WOLKITE UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATICS

DEPARTMENT OF INFORMATION TECHNOLOGY

PROJECT TITLE: - ONLINE EXIT EXAMINATION SYSTEM FOR ETHIOPIAN HIGHER EDUCATION AND INSTITUTES

PREPARED BY

Name	ID
1. Ayele Awulachewu	NSR/0235/12
2. Mentesnot Zewde	NSR/1010/12
3. Mequannent Worku	NSR/1011/12

SUBMITTED TO: Department of Information Technology

FEB 24, 2023

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IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
THE DEGREE OF BACHLER OF SCIENCE IN INFORMATION TECHNOLOGY

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Wolkite University, Wolkite, Ethiopia

FEB 24, 2023

DECLARATION

This is to declare that this project work which is done under the supervision of Mr. Abdo A. and having the title online exit examination system for Ethiopian Higher Education and Institutes the sole contribution of the examiners. No part of the project work has been reproduced illegally (copy and paste) which can be considered as Plagiarism. All referenced parts have been used to argue the idea and have been cited properly. We will be responsible and liable for any consequence if violation of this declaration is proven.

Date: _____

Group Members:

Full Name   Signature

1.

2.

3.

APPROVAL FORM

This is to confirm that the project report entitled online exit examination system submitted to Wolkite University, College of Computing and Informatics Department of information technology by the examiners is approved for submission.

Student Team Approval Form

Student Name	Signature	Date
. ………………. ….	………………….	………………….
……………………….	………………….	………………….
………………………………	………………….	………………….

Advisor and Department Head Approval Form

Advisor Name	Signature	Date
………………….	………………….	………………….
Department Head Name	Signature	Date
………………….	………………….	………………….

Examiner Approval Form

Examiner 1 Name	Signature	Date
………………….	………………….	………………….
Examiner 2 Name	Signature	Date
………………….	………………….	………………….
Examiner 3 Name	Signature	Date
………………….	………………….	………………….

ACKNOWLEDGMENT

We would like to thank GOD for giving us strength and health to start this project. We are also grateful to our advisor Mr. Abdo A. for his constructive guidance from the beginning of the project up to now, and then we would like to thanks our college for giving as this chance to do this final project. Finally, we want to extend our thanks to our parents for their encouragement, motivation and support throughout our study.

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CHAPTER ONE

1. INTRODUCTION

Nowadays many governmental and non-governmental institutions are using computer technology and system-based procedures to accomplish their organizational activities effectively and efficiently. Many companies are making transitions from using manually oriented systems to automated systems to accomplish their tasks. The development of different computer-based systems, has provided tremendous advantages for many organizations and institutions. Especially A web-based system is used widely and it provides access to a software system using a computer and internet access. While appreciating the fact that such transitions are being occurred in our country, yet there are still lots of important organizational activities that are being continued with the manual trend. From these numbers of activities, higher educational examination process is one of them. As Information technology students, for the industrial level project, we want to develop a Web Based University Exit Examination System for the Ethiopian Higher Education and Institutes.

1.1. Background of the Organization

There are 83 private universities, and 42 governmental universities, and more than 35 institutes of higher learning in the current educational status of Ethiopia. The main mission of the Ethiopian Higher Education and institutes, is to produce competent graduates, providing need-based community services and producing problem-solving researches through innovative and creative education system. Its mission also includes giving research and consultancy services to foster social and economic development of the country by providing the appropriate curriculums for all universities. Its vision aims at producing at least one university that can be ranked among the top ten pre-eminent African graduates and research universities in 2023. The main objective of this institution is to provide people with an opportunity to reflect on the critical social, economic, cultural, moral and spiritual issues facing humanity. It contributes to national development through dissemination of specialized knowledge and skills.

In order to achieve the missions, visions and objectives of the institution which are mentioned above, creating well educated and well evaluated professionals is one of the significant criteria to be considered.

Students in universities and other higher educational trainers have to be well evaluated, to measure how efficient they are for their profession. To ensure this standard, the university exit exam program is already planned to be given for every graduating student starting from this year. Before this academic year the institute has been giving exit exam in the universities for college of health and department of law manually.

