Payroll System

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Payroll System

A dissertation submitted for the Degree of Master of Information Technology

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UCSC

Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of

Mr. H.L Sajan Nirmal

under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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_____

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Abstract

By using this system all the salary related tasks of the Atomic Energy Regularity Council can be done in a computerized single centralized system is very helpful for the users who have been use manual methods for long time. Salary details information of the Atomic Energy Regulatory Council organization is not handled properly and therefore needed a new system which can handle all the salary related tasks including display salary sheets, print salary sheets and keeping track of all the salary details for every employee separately. This System will provide an attractive way of handling salary related details and it will reduce the work of the user heavily and will give accurate output by generating salary sheets the way user needs.

This is a system which developed based on dot net technology and the system is developed using visual studio community edition. The database is sql server and all the data will be saved on this database. Database can be back up by the user and hence it will protect the salary related data of the company.

User Interfaces of the system are much clear colorful and easy to understand. So users will able to easily interact with the system using these interfaces. The functionalities of the system includes generate salary slips of the employees, display salary sheets according any month and year, add and update employee details, update salary, taking backups, generate salary Reports and print salary slips.

Acknowledgement

I like to take this opportunity to express my gratitude to everyone who supported me throughout the project and specially my supervisor, Dr. K. L. Jayaratne, for being helpful and for his guidance and motivation from the beginning of this project. And also I like to thank all others who helped me to get a good knowledge from the university.

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List of Abbreviations

- AERC – Atomic Energy Regulatory Council
- IDE – Integrated Development Environment
- EPF – Employee Provident Fund
- ER – Entity Relationship
- VB – Visual Basic
- UML – Unified Modeling Language
- UAT – User Acceptance Testing
- UI – User Interface

1. Introduction

1.1 Motivation

Salary information details of the 'Atomic Energy Regulatory Council' organization is not handled properly. They are using an excel sheets to maintain salary related information. Therefore they need a new system which can handle all the salary related tasks automatically. Some of the feathers include in the system are display salary sheets according to any given month and year, update salary details, print salary sheets and keeping track of all the salary details for every employee separately. By developing software which can handle these tasks can make it easy to keep track of information in a centralized system. In the current system there is no way of identifying salary related information for employees according to the month, year separately. And also it does not display salary details by individuals and for all employees. This new system will display salary information in a detailed and easy way.

Salary details of all the employees can be viewed in a single page for any selected year and month.so it will be a very attractive thing to the user. Users can clearly get an idea of the salary details and easily can identify the required information. This is very helpful software to the user who is creating the salary sheets as well as for the managers. They can simply get an idea of the whole salary details and data by looking a one single interface which will be an interesting thing. Users of the system can easily add new employee to the system and at the same time they can update the salary details of that employee will be a very attractive feature. Salary slip generation is very easy and can be done according to the employee; year or month will be an advantage.

Salary details can be updated using single interface and user only need to change the EPF no of the employee to update the salary details of an employee. User also can take backups of the salary details at any time. So it will be useful in any case of details are needed.

Managers also can make reports through the system will be a very efficient way of identifying and get good idea of the salary structure and breakdown. System will give an attractive way of handling salary related details and it will reduce the work of the user heavily and will give accurate output by generating salary sheets the way user needs.

1.2   Aims and Objectives

Design payroll system software to the Atomic Energy Regulatory Council organization which can handle all the salary related tasks without doing them manually is the main objective of the project. Users can view salary sheets and information in screens which can navigate through easily from one interface to another. Salary slips are going to be the main output of the product and it can be viewed in printer friendly format before printing it. Other than that reports will be generated monthly yearly by the system.

User is able to print salary sheets separately for each employee as well as print all salary sheets of all the employees at once. Salary details of employees can be searched easily based on to the year and month. So it is easy to find out a particular record quickly and easily. All the information will be stored and ability of taking backups ensures the protection of data. If there is a need of adding new field to the salary sheets it can be easily done by using the corresponding interface of the system.

And also new system can add new employees to the system and update their details as well with the salary data. After creating a salary structure for one time it is very easy to update that monthly since that structure can be used to update salary information for the next month.

1.3 Scope of the Project

- Display all the salary sheet information of all employees in a separate interface and user is able to view them according to the year.

- Ability to update the salary sheets through the system by inserting only the information which changes for the month.

- Add new employees to the system with the salary information using a separate Interface.

- Ability of update the basic information of an employee added initially.

- Display print formats of the salary sheets for each employee separately and user will able to navigate through all the salary sheets using single interface.

- User will able to update the salary sheets by providing year and the month with the EPF number of the employee.

- Keep all the salary related information in the database and users will able to search and filter information separately by year and month.

- Separate search mechanism is planned to create to search salary details using EPF number as well.

- Salary slips will able to print in the sheets and two sheets per page will be printed.

- User can easily take backups of the system and it will protect the data in a separate location.

- Testing is done during development of the system as developer testing and user testing done after developed the system.

1.4 Structure of the dissertation

Chapter 2: Background/Literature Review

Background information to the implementation is described in this section and also have discussed about other similar systems.

Chapter 3: Analysis and Design/Methodology

This Chapter describes how the system analysis and Design parts done and functional and nonfunctional requirements of the system

Chapter 4: Implementation

Implementation chapter describes the way implementation done the software and hardware used to develop the system.

Chapter 5: Evaluation and User Testing

In this Section describes about the way testing happens and the technologies used to do the testing.

Chapter 6: Conclusion and Future Works

This chapter includes description about findings of the project, lessons learnt and what are the future wok can done to improve the system.

2. Background/Literature Review

2.1 Introduction

A payroll is a company's list of its employees, but the term is commonly used to refer to:

- the total amount of money that a company pays to its employees
- a company's records of its employees' salaries and wages, bonuses, and withheld taxes
- The company's department that calculates and pays these.

Payroll in the sense of "money paid to employees" plays a major role in a company for several reasons.

From an accounting perspective, payroll is crucial because payroll and payroll taxes considerably affect the net income of most companies and because they are subject to laws and regulations. From a human resources viewpoint, the payroll department is critical because employees are sensitive to payroll errors and irregularities: Good employee morale requires payroll to be paid timely and accurately. The primary mission of the payroll department is to ensure that all employees are paid accurately and timely with the correct withholdings and deductions, and that the withholdings and deductions are remitted in a timely manner. This includes salary payments, tax withholdings, and deductions from paychecks. [1]

If your business has one or more employees, you should have a payroll system in place. An automatic payroll process helps you comply with legal and tax requirements and simplifies the process of paying your employees. Many employers outsource the payroll function to an outside vendor or use payroll system software instead of relying on manual processes. [2]

There are many payroll systems available in the internet. But desktop applications available in the internet cannot fulfill all the requirements of the Atomic Energy Regulatory Council. Therefore this separate payroll system is created with more functionality which is specially required for the organization. The AERC is using excel sheets to update the salary related information and to

print the salary sheets. They have the need of updating the manual system into an automated one which is very efficient compared to manual insertion of all the data regularly.

Following is a comparison which shows the time saving of an automated payroll system compared with manual one.

Time Saved with Payroll Software [3]

	Without Payroll software	with payroll system
	(Time needed for Employee)	
• Calculates Employee Salaries	1 minute	20 seconds
• Complete paper work	1 minute	20 seconds
• Check compliance with tax and Deductions	2 minutes	20 seconds
• Create payroll reports	2 minutes	20 seconds
Total Time	6 minutes	1 minute 20 seconds

2.2 Analysis of existing popular Payroll Systems worldwide

Below are some of the leading worldwide online payroll systems available in the market.

- Kronos Workforce ready Payroll

All payroll data is readily available through intuitive, highly configurable standard and ad-hoc reporting. Built-in tools make it simple to modify standard reports and to sort, group, filter, or customize report content for any time period. And Perfect Paycheck Analysis helps ensure calculation of the perfect paycheck while offering insights to inform next year's budget planning [4]

- APS Payroll

APS Payroll is an award winning U.S Company which provides that provides cloud-based workforce management and human resources solutions for businesses. APS software provides online HR software, payroll processing services, reporting and workforce management solutions to small and medium sizes companies. [5]

- SAGE payroll

SAGE is another flexible solution designed to meet the payroll need of a business.in this payroll system users can submit payroll data online to HMRC. It keeps up to date records of all employees. The system automatically calculates tax and deductions. Payslips can be created. [6]

- ADP Payroll system

ADP payroll supports three categories which are small, medium-large and any size of Business. System provides online and printed payslips. And it provides flexibility to manage pay roll in house or outsource processes. This is a single database solution for payroll processing. [7]

2.2.1 How Payroll System different from other systems

These systems not having any management related information providing feature. But in Payroll System of AERC have features to get this done. It will provide all the necessary information which need to have for managers to get an overview of the way salary has distributed among employees. And also other than that it will provide picture of how the salary differs from year by year to each employee using charts in an easy way to understand. These charts automatically generated upon user selection of year and EPF number.

