1. Verify HR can add employee details.2. Verify stored data is accurate.	TC_8.1.1, TC_8.1.2	System Testing
9.1	Use Case - Generate Payroll	High	1. Verify payroll generation process.2. Confirm correct salary update for employees.	TC_9.1.1, TC_9.1.2	User Acceptance Testing

# POSITIVE & NEGATIVE TESTING

- Negative Testing

TEST CASE	SCENARIO	CURRENT STATE	TEST INPUT	TEST RESULT
T01-A	User Login	Logged out	Incorrect username	Invalid username or password
T01-B	User Login	Logged out	Incorrect password	Invalid username or password
T02-A1	Add Employee	Empty Field	Incorrect format of email	Please enter a valid email
T02-B1	Add Employee	Empty Field	Incorrect format of phone number	Phone number must be a valid 10-digit number
T02-C1	Add Employee	Empty Field	Incorrect format of Aadhaar number	Aadhaar number must be a valid 12-digit number
T02-D1	Add Employee	Empty Field	Incorrect format of salary	Salary must be a valid number
T03-A1	Payroll System	Empty Field	Incorrect Employee ID	Employee ID not found
T03-B1	Payroll System	Empty Field	Incorrect format of Salary	Salary and Increment must be numeric
T03-C1	Payroll System	Empty Field	Incorrect format of Increment	Salary and Increment must be numeric
T04-A	Attendance marking	Empty Field	Multiple Check-ins	Duplicate Attendance ignored

T04-B	Attendance marking	Empty Field	Future Date Entry	Attendance cannot be marked for a future date.
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- Positive Testing

TEST CASE	SCENARIO	CURRENT STATE	TEST INPUT	TEST RESULT
T01-C	User Login	Logged out	Correct username and correct password	Logged in successfully
T02-A2	Add Employee	Empty Field	Correct format of email	Email added successfully
T02-B2	Add Employee	Empty Field	Correct format of phone number	Phone number added successfully
T02-C2	Add Employee	Empty Field	Correct format of Aadhaar number	Aadhaar number added successfully
T02-D2	Add Employee	Empty Field	Correct format of salary	Salary added successfully
T03-A2	Payroll System	Empty Field	Correct Employee ID	Employee ID found
T03-B2	Payroll System	Empty Field	Correct format of Salary	Salary updated for the month
T03-C2	Payroll System	Empty Field	Correct format of Increment	Salary updated for the month
T04-C	Attendance marking	Empty Field	Correct attendance details	Attendance marked successfully

## **1. User Login**

### **Negative Testing**

**T01-A:** When a user enters an incorrect username while logged out, the system should display "Invalid username or password" to indicate an unsuccessful login.

**T01-B:** When a user enters an incorrect password while logged out, the system should respond with "Invalid username or password," signifying that credentials do not match any user in the system.

### **Positive Testing**

**T01-C:** When a user enters a correct username and password while logged out, the system should allow them to log in successfully with the message "Logged in successfully."

## **2. Add Employee**

### **Negative Testing**

**T02-A1:** If the email field is filled with an incorrectly formatted email address, the system should prompt "Please enter a valid email," ensuring email validation.

**T02-B1:** When a user enters an incorrectly formatted phone number, the system should display "Phone number must be a valid 10-digit number" to confirm only proper formats are accepted.

**T02-C1:** If an invalid Aadhaar number format is entered (not a 12-digit number), the system should show "Aadhaar number must be a valid 12-digit number," enforcing correct Aadhaar formats.

**T02-D1:** When an incorrectly formatted salary is entered, the system should respond with "Salary must be a valid number," ensuring numerical format validation.

### **Positive Testing**

**T02-A2:** The system should acknowledge "Email added successfully," confirming valid email input if a correctly formatted email address is entered.

**T02-B2:** When a valid phone number format is provided, the system should respond with "Phone number added successfully," showing acceptance of valid entries.

**T02-C2:** Entering a correctly formatted 12-digit Aadhaar number should result in "Aadhaar number added successfully," acknowledging the valid Aadhaar input.



**T02-D2: A correctly formatted salary entry should prompt "Salary added successfully," confirming that the input is accepted.**

### **3. Payroll System**

#### **Negative Testing**

**T03-A1: If an incorrect Employee ID is used, the system should return "Employee ID not found," indicating that the ID doesn't match any registered employee.**

**T03-B1: Entering a non-numeric value for salary should result in "Salary and Increment must be numeric," requiring numeric inputs for financial entries.**

**T03-C1: Similarly, entering a non-numeric value for increment prompts the system with "Salary and Increment must be numeric," validating numerical-only entries.**

#### **Positive Testing**

**T03-A2: Using a valid Employee ID should return "Employee ID found," indicating that the system recognizes the ID.**

**T03-B2: Entering a valid salary format should prompt "Salary updated for the month," showing that the system correctly processed the salary update.**

**T03-C2: Providing a valid increment format should also result in "Salary updated for the month," indicating the successful application of the increment.**

### **4. Attendance Marking**

#### **Negative Testing**

**T04-A: Attempting multiple check-ins (duplicate entries for attendance) should prompt "Duplicate Attendance ignored," to prevent duplicate records.**

**T04-B: When a future date is used for attendance, the system should display "Attendance cannot be marked for a future date," enforcing the rule that only past or present dates are valid.**

### **Positive Testing**

**T04-C: When a user inputs correct attendance details, the system should display "Attendance marked successfully," validating the entry and ensuring proper functionality for attendance logging.**