1.2. Statement of the Problem

Up to now, the Ethiopian higher education and institutes exit examination procedures are performed by examiners with hard copy exam papers. The procedure is almost manual task. As it is mentioned earlier, in the previous trends, the examination has been given for schools of law and colleges of health students. The new strategic plan of the organization, instructs to give the exit examination for each faculty and field. By recognizing the previous ways of the examination procedure, and assuming the fact that the new exit examination practice for sure will have complexity and much more loads than ever, we have concluded that the examination needs technological advancements which can reduce its complexity and other related problems. There are numbers of problems that may occur and affect the examination process when it is practiced in manual. Some of the problems are mentioned as follows:

➢ High-cost expenditure on copy machines, printers, papers.
➢ High man-power need. It requires exam distributers, many security professionals (like police), and exam result evaluators as compared to computerized system.
➢ It is not a secured way for a mass student. since the procedure is too long, it is vulnerable for the access of unauthorized person, it is easy for cheating practices and other reasons.
➢ It is not possible to recover files which are lost.
➢ Wastage of time to print and copy the exam papers.
➢ Takes time to evaluate the answer sheets of the exams and to announce the exam result to the candidates.
➢ It is prone to error like Some pages of exam paper may be jumped by error while duplicating.
➢ The candidate cannot see the result immediately after taking exam.

1.3. Objectives of the Project

1.3.1. General Objective

The general objective of this project is to design and implement Web Based Graduate Online Exit Examination System for Ethiopian higher education and institutes.

1.3.2. Specific Objectives

To achieve the above stated general objective, we formulate the following specific objectives:

- ➢ To analyze and identify the problems in the existing system.
- ➢ To design interactive user interfaces and implement the system
- ➢ To design and implement a database for the proposed system.
- ➢ To develop secured system in order to reduce cheating.
- ➢ To produce skilled and competent manpower to national and international market.
- ➢ Lastly, to test and deploy our system [5].

1.4. Feasibility Analysis

The Feasibility of our project determine whether it is worth or not after doing the project process followed and making. As the project team planned, this project is solving many problems.
The basic criteria when we say our proposed system is feasible:

- ➢ To make it acceptable by the users.
- ➢ To increase its reliability by users.
- ➢ To make it solves problems of existing system.

Therefore, the teams to be considering some feasibility studies like technical feasibility, Economical feasibility and Operational feasibility.
Feasibility of this project discussed in many ways. These are:

1.4.1. Operational Feasibility

The proposed development system fits, solves the existing system problems and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis. Under the operational feasibility the following activities:

- ➢ It provides users with timely, accurate and usefully formatted information.
- ➢ It provides desirable reliable service for the user.
- ➢ It provides easier retrieval, storage data and helps them to update their information.

Because of the above reason the proposed system will operationally feasible.

1.4.2. Technical Feasibility

The technical feasibility of our proposed system is focused on gaining an understanding of the present technical resources of the Ethiopian Higher Education and Institutes and their applicability to the expected needs of the proposed system. The technical requirements compared to the technical capability of the institutes. The proposed system can be easily maintained and repaired without requiring high Experts or technical assistants; because the system will be developed by familiar programming language and end user of, the proposed system is somewhat familiar with web-based systems. Additionally, the proposed system is very simple to use and user friendly.

1.4.3. Economic Feasibility

The Economic feasibility or cost benefit analysis of our proposed development system is feasible depend on by compared the economic benefits with technical knowledge required to implement the system and the time available for the project. It is the most evaluating the effectiveness of our proposed system. The benefits balance costs, and then our decision is made to design and implement the system. In general, the system is economically feasible because the existing system pay large amount of money for stationary, human resource and other consumption. The benefit of the project is greater than the cost the project, so it is feasible economically.