Other than that it will as a report how all the employees' salary has been distributed among each month of a particular year. And also there are customized reports which will generate chart of salary distribution for particular chosen time period by the user.

And another feather of this system compared to other system is updating the salary sheets. User can update the salary sheet easily because previous salary sheet is auto generating when new salary updating.

And also Payroll system of AERC having the ability of backup the data of the Database which will be useful when need to access old data in a later time.

2.3 Analysis of similar Payroll Systems

Following are some of the Examples which available in internet designed using visual basic. These Payroll Systems which are available looks same and functionalities are differ.

Payroll Management system project in visual basic[8]
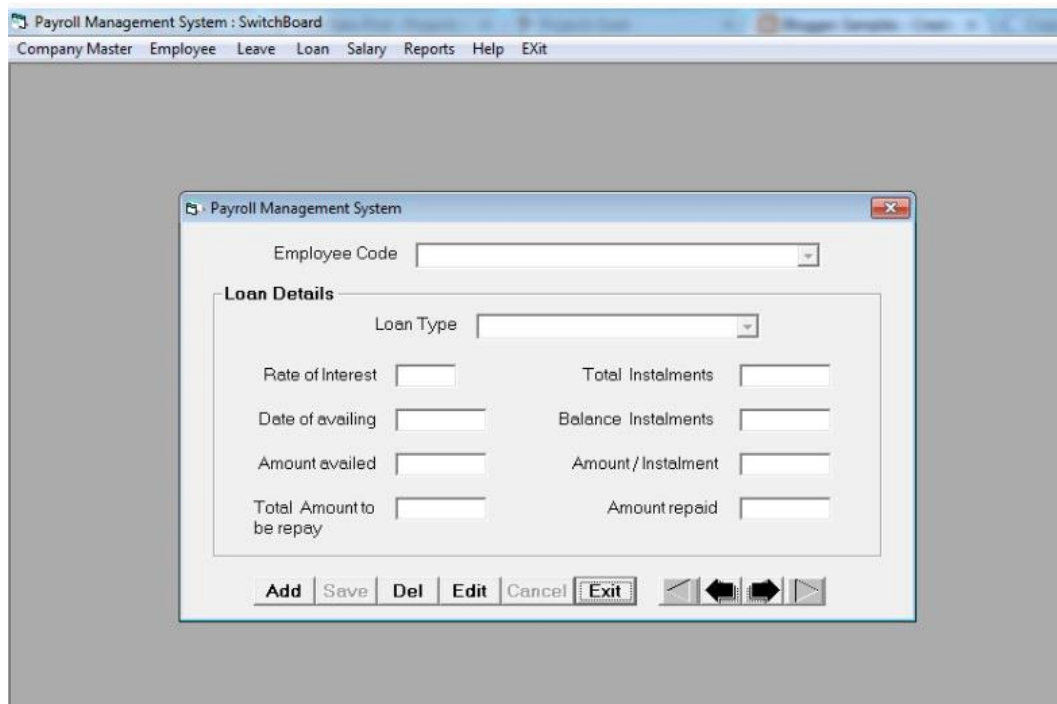
Figure 2.1: Other system interface1

In this system they have used visual basic to create the system. In this system user friendliness is very low and user will not able find out the buttons easily.

System is looking like an old system and not very attractive. Hard to find out the main functionalities of the system and hard to understand what tasks are performing in what interface.

Employee and payroll System [9]
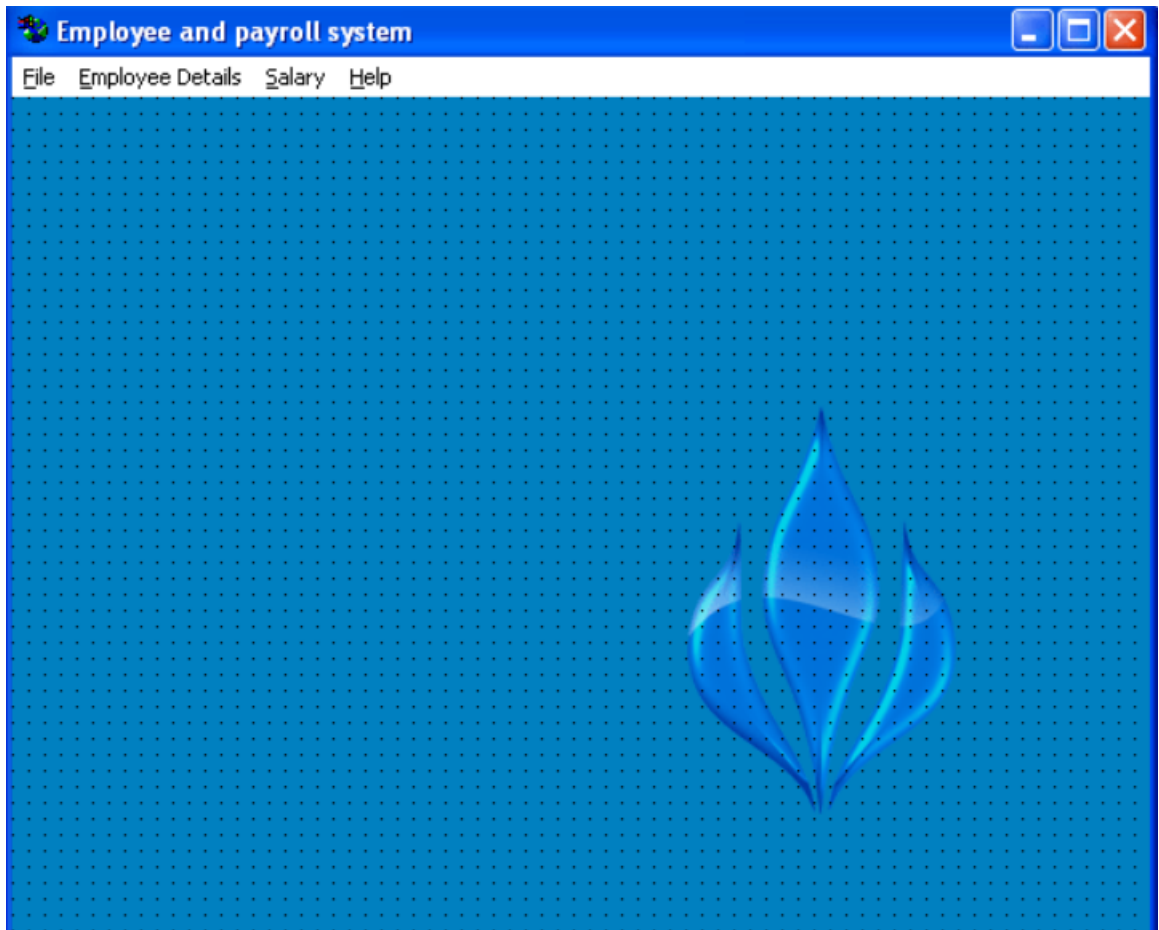
Figure 1.2: Other system interface2

This system also not very attractive and functionalities are hard to identify. System only displaying a menu bar when open the application which is not very user friendly.

2.4   Comparison of alternative technology options

2.4.1   Programming Language

For the system implementation C# Language is chosen as the programming Language and there are some alternative languages such as VB.net and Java which can be used to develop a system.

VB.net vs. C#.net

- Both are Microsoft developed language and based on .net framework development platform.
- Both languages reference the same base classes of the .net fframework to extend their functionality.

Pros – VB.net

- Variables can be declared using the 'WithEvents' construct.so it may select an object from the Class Name drop down list and then select a method from the Declarations drop down list
- Local variables are automatically initialized.
- Local variables can be declared with the static modifier
- Have End keyword which terminates an application.

Cons – VB.net

- Assigning and comparing uses the same token which may create errors.
- Identifiers are not case sensitive.

Pros – C#.net [10]

- Static classes
- Iterative for loops can contain multiple conditions'
- The getter and setter of a property may implement separate interfaces.
- Implicit interface implementation

Cons – C#.net

- By default, numeric operations are not checked. This results in slightly faster code. but may be numeric overflows will not be detected.

C# vs. Java

C#	Java
C# type discipline is nominative and partially inferred.	C# type discipline is nominative and manifest
Type safety is unsafe	Type safety is safe
Designed to be executed on the common Language runtime-CLR	Designed to be executed in java platform using java runtime environment
All its data types derived from one common root type.	Reference types are alone derived from a common root type.
Supports a late bound dynamic types	Does not support a late bound type
Supports operator overloading and custom conversions	Does not support operator overloading and custom conversions.
Support objects initializers and collection initializers.	Does not Support objects initializers and collection initializers.
Supports goto statements	Does not support goto statements
Supports cross language interoperability	Does not support cross language interoperability.

[11]

2.4.2 Database

For the system implementation Microsoft sql server is chosen as the database. Oracle is another alternative database which can be used as the database for a system.

	SQL	Oracle
Developer	Microsoft	Oracle
Server operating systems	C++	C and C++
Operating systems	windows	OS X, Solaris, Windows
Data scheme	Yes	Yes
XML support	Yes	Yes
Secondary indexes	Yes	Yes
APIs and other Access Methods	OLEDB, Tabular Data stream(TDS),ADO.NET,JDBC, ODBC	ODP.NET, Oracle call interface(OCI),JDBC .ODBC
Server side scripts	Transact SQL and .NET languages	PL/SQL
Triggers	Yes	Yes
Foreign keys	Yes	Yes
Concurrency	Yes	Yes
Durability	Yes	Yes

[12]

Since this is a Desktop application C#.net is chosen as the preferred language and Microsoft SQL server is the best suited Database for the .NET environment.

For the Implementation of the system Microsoft Visual studio IDE is chosen as the environment of developing since C# .net is the programming language and sql server is the database which both are Microsoft products hence supports well for the visual studio IDE.

3. Analysis and Design/Methodology

3.1 Analysis

Analysis is based on requirement gathering, functional requirements and non-functional requirements. First have to gather required information from the client prior to implementation of the system. Need to have good understanding of the requirements of the users of the system.

And also required information is done by referring the internet and find out similar solutions and get some ideas from that as well. And also had meet ups with the client and by doing so able to gather lot of information like how should be the interfaces looks like and what are the main and sub functionalities they are looking for and what type of users may use the system and their computer knowledge and understanding of the system also identified.

The Requirements can be mainly divided into two parts which are

- Functional Requirements
- Non Functional Requirements

Functional requirements includes the actual systematic functions of the system which is directly expecting by the client to be get from the system using user interfaces. This covers the general requirements which can see directly.

Non Functional requirements includes the functions which are not directly visible and which should include in the system to be a more valuable and good system. These requirements are also expected by client and very important to get the client satisfactory. These can be measured using different technologies and they are depending on the functionality type.

3.1.1 Functional Requirements

Following are the list of main functional requirements of the Payroll system of AERC. These are identified according to the automated payroll system requirements of Atomic Energy Regulatory Council.

- Display all the salary sheets in a separate interface

  User should able to get all the salary information of all the employees in a single interface and able to navigate through all the options of the salary structure.

- Able to view the salary details in the front interface yearly

  User should able to see the salary details according to the selected year which can be chosen by the user for all employees in the Display salary sheets interface

- Able to view the salary details in the front interface monthly

  User should able to see the salary details according to the selected month which can be chosen by the user for all employees in the Display salary sheets interface

- Ability to update the salary details only for month

  User should able to update the salary details of a particular month by using the EPF No and the help of update salary sheets interface.

- Add new employee to the system with salary details

  By using a new interface called Add new employee use should able to add a new employee to the system and thereafter can update the salary details of that employee from the day of added.

- Update employee salary details

  User should able to update the salary details of the employees by using their lasth given salary structure and appropriate changes have to be done using update salary sheets interface.

- Update basic information of an employee

  After adding an employee to the system employee basic details can be updated using update employee interface.

- Display salary print formats separately for employees

  System should have the ability to show print format of the salary sheets separately for each employee and navigate through each employee using same interface

- Ability to navigate through all the salary sheets

  In the generate salary slips interface user should able to navigate through all the salary sheets.

- Ability to update salary sheets by providing year month with EPF number

  User should able to update any salary sheet of an any employee by providing year and month.

- Keep All the Salary details in the database

  All the salary details of the employees should be kept in the database

- Able to filter salary details by year and month.

  User should have ability to filter salary details of an employee and do q quick search using search interface.

- Print salary sheets

  System should print the salary sheets in the format of salary sheets

- Ability to backup of the salary data

  System should provide backup ability of the database using Backup interface to Back up all the data into a separate location.

- Ability to restore of the salary data

  System should able to restore database using a backup took by earlier and separate password may use to restore since it should have access control per the requirements of the client.

3.1.2 Non Functional Requirements

User friendliness of the Interface

     User is able to navigate to the Salary sheets with a single interface easily. So user can view all the salary sheets of the all the employees in a single interface. And also user can view the salary details of all employees according to the year and month in a single interface. Interfaces are clear and easy to identify because of the look and appearance of them. It is not complex and colors and themes will be attractive for the person using the system.

Performance

     User will able to view the details quickly without any delay. Data should be loaded instantly to the user when perform a task in the system. When user navigate through salary details sheets using arrow keys provide in the software user will not face any delay to getting in to the next salary sheet.

Accuracy

Data which is generated by the system should be accurate. Then user can perform tasks easily with confidence. The Data which is provided to the system are calculated using well tested scenarios and results will be accurate since that. Salary details should be very accurate since error can be caused a mismatch in money. Specially because the system is interacting with money accuracy is considered very tightly.

Security

Security also very important factor in system and the whole system is therefore password protected. Main interface of the system can be only accessed after provide the main password. Other than to view reports and to done a restoration of a database separate passwords are needs which ensures the security of the system.

Availability

System should available for the use whenever it needed to access. Since this is desktop application availability should be always there without even having the network support. Connection to the database should be there always and hence able to do any insertion or updating to the database without any issue.

Privacy

All salary related details only can be update and access by authorized person. Database access should be only done using authorized person and database should have a password and only admin users should able to use that.

3.2 Design

3.2.1   Use Cases

Use-Case Name	Add new Employee
Use-Case ID	001
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Add new Employee 2. Enter EPF NO 3. Enter Employee Details 4. Enter Salary Details 5. Click on Save button
Alternative flow	2(a) Enter Invalid EPF no 2(a) 1. Popup displaying indicating EPF no should be a valid number 2(a) 2.System will prompt to enter the EPF No again
Post-condition	User will create a new Employee with salary Details.

Table 3.1: Add new employee use case

Use-Case Name	Update an employee
Use-Case ID	002
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Update Employee 2. Enter EPF NO 3. Enter Employee Details 4. Enter Salary Details 5. Click on Save button

Alternative flow	2(a) Enter Invalid EPF no
	
	   2(a) 1. Popup displaying indicating EPF no should be a valid number
	   2(a) 2.System will prompt to enter the EPF No again

Post-condition	User will update employee details with salary Details.

<div align="center">Table 3.2: Update an employee use case</div>

Use-Case Name	View All Salary Details
Use-Case ID	003
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Display Salary Sheets 2. System should display all the salary details of the employees in a single interface 3. Navigate through months using left and right arrows

Alternative flow	2(a) Enter Invalid EPF no
	
	   2(a) 1. Popup displaying indicating EPF no should be a valid number
	   2(a) 2.System will prompt to enter the EPF No again

Post-condition	User will create a new Employee with salary Details.

<div align="center">Table 3.3: View All Salary Details use case</div>

se-Case Name	Update Salary of an Employee
Use-Case ID	004
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Update Salary Details 2. Enter EPF Number 3. Select the year 4. Select the month 5. Click on update button 6. Update salary information 7. Click on save button

Alternative flow	2(a) Enter Invalid EPF no
	
	  2(a) 1. Popup displaying indicating EPF no should be a valid number
	  2(a) 2.System will prompt to enter the EPF No again
	
	3(a) Enter a year which does not contain information of that employee
	
	  3(a) 1. Popup displaying details for this year is not available
	  3(a) 2.System will navigate back to the year drop down
	
	4(a) Enter a month which does not contain information of that employee
	
	  4(a) 1. Popup displaying details for this month is not available
	  4(a) 2.System will navigate back to the month drop down

Post-condition	User will Update salary Details for an particular employee

Table 3.4: Update Salary of an Employee use case

Use-Case Name	search for details of an Employee
Use-Case ID	005
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on search 2. Enter EPF Number 3. Select the year-optional 4. Select the month - optional 5. Click on search button

Alternative flow	2(a) Enter Invalid EPF no
	
	  2(a) 1. Popup displaying indicating EPF no should be a valid number
	  2(a) 2.System will prompt to enter the EPF No again
	
	3(a) Enter a year which does not contain information of that employee
	
	  3(a) 1. Popup displaying details for this year is not available
	  3(a) 2.System will navigate back to the year drop down
	
	4(a) Enter a month which does not contain information of that employee
	
	  4(a) 1. Popup displaying details for this month is not available
	  4(a) 2.System will navigate back to the month drop down

Post-condition	User will able to see the related information of the employee which searched

Table 3.5: search for details of an Employee use case

Use-Case Name	Manage deductions
Use-Case ID	006
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Leave and deductions 2. Enter EPF Number 3. Select the year 4. Select the month 5. Update the deductions for the particular month 6. Click on update deductions button

Alternative flow	2(a) Enter Invalid EPF no
	
	   2(a) 1. Popup displaying indicating EPF no should be a valid number
	   2(a) 2.System will prompt to enter the EPF No again
	
	6(a) all the required part is not filled.
	   6(a) 1. Prompt user to fill all the required fields and show the places.
	   6(a) 2.Navigate back to the deductions page.