1.5. Scope and Limitation of the Project

1.5.1. Scope of the Project

This project focuses on Wolkite university and other Ethiopian Higher Education and Institutes to develop online Exit Examination System. The system should be launch from the central server in located in Ethiopian Education Assessment and Examinations Service (EAES) for all students in their respective institute. It will cover most of the functions listed below:

- ➢ All user will have their own user account.
- ➢ Exam will be settled in to the system with its permitted time.
- ➢ The system only includes choose type of questions (either multiple choice or true-false question).
- ➢ The candidate will take the exam within the permitted time
- ➢ The candidate will not access other website or materials if the exam is already started.
- ➢ The system will give the result for student automatically as soon as they submit their answers.

➢ The system will have the required reports to be generated.

1.5.2. Limitation of the Project

Even if we have done many functionalities about Exit Exam, we also not able to include the following activities:

➢ Online payment system when candidate take Rexam.
➢ Digital signature.
➢ The system provides service only non-blind candidates.

1.6. Significance of the Project

The significance of our project lies in its ability to provide an efficient and effective online examination. By implementing an online exit examination system, we can reduce the complexity of exam administration, provide a more streamlined and convenient testing experience for users, and ensure the security and integrity of exam results. Overall, this project has the potential to improve the quality and accessibility of education and assessment, and to benefit a wide range of stakeholders in the academic and professional communities.

1.7. Beneficiary of the Project

Developing this project has much significance for the university or institutes and the students which are take exit exam before graduate. The system is centralized administrator controls and saves the efforts and time of both the university and the students.

For university:

➢ Reduce economy spend for buying papers and printers.
➢ Reduce Time consumption
➢ Reduce man power that participate in exam related to number of worker needed during manual system.
➢ Avoid document missing about candidate information.
➢ Avoid tiredness to analysis the student result, because the student file will have stored in the database instead of cabinet so, it is easy to search student file from database.
➢ It ensuring the availability of documents in their proper place in the database.

For students:

➢ Making students aware about the examination because student can see all information about exam detail from the system.

➢ Student can see how much time is remaining to submit their answer or expire time to fill answer.

➢ It reduces time consumption when we see the results.

➢ It reduces economy wastage like pen and paper.

➢ Generally, the system Create suitable condition for candidates (students) to view their result online and detail information.

1.8. Methodology of the Project

1.8.1. Data collection tool/techniques

To do this project, the project team will be going to use different fact finding techniques to gather information about the current system and to collect the necessary information that is needed to develop the project. In order to know how the existing system work and what problem are there we are going to use the following fact-finding techniques.

➢ **Observation:** will be important to look and examine the current manual working system of the Ethiopian Higher Education and Institutes

➢ **Document analysis**: to get more information related to our project we will analysis different documents from Higher Education and Institutes by visiting some of them.

➢ **Interview**: will help us to gather required data for the project by interviewing different people, Higher Education and Institutes of the country.

➢ **Internet**: will Aids us to see the available sample on the internet and to download different types of software, tutorials and documents that help us in developing the project.

1.8.2. System analysis and design approach

In the system analysis and design phase of a project, we will use the OOSAD (Object Oriented System Analysis and Design) approach. Because it is a better way to construct, manage and assemble objects that are implemented in our system.

This technique has several phases, some of them are: -

1.*8.2.1. Object-Oriented Analysis (OOA)*

During this phase, the team will uses to model the function of the system (use case modeling), find and identify the business objects, organize the objects and identify the relationship between them and finally model the behavior of the objects in detail.

1.8.2.2. Object-Oriented Design (OOD)

During this phase, our team will uses E-draw and Visio software to refine the use case model and rational rose for designing the sequence, activity diagrams and to model object interactions and behavior that support the use case scenario.

The reason why we have selected OOSAD (Object Oriented System Analysis and Design) method specifically UML (Unified Modelling Language) model is because of the following advantages: -

➢ To enable a high degree of reusability of designs. To decrease the cost of software maintenance.
➢ To Reduce maintenance burden.
➢ To Increased consistency among analysis, design, and programming activities. Improved communication among users, analysis, design, and programming [7].

1.8.3. System development model

In our project we will use the iterative model because of the following reasons:

Iteratively enhances the evolving versions until the complete system is implemented and ready to be deployed.

➢ The life cycle model does not attempt to start with a full specification of requirements.
➢ This process is then repeated, producing a new version of the software at the end of each iteration of the model.
➢ The progress is easily measurable
➢ Generates working software quickly and early during the software life cycle. More flexible – less costly to change scope and requirements.
➢ Easier to test and debug during a smaller iteration.

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➢ Easier to manage risk because risky pieces are identified and handled during its iteration [1].

1.8.4. System testing methodology

✦ Unit testing

Since the designed system is in an object-oriented method the team firstly tested the system at the individual class level. To check each module (API) we will test the modules using postman.

✦ Integration Test

To check whether the unit test working together correctly we will do Integration testing using postman.

✦ System testing

After all the testing is performed, the system will be tested by a user who we be invited by the team. Especially at this level of testing the team seriously tested the system.

1.8.5. Development tools and technology

1.8.5.1. Front end technology:

- ✦ HTML
- ✦ CSS: is the language we use to style an HTML document
- ✦ JavaScript library that is used for building user interfaces.

1.8.5.2. Back-end technology:

- ✦ PHP as our main backend language
- ✦ SQL [6]

1.8.5.3. Documentation and modeling tool

Documentation tools

- ✦ MS word 2019: We use for the purpose of writing documentation.
- ✦ Microsoft PowerPoint 2019: We use for making presentation.

Modeling Tools

- ✦ Adobe Photoshop (CS5): - used to edit photos.
- ✦ Draw.io: we use to draw use case diagrams, pie charts e.t.c

Deployment Environment

For deployment environment we must have

- Desktop and personal computer
- Internet Connection
- Storage devices like hard disk, flash disk

1.9. Budget and Time Schedule of the Project

1.9.1. Budget of the Project

Table 1.1: Budget Table

Material needed	value	Cost(birr)	Use of Materials
Paper(A4)	1 dozen	520	for Documentation process of the Project
Pen	6	90	for Documentation process of the Project
Pencil	5	25	To trailing model
Mobile Card	3 worker * 6 month = 15 card	15 card * 25 birr = 400	To Communicate with each other when we collect required information for the project
Transport	…	1800	The cost of transport used for collect information in minister of education.
Laptop	2	40,000	It needs for prepare Softcopy materials of the documentation. And also to do our project
Desktop Computer	1	25000	it needs to develop The project from start to end
Flash drive	1	400	Store File
For print	…	400	
For binding	…	150	
	Total	68785	

1.9.2. Time Schedule of the Project

Table 1.2: Time Schedule Table

Phases	Time				
	Nov 30–Dec 18, 2022	Dec 19-Feb 1, 2022/2023	Feb 2-Apr 25, 2023	Apr 26-May 15, 2023	May 16-May 31, 2023
Requirement gathering and Analysis	████				
Design		████			
Implementation			████		
Testing				████	
Maintenance					████

1.10. Team Composition

Table 1.3: Team composition Table

No	Name	Activity
1	Mequannent Worku	Especially Requirement gathering and Analysis
2	Mintesnot Zewude	Especially system design and testing
3	Ayele Awlachew	Especially system implementation and maintenance

1.11 Document Organization

The proposed system document will contain the following chapter each chapter will describe it in the following manner:

Chapter one:

describe the introduction of the existing system, the problem of the existing system, objective (general and specific objective) ,scope, significance ,benefit, Limitation , schedule , Budget of the Project and methodology we followed during data collection and analysis.

Chapter two:

describe what the existing system looks like in detail (who uses the existing system with major function, business rule and drawback of the existing system will describe in this chapter in detail).

Chapter three:

 functional requirements, and non-functional requirements of proposed system

Chapter four:

discussed about use case model, object model and dynamic models of proposed system.

Chapter five:

design goals, current and proposed software architecture, Hardware/software mapping, Persistent data management and Access control and security.

Chapter six:

In this chapter, we will discuss about implementation of database, detailed class diagram, application server, application security.