Post-condition	User will able to see the related information of the employee which searched

Table 3.6: Manage decisions use case

Use-Case Name	Generate Salary Slips
Use-Case ID	007
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Generate Salary slips button 2. Select the year 3. Select the month 4. Click on submit button

	5. Navigate through the salary details
Alternative flow	2(a) Salary slips not available for that year
	2(a) 1. Popup displaying salary details are not available
	2(a) 2.System will redirect to the main page
	3(a) 1. Popup displaying details for this year is not available
	3(a) 2.System will navigate back to the year drop down
	4(a) Enter a month which does not contain information of that employee
	4(a) 1. Popup displaying details for this month is not available
	4(a) 2.System will navigate back to the month drop down
Post-condition	User will able to generate the salary slips.

Table 3.7: Generate salary slips use case

Use-Case Name	Print Salary Slips
Use-Case ID	008
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Generate Salary slips button 2. Select the year 3. Select the month 4. Click on submit button 5. Click on print button
Alternative flow	2(a) Salary slips not available for that year and month
	2(a) 1. Popup displaying salary details are not available
	2(a) 2.System will redirect to the main page

Post-condition	User will able to print the Salary slips

Table 3.8: print salary slips use case

Use-Case Name	Generate reports
Use-Case ID	009
Primary business actor	Manager
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Generate Salary slips button 2. Select the year 3. Select the month 4. Click on submit button 5. Click on print button

Alternative flow	2(a) Salary slips not available for that year and month
	
	   2(a) 1. Popup displaying salary details are not available
	   2(a) 2.System will redirect to the main page

Post-condition	User will able to print the Salary slips

Table 3.9: Generate reports use case

Use-Case Name	Create Backup
Use-Case ID	010
Primary business actor	User
Pre-Condition	System should be open and ready to use
Main flow	1. Click on Backup button 2. Choose the destination need to save 3. Click on create button
Alternative flow	4(a) Backup is not created successfully

	2(a) 1. Popup displaying Backup is not created. 2(a) 2.System will redirect to the main page
Post-condition	User will able to create a backup of the salary details

Table 3.10: Create backup use case

Use-Case Name	Restore the system
Use-Case ID	011
Primary business actor	User
Pre-Condition	System should be open and ready to use Previous backup should be available
Main flow	1. Click on restore 2. Click on Restore button 3. Choose the backup saved location 4. Click on restore button
Alternative flow	4(a) restore is not successful. 2(a) 1. Popup displaying Restore process is not successful. 2(a) 2.System will redirect to the main page
Post-condition	User will able to do a restoration of the system successfully.

Table 3.11: Restore the system use case

3.2.2 Use Case Diagram
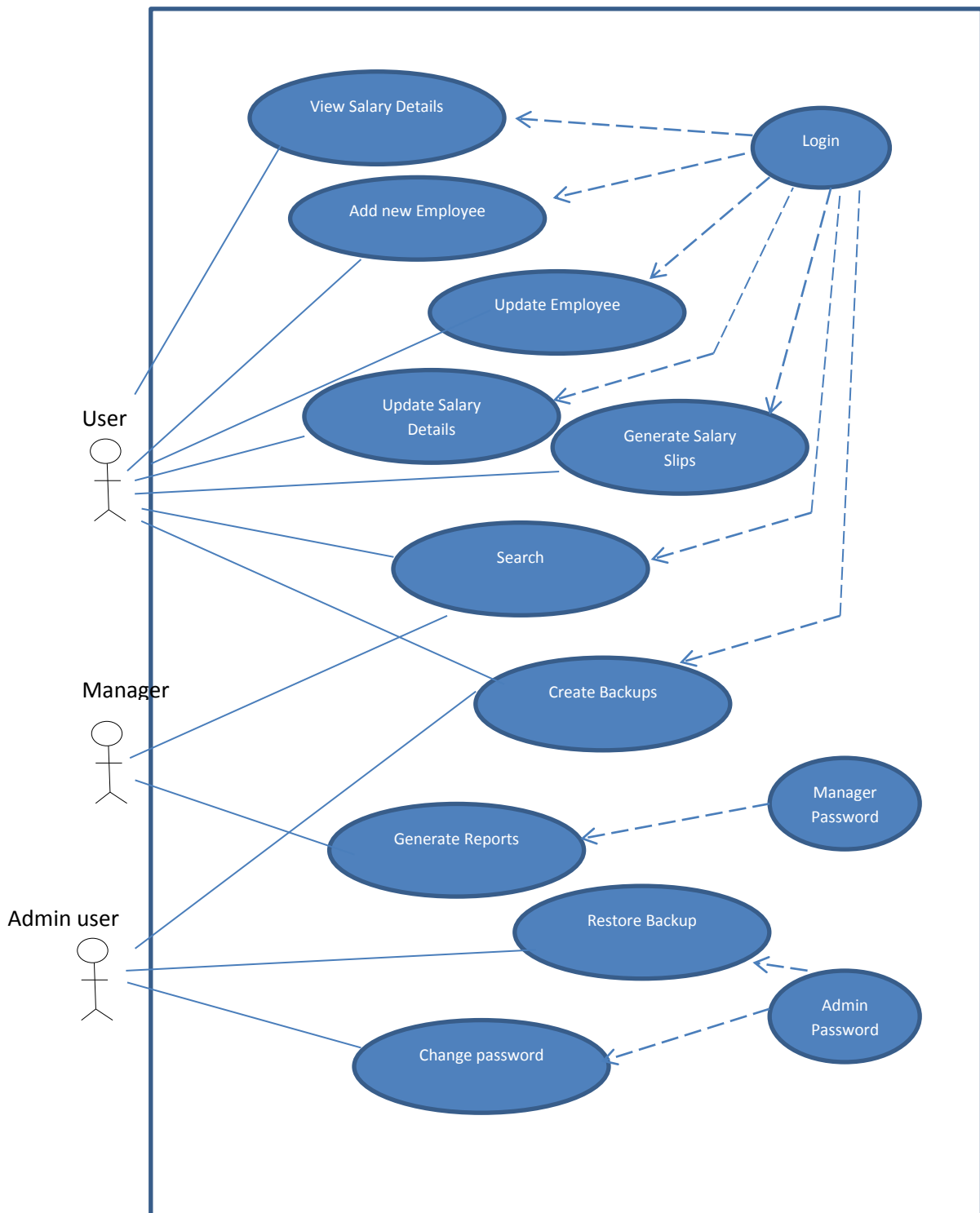
Figure 3.1 : Use Case Diagram

3.2.3 ER Diagram

Figure 3.2: ER Diagram

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3.2.4   Class Diagram

Display Salary

EPF : Int
Year : String
Month : String

Display_salary ()
Navigate_Salarysheets()

Update Employee

EPF : Int
Name : String

Update_employee()

Manage deductions

EPF : Int
Year : String
Month : String

Add_deductions()

Add Employee

EPF : Int
Name : String

Create_employee()

Update Salary

EPF : Int
Year : String
Month : String

Open_salary ()
update_salary()

Backup

Backup_No : int
Date : Date

Create_backup()

Generate reports

EPF : Int
Report No : int

create_report()

Restore

Backup_No : int
Date : Date

Restore_backup()

Access Main Page

Password : String

password ()

User Login

Password ()

Admin User

Password ()

Manager Login

Password ()

Figure 3.3: Class Diagram

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4. Implementation

4.1 Introduction

For the implementation of the Payroll System used Visual studio as the main IDE and used C# as the programming language to program the system. For data retrieval from the database sql language is used and as the database used the Microsoft SQL server.

First user interface creation is done and then started to do the database creation and the coding of the system based on the user interfaces. SQL queries were written to retrieve data from the database and to display those data use interfaces.