CHAPTER TWO

2. DESCRIPTION OF THE EXISTING SYSTEM

2.1. Introduction of Existing System

Before this academic year the institute has been giving exit exam in the universities for college of health and department of law manually. The existing system of conducting examination process in Ethiopian higher education and institutes is through manual system. But the university exit exam program is already planned to be given for every graduating student starting from this year. So it is difficult to manage the process of examination manually as compared to before this year. It is our reason to develop web based exit examination system for this institute. There is a big institute under Ethiopian higher education and institutes called Educational Assessment and Examinations Service(EAES) as an Exam agency which control all activities related to exit exam. There are a lot of technical Committee in this institute to manage different activities. For example, the pass point is determining by this committee.

2.2. Users of Existing System

Let us see the entities that interact with the existing system or user of the system and have its own role. The current system users relating to exit exam are:

1. **Educational Assessment and Examinations Service (EAES) /Exam agency:** manage almost all activities and actors related to exit exam. Its committee decide when the exam is start and end, who should be set exam (select many professors from different university) and how much is the pass point.

2. **Exam setter:** responsibility to prepare or set the exam in line with the scope of the learning domain to be assessed. During preparing the exam the exam setter Prepare exam with in a given time and Responsible for providing answer key and making corrections where some error is detected in the questions. also, responsibility to check question are not repeated and include the answer in the listed choice.

Exam setter also has responsible to check the exam whether it is preferable for the first-degree label or not that exam is drafted/prepared already. Edit the entire content and correctness of the exam. Also, they have responsibility to check question are not repeated.

3. **Candidates**: are student who take the exit exam. They can see exam schedule and their result.

4. **Examiners:** responsibility to tests or examine candidates or students and shall be assigned from another department.

5. **College dean:** has permission to view generated report from registrar of institute.

6. **Registrar of institute:** Responsibilities to capture candidate information or profile and checks candidates full fill all requirements in all department course before take exam. Additionally, the registrar has responsibility to attach exit exam result of student which sends from exam agency on their tempo.

7. **Exam evaluator:** They were responsible to grade students answer for each course in the existing system. But it is not necessary for the proposed system.

8. **Department Head:** responsibility to Specifies places for exam and generally he manages all activities in his perspective departments. They can see exit exam result of student.

9. **Supervisor:** responsibility to controls exam paper to examiner and candidates. But it is not necessary for the proposed system [4].

2.3. Major Functions of the Existing System

➢ The major function of the existing system is to give exit exam for students to check the student is competent or not. Additionally, it evaluates and provide the result for the student and to give certificate. The national public administration exit exam shall have the following objectives:

• To produce skilled and competent manpower to national and international market

- Assessing students' educational achievement in major areas of public administration and development management (PADM)
- Ensuring whether the graduation profile of PADM curriculum have achieved at least common standards of knowledge and practical skills
- Improving public trust and confidence in public administration activities of professionals
- Facilitating the efforts of students to revise the core learning outcomes of the courses covered by the exit examination
- Ensuring all graduates from HEIs satisfy the requirements of the labor market and employability through the national wide implementation of competency-based exit exam
- Creating competitive spirit among PADM departments in Ethiopia with the vies to encouraging them to give due attention to the national standards

2.4. Forms and Other Documents of the Existing Systems

Federal Justice and Law Institute

Law - Exit Exam Registration Form

University Name: - WOLKITE **UNIVERSITY**

Table 2.1:- List of Candidates for law exit exam to be held in June 27 – July 01 / 2022(Sene 20-24 /2014 E.C) (Sample)

S.N.	Full Name	Sex	Age	Sight (B/NB)	Student Type	Exam Centre	Remark
1	Kuresha Abuna Kedir	F	24	NB	Regular	Wolkitie University	
2	Mahlet Admasu Niga	F	24	NB	Regular	Wolkitie University	
3	Genet Wada Worku	F	24	NB	Regular	Wolkitie University	
4	Hebrone Girma Teni	F	23	NB	Regular	Wolkitie University	

| 5 | Sintayehu Girma Degefa | F | 23 | NB | Regular | Wolkitie University | |
| 6 | Wubalem Ambachew Gesese | F | 22 | NB | Regular | Wolkitie University | |