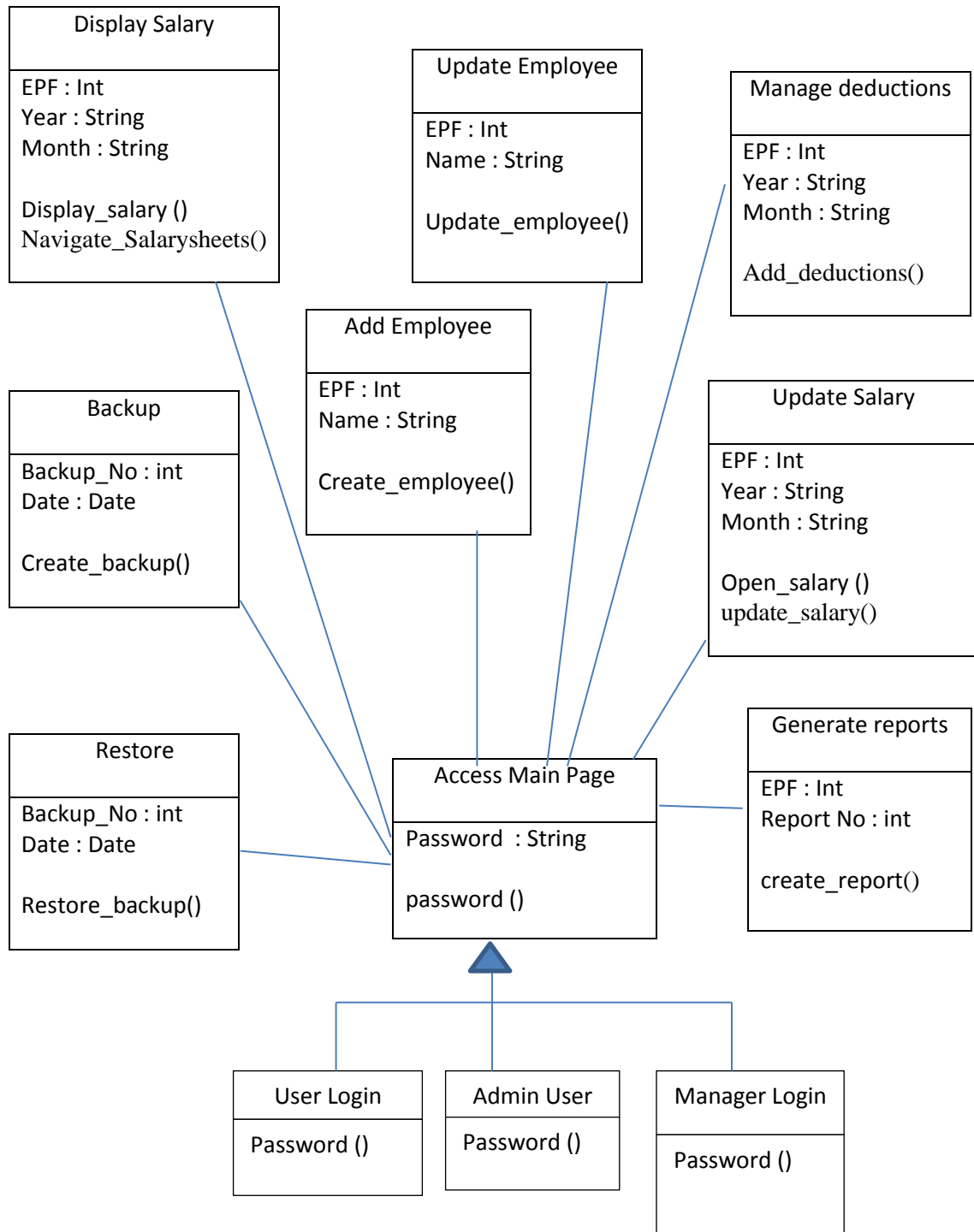Interfaces are consists of add new employee, update employee, display salary sheets, update salary sheets, backup, generate salary slips, search, change password , reports.

Users can perform display salary sheets, update salary sheets, add new employee, update employee, generate salary slips, search and creating backups. Managers have ability to view reports and managers will able to generate and view reports

For the implementation of the system used the waterfall life cycle and design patterns like Inheritance has been used.

Inheritance

In object-oriented programming, inheritance is the concept that when a class of objects is defined, any subclass that is defined can inherit the definitions of one or more general classes.It is a mechanism for code reuse and to allow independent extensions of the original software via public classes and interfaces

In the Payroll system of AERC users can be categorized in to three main groups. They are Normal users, Admin Users and Managers. They all having common functionality which is password and Admin users and Managers differ since they are using an additional password.

So the main functionalities of the all users are same and Managers and Admin users have some extra functionality which makes inheritance of normal user.

4.2 Technologies and Tools used

- C#.net

C# is used as the programming language to build the system in the .net environment. C# is an object oriented language from Microsoft that aims to combine abilities of C++ and VB.net languages. C# is based on C++ language. C# is one of the languages developed for Common language infrastructure# is one of the commonly used popular language worldwide.

- Microsoft SQL Server

Microsoft SQL server is used as the database of the system. SQL server is relational database management system which is from Microsoft. This is a fully featured competitive database which having all necessary functions. It is one of the three market leading database technologies available.

- Microsoft Visual studio Express

Visual studio express 2015 community edition is used as the developing environment for developing the system. This is a full free version of the visual studio and contains most of the features. Visual studio is an integrated development environment from Microsoft. It is used to develop software for Microsoft windows, web sites, desktop applications and mobile applications. It can produce both native code and managed code.

- Adobe Photoshop, paint

Adobe Photoshop and paint software were used to create the contents of the user interfaces. Use for edit the images of the buttons to create colorful features of the user interfaces.

4.3 Software and Hardware Requirements

4.3.1 Hardware

- Intel core I7 processor
- 8 GB RAM
- 1TB hard disk
- 64 bit operating system supports windows xp,7 and 8
- VGA
- 2.6 GHz CPU

4.3.2 Software

- Microsoft Visual Studio 2015 express community edition
- Microsoft SQL server 2012
- Adobe Photoshop cs5/ Microsoft paint
- Microsoft Windows
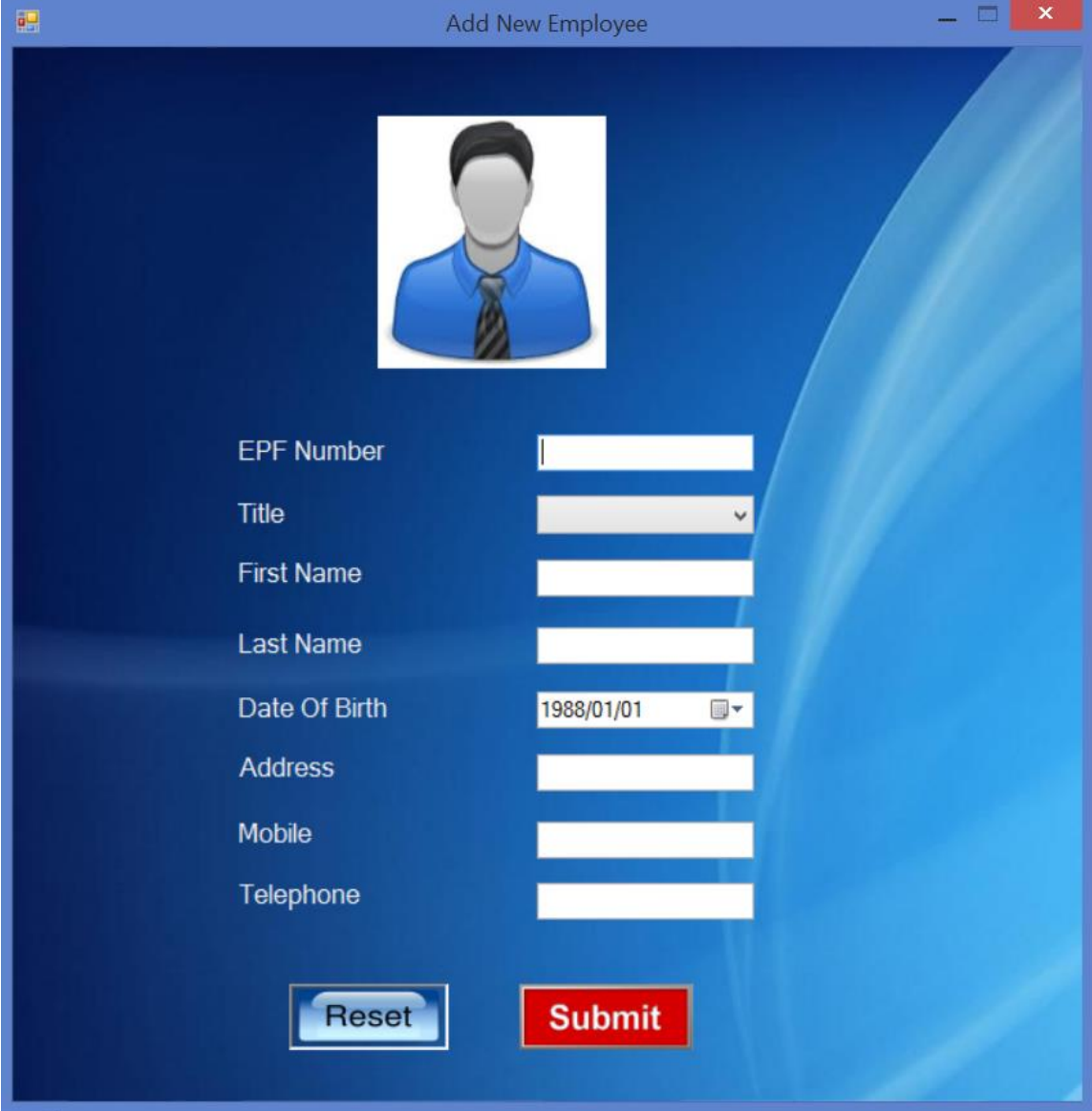
4.4 System interfaces

Following is the main interface of the Atomic Energy Regulatory council payroll system which is used to navigate to other functional interfaces.