Educational Assessment and Examinations Service

2.5. Drawbacks of the Existing System

The existing systems have the following disadvantages: -

- Redundancy of the data: - The same data may register repeatedly.
- Time consumption: - It takes long time to access the data.
- High human labor: - It requires more people to complete the task.
- Lack of security: - The stored information's are not secured.
- There is high cost to buy copy machines and printers.
- The information stored on the paper form may loss in data. It may be disappeared by human factor or natural factor.
- It is difficult to submit report on time at any process when some report is required.
- The exam may be stolen during send to exam place.
- It requires more paper to maintain the existing system and to prepare the exam sheet.
- It is difficult to test the exam, to evaluate the answer or exam, to announce the exam date to the candidate directly.

2.6. Business Rules of the Existing System

- ➢ The candidate should take all department courses before take exam.
- ➢ The registrar must send students which have full fill their precondition to take exit exam list with full information to Exam agency.
- ➢ The candidates should have to take the exam within the given time of period.
- ➢ The exam question should not be duplicated or there is no redundancy of question.
- ➢ Candidates can take another exam more than once, when candidate cannot pass the first time, but in some department, candidate may be pay fee before taking re-exam.

- ➢ The entire examinations question should be objective. Unless it should be edited by Exam editor and exam evaluator together.
- ➢ All candidates must take the same exam according to their department.
- ➢ The candidate takes exam only the selective course.
- ➢ The examiner and supervisor must be from another department.
- ➢ The CGPA must be greater than or equal to 2.00 to take exam (it may be varying from time to time).
- ➢ The grade of individual selective course must be greater than or equal to C (for the selective department).

CHAPTER THREE

3. PROPOSED SYSTEM

In this chapter we have discuss on the overall description of our proposed system, functional requirements, and non-functional requirements. There is features and behavior (any function, constraint, or property that the system must provide, meet, or satisfy) of a system or software application we need to implement in our system in order to fulfill its purpose.

3.1. Functional Requirements

The functional requirements (the behavior of the system as it relates to the system's functionality) for the new proposed system includes the following section. This behavior may be expressed as services, tasks or functions that the system is required to perform. The system should give permission for:

- System admin to create account to all users.
- Exam agency to select and register Exam setter in to the system.
- Exam agency to register institute which has permission only to test their student.
- Exam agency to set exam date and time.
- Exam setter to prepare the exam question.
- Exam setter to set exam.
- Admin to manage user account.
- Admin to take backup and restore.
- Exam setter to edit the exam.
- Students to view exam date and time.
- Registrar of institute to register student who can take exam into the system.
- Registrar of institute to set Examiners.
- Registrar of institute to view report.
- Head and dean to view report.
- Candidates to view exam questions and to fill the answer with in the given time.
- Candidates of institute to view exam result.
- Candidates to send request and to receive and view its response.
- Registrar of institute to update student information.

- ➢ Exam agency to add notice.
- ➢ Exam agency to receive feedback and to give response for it.
- ➢ Exam agency to specify the passing score.
- ➢ **Registrar of institute** to send feedback for the Exam agency.

3.2. Non-functional Requirements

In this section we see any requirement which specifies how our system performs a certain function or how our system should work and what limits there are on its functionality. The non-functional requirements of our new system that we proposed are those requirements that are not readily captured in our use case.

3.2.1. User Interface and Human Factors

The kind of interface our system provides should be attractive (Not Weary) and contain all required form. Also, it is very good and flexible for users. It can be usable using clear English language (for student and users). The user of this system must should have a know how about a computer.

3.2.2. Hardware Consideration

- ➢ The system is portable because it runs any operating system (its platform independent).
- ➢ The hard ware required to run the system are server, network cable and laptop/desktop computer. But we can test the system in localhost.

3.2.3. Security Issues

- ➢ This system will use different security systems to protect its data. Among this: Password and user name. The system users will have allowed performing activities or making a modification to the data if and only if they are authorized which will be checked by their username, password, and role. So, it will be protected against internal and external intrusions or against an authorized user. We will Use different algorithm for our system. For example, we will use MD5 (Message Digest 5) which is a widely used cryptographic hashing algorithm. We use this to verify the integrity of data and Password storage where the password is hashed using MD5 and the resulting hash value is stored instead of the plaintext password. All major operations/transactions done on the

system should be logged to the central database that means all of the users have their own login page.

3.2.4. Performance Consideration

The amount of time needed to get the response for a transaction or request is minimized and also the system has fast response time because of a light weighted code in HTML, PHP, CSS and JavaScript. it will support many concurrent users.

3.2.5. Error Handling and Validation

Our system should handle error by showing the message "invalid input "when the user enters invalid input. Generally, if an error occurs, the system will identify the error and notify the user so that he/she can take the appropriate corrections.

3.2.6. Quality Issues

The system will have an interactive and attractive GUI which eases users' usage problem. It needs simple training. Because it is easy to use and adapt.

3.2.7. Backup and Recovery

In addition to authorizing access to users, the system could have problems in such areas of data crime, disaster, and human errors. For this purpose, incremental backup copies (copies of only the challenge to files) and full backup copies (copies of all files) will be made and stored in a secured location. Additionally, we will use logical backup method in the database and source code in order to recover as it needed.

3.2.8. Physical Environment

Our system is functional everywhere electric light and the internet service available. The system should be launch from the central server in located in Ethiopian Education Assessment and Examinations Service (Exam agency) for all students in their respective institute.

3.2.9. Resource Issues

Our system can run appropriately on any computer which has 4 RAM, a processor of intel r core tm i3-8400 cup @ 2.80ghz 2.81 ghz and 64-bit operating system, x64-based processor and more than this version. The system also consumes internet and electric light.

3.2.10. Documentation

The system will have a guidebook discussing how to use the system for users. Technical documentation that contains instructions on how to install the product and configure it for different purposes must be prepared for maintainers/administrator.

CHAPTER FOUR

4. SYSTEM ANALYSIS

In this chapter, we would have discussed about use case model, object model and dynamic models.

4.1. System Model

4.1.1. Use Case Model

In this section, we are expected to model comprised use case diagram, use case definitions, and actor definitions to document the functional requirements of a system. Also, we should have to identify each actor and use cases of the system based on the functional requirement.

The system we have proposed has the following actors.

  ➤ System Admin
  ➤ Exam Agency
  ➤ Exam Setter
  ➤ Candidate
  ➤ Registrar of Institute
  ➤ Department Head
  ➤ College Dean

The possible use cases of the new system are:

Table 4.1: Use Case Identification

Use case ID	Use Case Name	Include
UC01	Login	
UC02	Create Account	UC01
UC03	Register Candidate	UC01
UC04	Register Exam Setter	UC01
UC05	Set Exam	UC01

UC06	Edit Exam	UC01
UC07	Assign Examiner	UC01
UC08	Give Feedback	UC01
UC09	Set Schedule	UC01
UC10	View Schedule	UC01
UC11	View Examiner	UC01
UC12	View Request	UC01
UC13	Update password	UC01
UC15	Manage User	UC01
UC16	Take Exam	UC01
UC17	Update Candidate Information	UC01
UC18	Specify Passing Score	UC01
UC19	View Result	UC01
UC20	View Candidate Information	UC01
UC21	Send Compliant	UC01
UC22	Reply Compliant	UC01
UC23	View Report	UC01
UC24	Take backup	UC01
UC25	Restore	UC01
UC27	Logout	UC01