Figure 4.1: Main interface of payroll system

Below is an screenshot of the add new employee interface. Adding a new Employee to the system is done using this interface.

Figure 4.2: Add new employee interface

Below is the display salary sheets interface. This interface view the all salary details of all employees and user can navigate through the buttons and view salary sheets according to a particular year and month. And also user can get print out of the view as well

Figure 4.3: Display salary sheets interface

5. Evaluation and User Testing

5.1 Testing Methodology

Software testing is the execution of the software by intention of finding software bugs. By doing good software testing software can be a very good one with bug free or minor bugs. Software testing can be categorized in to many areas. Software testing can be done in the time of development and later as a separate testing process.

5.1.1   Ad-hoc Testing

Testing which will be done during the coding according to the paths which identified. So the Errors can be identified at the same time. By doing Ad hoc testing able to identify some errors and areas which need to improve. Ad-hoc testing is performed without planning and documentation. This is the least formal testing method.

5.1.2   White Box Testing

Testing is being done while development and coding is done. Errors will be identified at the moment where development happens and fixed them at the same time. This is very effective way and defects can be fixed without going to the Testing phase. It is a method of testing software that tests internal structures and working of an application.

5.1.3 Black Box Testing

Testing which will be done by examines the functionality of an application without monitoring the internal structures of the system. This testing will be done without looking at internal code structure, implement details and knowledge of internal paths.

5.1.4 User Acceptance Testing

Testing which will be done by the user. User will give feedback about the system after done testing by the user. So the things which they are mentioning and errors need to be fixed after the user Acceptance testing.

5.2 Usability Testing

To get what are the actual needs and to get an idea how user will interact with system one of the methods can be used is Questioners can. By giving some set of simple questions with answers to choose able to identify the way how user expected the system should behave and what type of computer knowledge they have. And also what kind of people are going to interact with the system. Following is a part of Questioner used for the Payroll system.

Please refer the Sample questionnaire in appendices section

5.3 Testing of the Add new Employee functionality

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test Add Employee validations	Test case 1: Check system can add new Employee	Pass	
	Test Case 2: Check system can add new without Earnings and Deductions	Pass	
	Test Case 3: Check system can add new employee only with Earnings and Deductions	Pass	
Test Basic Details part of the Add new Employee page	Test Case 4: Check EPF Number	Pass	
	Test Case 5: Check Name Validations	Pass	
	Test Case 6: Validations of selecting year	Pass	
	Test Case 7: Validations of selecting month	Pass	

Table 5.121: Add new employee functionality

5.4 Testing of the display salary sheets functionality

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test display functionality	Test case 1: Check system can display the salary sheets without selecting year	Pass	
	Test Case 2: Check system can display the salary sheets according to the year	Pass	
	Test Case 3: Check system can display the salary sheets according to the month	Pass	
Test navigation functionality	Test Case 4: check whether left navigation working properly	Pass	
	Test Case 5: Check whether right navigation working properly	Pass	
	Test Case 6: check left navigation without click on view button	Pass	
	Test Case 7: check right navigation without click on view button	Pass	
Test print functionality	Test Case 8: Check whether print button enabled without click on view button	Fail	Identified as a minor defect and fixed the issue

	Test Case 9: check print button functionality	Pass	
	Test Case 10: check print button functionality with navigation buttons	Pass	

<div align="center">Table 5 132: display salary sheets functionality</div>

5.5   Testing of the Update employee functionality

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test select employee functionality	Test case 1: Check system can select the correct employee using EPF	Pass	
	Test Case 2: Check system can display the correct information of the selected employee	Pass	
Test update functionality	Test Case 3: Check whether details can be update accordingly.	Pass	
	Test Case 4: check save functionality of the updating.	Pass	
	Test Case 5: check whether updated information can view with the updates.	Pass	

5.6   Testing of the update salary sheets functionality

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test display functionality	Test case 1: Check validations of EPF number	Pass	
	Test Case 2: Check system can select the correct salary sheet of the employee	Pass	
	Test Case 3: Check system can select the salary sheet according to the year	Pass	
	Test Case 4: Check system can select the salary sheet according to the month	Pass	
Test update functionality	Test Case 5: Check whether all the required fields can be updated	Pass	
	Test Case 6: check validations of the fields	Pass	
	Test Case 7: check error messages of the field validations.	Pass	
	Test Case 8: check save of the update details function	pass	
	Test Case 9: check whether updated salary details can be viewed with the updates	Pass	

Table 5.154: update salary sheets functionality

5.7 Testing of the generate salary slips functionality

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test display functionality	Test case 1: Check validations of EPF number	Pass	
	Test Case 2: Check system can display correct salary sheet of the employee	Pass	
	Test Case 3: Check system can select the salary sheet according to the year	Pass	
	Test Case 4: Check system can select the salary sheet according to the month	Pass	
Test navigate functionality	Test Case 5: Check whether left navigation working properly	Pass	
	Test Case 5: Check whether right navigation working properly	Pass	
	Test Case 6: check left navigation without click on display button	Pass	
	Test Case 7: check right navigation without click on display button	Pass	

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comment
Test print functionality	Test Case 8: Check whether print button is enabled properly	Pass	
	Test Case 5: Check whether can print selected salary sheet	Pass	
	Test Case 6: check whether can print all the salary sheets	Pass	
	Test Case 7: check whether print working properly with navigate buttons	Pass	

Table 5 165:   generate salary slips functionality

5.8 Testing of the Login page

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comment
Test user login functionality	Test case 1: check validations by click login without any password	Pass	
	Test Case 2: check validations by click login with a wrong password	Pass	
	Test Case 3: check validations by click login with a correct password	Pass	
Test Admin user login functionality	Test Case 4 : check whether password popup is available when navigate to the Backup page	Pass	
	Test Case 5 : check whether password popup is available when	Pass	

	navigate to the settings page		
	Test case 6: check validations by click login without any password	Pass	
	Test Case 7: check validations by click login with a wrong password	Pass	
	Test Case 8: check validations by click login with a correct password	Pass	
Test Manager login functionality	Test case 9: check validations by click login without any password	Pass	
	Test Case 10: check validations by click login with a wrong password	Pass	
	Test Case 11: check validations by click login with a correct password	Pass	
	Test Case 12 : check whether password popup is available when navigate to the reports page	Pass	

Table 5.176: Login page functionality

5.9 Testing of the Backup page

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test Backup function	Test case 1: click on backup and check whether backup window is populating	Pass	
	Test Case 2: Check the validation of the date field	Pass	
	Test Case 3: Check whether location of the backup can be changed.	Pass	
	Test Case 4: Check whether backup is successfully saved in the given location.	Pass	
	Test Case 5: check whether when backup not happen error message is displaying	Pass	

Table 5.187: Backup page functionality

5.10   Testing of the Restore page

Test Scenario	Test cases	Status(Pass/on hold/Fail)	Comments
Test restore function	Test case 1: click on Restore and check whether password prompt is displaying	Pass	
	Test Case 2: check whether Restore window is displaying after enter the correct password.	Pass	
	Test Case 3: Check whether location of the backup file can be search correctly	Pass	
	Test Case 4: Check whether backup is successfully can be restored	Pass	
	Test Case 5: check whether when restore not happen error message is displaying	Pass	

Table 5.198: Restore page functionality

5.11   User Acceptance

User Acceptance is a very important factor in software development. It is the last phase of software testing. Actual users of the system test the system to make sure it can handle required functionalities well. If the users are satisfied with the system the software development is done.

Below is a form of user Acceptance used and the results.

Payroll system - AERC	
01	How the user Interfaces looks in the system 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
02	How easy adding a new employee to the system 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
03	Display salary sheets page 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
04	How fast update a salary sheet 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
05	Find a salary sheet of an particular employee 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
06	How is update employee details page 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
07	How easy to generate a salary slip 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
08	How is the printed salary sheet 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
09	Time taken to print all the salary sheets 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐
10	How is the overall performance of the system 1. Poor ☐ 2. Average ☐ 3. Good ☐ 4.very good ☐ 5.Excellent ☐

Figure 5.1: Acceptance Test

Results of the test

Question No	Poor	Average	Good	Very good	Excellent
01	0	2	3	5	10
02	1	3	8	6	2
03	0	0	5	13	2
04	0	2	6	6	6
05	1	3	4	8	4
06	2	2	8	5	3
07	0	1	5	5	9
08	0	2	5	7	6
09	1	2	4	6	7
10	0	1	4	6	7

Total	5	18	52	67	56
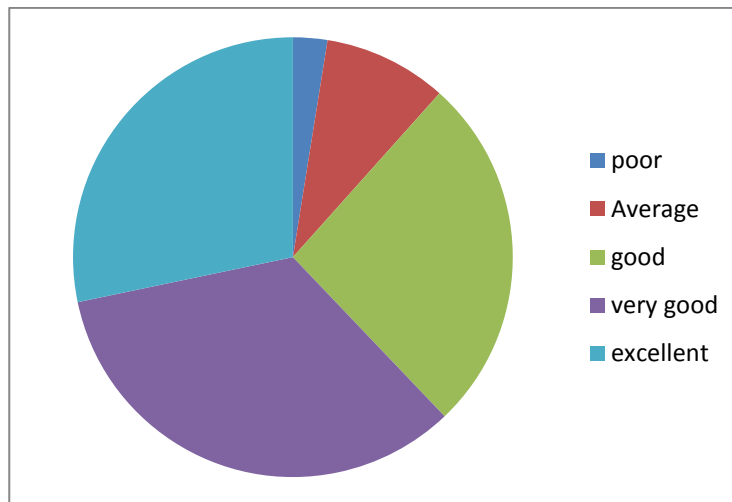
Figure 5.2: Test results chart

From this testing methodology most of the time system get accepted as very good and excellent level which is good level of user satisfactory.

6. Conclusion and Future Works

6.1 Conclusion

The System will give an attractive way of handling salary related details and it will reduce the work of the user heavily and will give accurate output by generating salary sheets the way user needs.

The major findings of the projects are how to make a printable version of the salary slips, how to interconnect interfaces using one interface, how to navigate in many pages using one interface.

6.2 Lessons Learnt

It was difficult to make the salary sheet in to a printable version. Have to do some extra findings to do the coding of the printing part. By using internet resources able to find out a way to do it and get the final main output of the project which is a salary slip in a printable format.

6.3 Future Work

As extensions of the Project for Future work the Payroll system can be connected with other systems of the company and can use these data of the salary details to make easy the work of the other systems.

The number of salary slips which will fit in to one page can be designed to decide by the user with few multiple selections and according to the user's selection number of salary sheets should be included in a page can be changed will be an added feature to the system.

And also deduction page of the system can be directly connect with a attendance system and get the records directly from that without calculating in the payroll system

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Appendices

Appendices – A: User Manual

Login page

First user have to provide password in the Login page and enter into the below main page of the system.
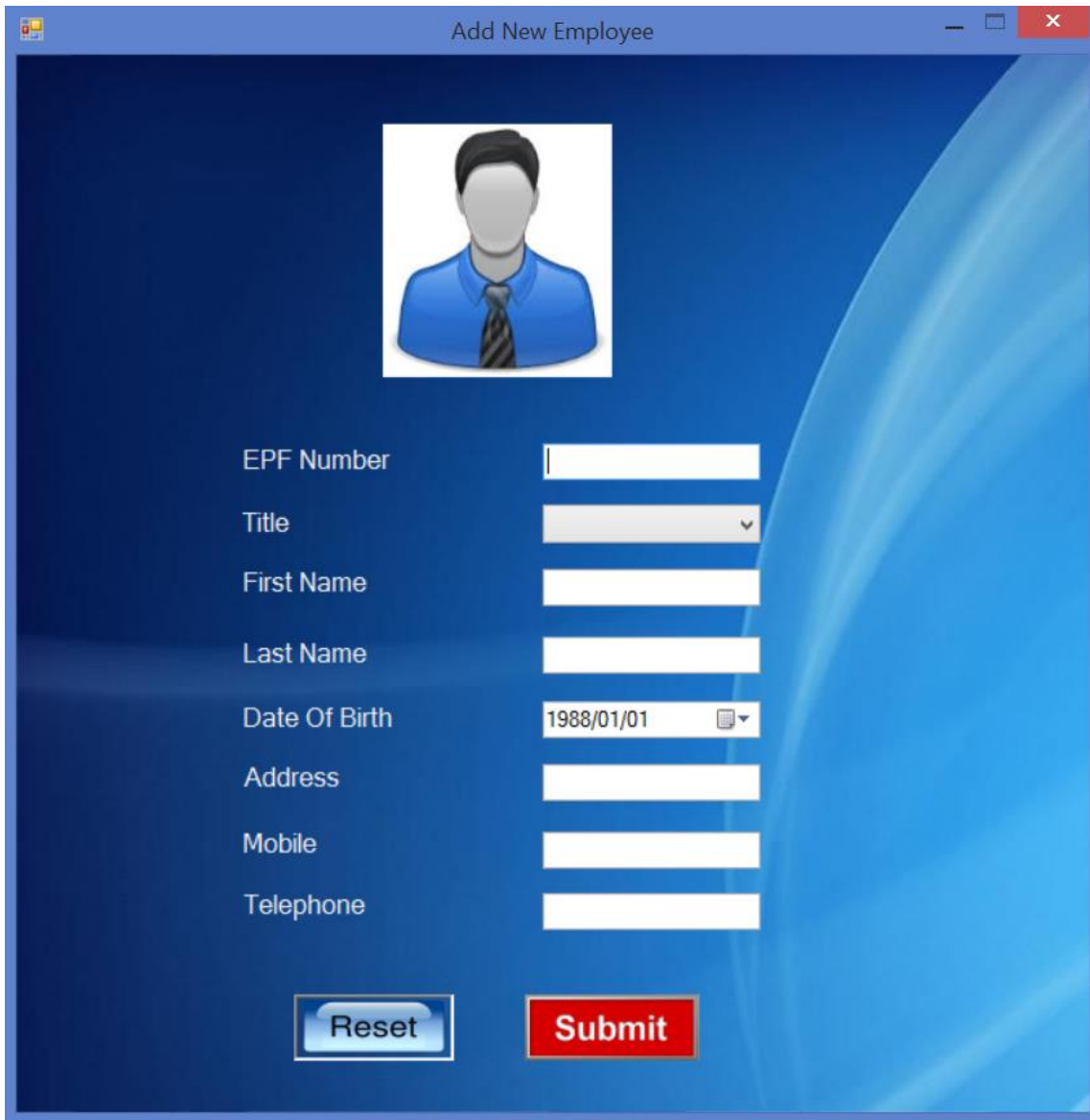
Then if user needs to display all the salary sheets have to click on Display salary sheets option. Then below window will be opened and using navigation arrows can navigate through whole salary structure easily. Print button is there to print the salary sheets from the moment you view it.
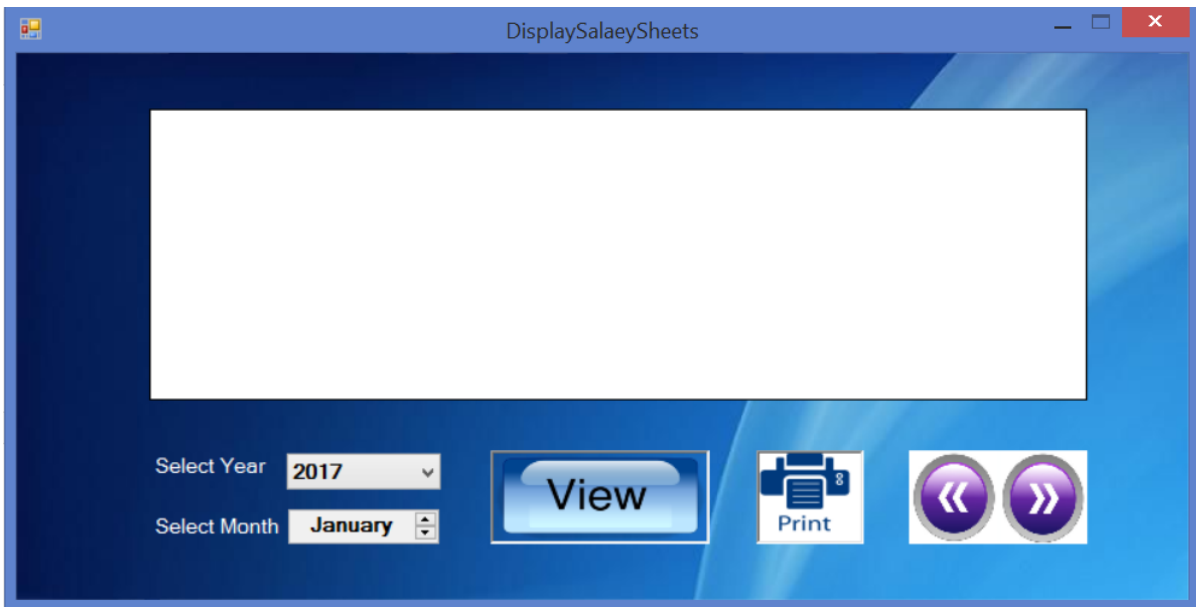
You can change the year and month accordingly and view the corresponding salary sheets of all the employees. After done you can close the page using close button.

If you need to add new employee to the system click on Add new employee option on the main page of AERC and then fill necessary information properly and click on add button will create a new employee in the system.

To generate salary slips click on Generate salary slips option. Then select the year and Month and then click on submit button will display all the salary sheets and you can navigate among employees using previous and next buttons.

To take a Backup of the system simply clicks on Backup button and then window will pop up and you have to select the location of the backup file need to be saved and then save the file in the which shows as below.
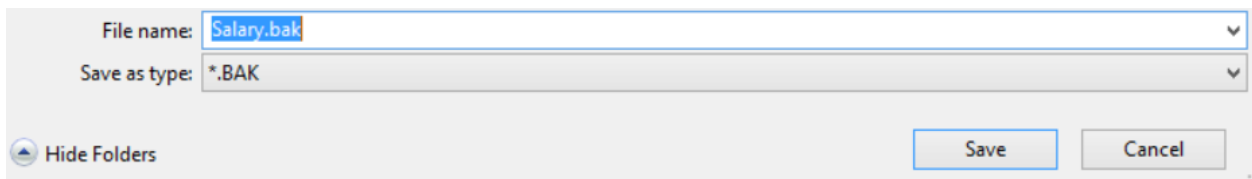
To restore a Backup you need to have the Admin user access and then select the backup file location and then click on restore button will restore your system with the backup file.

Other than that you can update Employee details using update employee option of the main page. And also update the salary details using update salary details in the main page.

Also you can search for an employee using search page and salary sheets also can be searched. Using Report option managers can generate repots using their separate password and Admin users have the ability of restore the system and change the passwords.

Appendices – B: System Documentation

Payroll system for Atomic Energy Regulatory Council-AERC

Windows Desktop Application

Version 1.0

Hardware requirements

Processor	Intel 2 Ghz or higher cpu
RAM	1GB or Higher(2GB recommended)
Hard disk	100GB free disk space
Screen resolution	1920x1080 recommended

Software requirements

Operating system	Windows xp/7/8/10
Framework	.Net Framework 4.0 or higher
Database	SQL server 2012 SQL Management studio

The sample Questioner for Payroll system of AERC

1. How many experience you have as an employee

○ Less than 2 year

○ Greater than 2 year

○ Greater than 5 year

2. Your Knowledge about handling computer Software

○ Basic

○ Average

○ Advance

3. Your Knowledge about Payroll system

○ Basic

○ Average

○ Advance

4. How much user Friendly the Payroll system Software is

○ Bad

○ Good

○ Excellent

5. Is the System is satisfied with your needs

○ Yes   ○   No

6 Need to do modifications to this system.

○ Yes   ○   No

Appendices – C: Test Plan and Test Cases

Test Plan

Test Case No	Test cases	Status(Pass/on hold/Fail)	Priority	Comments
Add new Employee Functionality				
01	Check system can add new Employee	Pass	High	
02	Check system can add new without Earnings and Deductions	Pass	Med	
03	Check system can add new employee only with Earnings and Deductions	Pass	Med	
04	Check EPF Number	Pass	Med	
05	Check Name Validations	Pass	Med	
06	Validations of selecting year	Pass	Med	
07	Validations of selecting month	Pass	Med	
Display Salary Sheets				
08	Check system can display the salary sheets without selecting year	Pass	High	
09	Check system can display the salary sheets according to the year	Pass	High	
10	Check system can display the salary sheets according to the month	Pass	High	
11	check whether left navigation working properly	Pass	Med	
12	Check whether right navigation working properly	Pass	Med	

13	check left navigation without click on view button	Pass	Med	
14	check right navigation without click on view button	Pass	Med	
15	Check whether print button enabled without click on view button	Fail	Med	Defect Fixed
16	check print button functionality	Pass	High	
17	check print button functionality with navigation buttons	Pass	High	
Update Employee Functionality				
18	Check system can select the correct employee using EPF	Pass	High	
19	Check system can display the correct information of the selected employee	Pass	High	
20	Check whether details can be update accordingly.	Pass	High	
21	Check save functionality of the updating.	Pass	High	
22	Check whether updated information can view with the updates.	Pass	High	
Update Salary sheets				
23	Check validations of EPF number	Pass	High	
24	Check system can select the correct salary sheet of the employee	Pass	High	
25	Check system can select the salary sheet according to the year	Pass	High	
26	Check system can select the salary sheet according to the month	Pass	High	
27	Check whether all the required fields can be updated	Pass	High	
28	Check validations of the fields	Pass	Med	

29	Check error messages of the field validations.	Pass	Med	
30	Check save of the update details function	Pass	High	
31	Check whether updated salary details can be viewed with the updates	Pass	High	

Generate Salary slips

32	Check validations of EPF number	Pass	High	
33	Check system can display correct salary sheet of the employee	Pass	High	
34	Check system can select the salary sheet according to the year	Pass	High	
35	Check system can select the salary sheet according to the month	Pass	High	
36	Check whether left navigation working properly	Pass	Med	
37	Check whether right navigation working properly	Pass	Med	
38	Check left navigation without click on display button	Pass	Med	
39	Check right navigation without click on display button	Pass	Med	
40	Check whether print button is enabled properly	Pass	Med	
41	Check whether can print selected salary sheet	Pass	High	
42	Check whether can print all the salary sheets	Pass	High	
43	Check whether print working properly with navigate buttons	Pass	High	

	Login page			
44	check validations by click login without any password	Pass	High	
45	check validations by click login with a wrong password	Pass	High	
46	check validations by click login with a correct password	Pass	High	
47	check whether password popup is available when navigate to the Backup page	Pass	High	
48	check whether password popup is available when navigate to the settings page	Pass	High	
49	check validations by click login for Admin user without any password	Pass	High	
50	check validations by click login for Admin user with a wrong password	Pass	High	
51	check validations by click login for Admin user with a correct password	Pass	High	
52	check validations by click login without any password for manager	Pass	High	
53	check validations by click login with a wrong password for manager	Pass	High	
54	check validations by click login with a correct password manager	Pass	High	
55	check whether password popup is available when navigate to the reports page	Pass	High	
	Backup page			
56	click on backup and check whether backup window is populating	Pass	High	
57	Check the validation of the date field	Pass	Med	

58	Check whether location of the backup can be changed.	Pass	High	
59	Check whether backup is successfully saved in the given location.	Pass	High	
60	check whether when backup not happen error message is displaying	Pass	High	
Restore page				
61	click on Restore and check whether password prompt is displaying	Pass	High	
62	check whether Restore window is displaying after enter the correct password.	Pass	High	
63	Check whether location of the backup file can be search correctly	Pass	High	
64	Check whether backup is successfully can be restored	Pass	High	
65	check whether when restore not happen error message is displaying	Pass	High	

Test Cases

Test case 1:	
Scenario:	Check system can add new Employee
Steps:	Enter Data for Details Fields Enter Data for Earnings Field Enter Details for deductions page Click on save button.
Expected output:	A new employee should be added to the system with entered details.

Test case 2:	
Scenario:	Check system can add new without Earnings and Deductions
Steps:	Enter Data for Details Fields Click on save button.
Expected output:	A new employee should be added to the system with only basic details.

Test case 3:	
Scenario:	Check system can add new employee only with Earnings and Deductions without
Steps:	Enter Data for Earnings Field Enter Details for deductions page Click on save button without enter basic details
Expected output:	system should display error message to enter basic details

Test case 4:	
Scenario:	Check EPF Number
Steps:	Select Title Enter Name Enter Year Select month Click on save button without enter EPF number
Expected output:	system should display an error message to enter EPF Number.

Test case 5:	
Scenario:	Check Name Validations
Steps:	Select Title
	Enter Year
	Select month
	Click on save button without enter Name
Expected output:	system should display an error message to enter name.

Test case 6:	
Scenario:	Validations of selecting year
Steps:	Enter EPF Number
	Select Title
	Enter name
	Select month
	Enter Data for Earnings Field
	Enter Details for deductions page
	Click on save button without select the year
Expected output:	system should display an error message to select the year

Test case 7:	
Scenario:	Validations of selecting month
Steps:	Enter EPF Number
	Select Title
	Enter name
	Select year
	Enter Data for Earnings Field
	Enter Details for deductions page
	Click on save button without select the year
Expected output:	system should display an error message to select the month

Appendices – D:

High level flow diagram

```
                    ┌─────────────────────────────┐
                    │         User Login          │
                    └─────────────────────────────┘
                                  │
                                  ▼
            ┌───────────────────────────────────────────┐
            │   • Display Salary sheets                  │
            │   • Update salary sheets                   │
            │   • Add new employee                       │
            │   • Update employee                        │
            │   • Search                                 │
            │   • Leaves and deductions                  │
            │   • Generate salary slips                  │
            │   • Backup                                 │
            └───────────────────────────────────────────┘
                    │                          │
                    ▼                          ▼
       ┌─────────────────────┐      ┌─────────────────────┐
       │     Admin Login     │      │    Manager Login    │
       └─────────────────────┘      └─────────────────────┘

       ┌─────────────────────┐      ┌─────────────────────┐
       │  • Restore Backup   │      │    • Reports        │
       │  • Change settings  │      │                     │
       └─────────────────────┘      └─────────────────────┘
```

Data Flow Diagram