4.1.1.1. Use Case Diagram
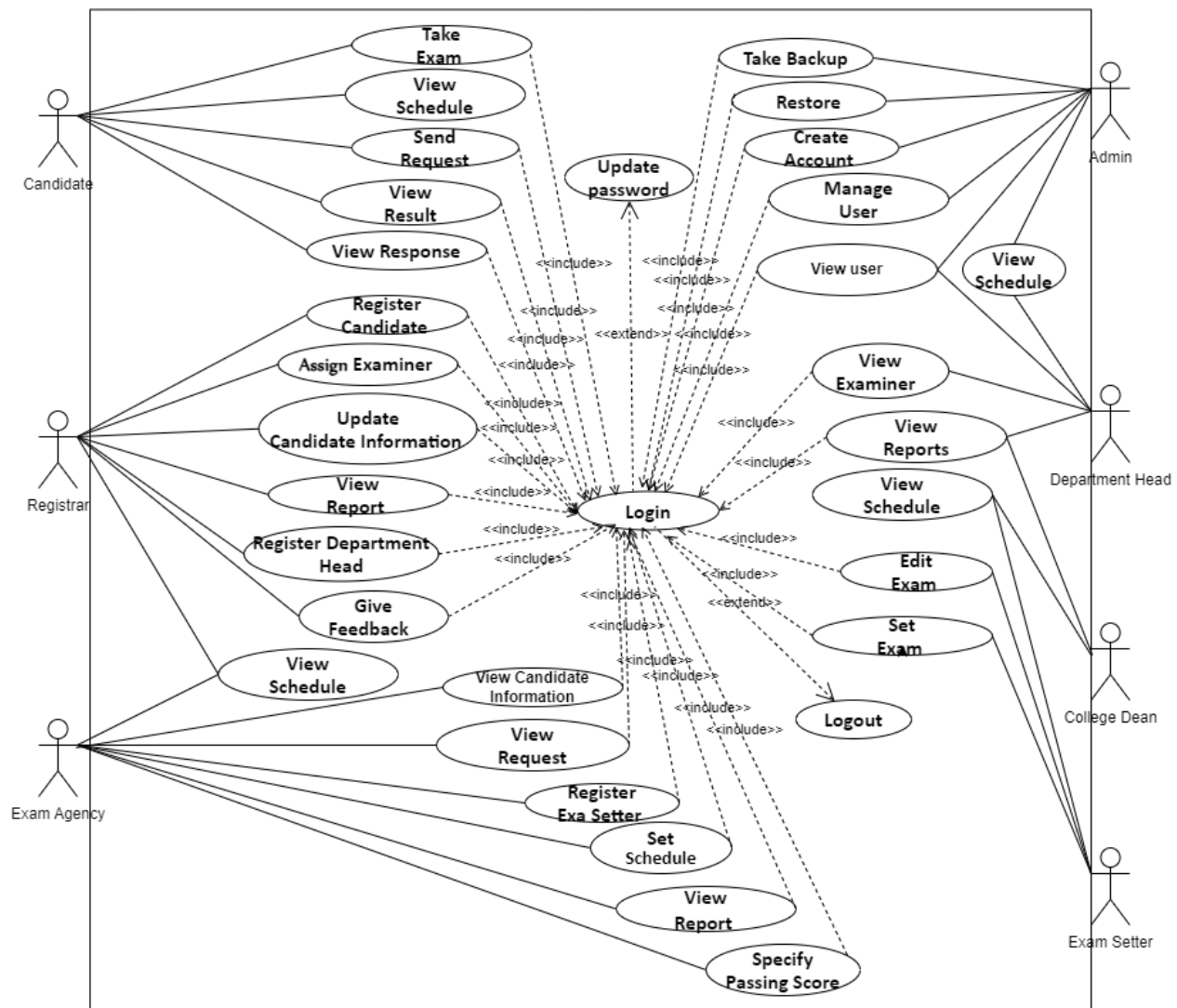
Figure 4.1. Use case diagram [3]

4.1.1.2. Use Case Description

Table 4.2: Use Case Description of User login

Use case name	Login
Use case ID	UC01
Actor	Admin, Exam Agency, Exam Setter, Candidate, Registrar of Institute, Department Head, College Dean
Description	This use case allow user to login in to the system to access

	the relevant functions according to the user's role. Login the system will display the relevant user's home page.
Pre-condition .	User has to have a valid account
Post condition	Authorized Users are login to the system or the system display the relevant home page.

	User action	System response
	Step1.User clicks to login button.	Step2. System prompts user to enter user name and password
Basic course of action	Step3.User enters user name and password	Step4. System validates the user name and password
		Step5.System well comes user if user name and pass word are valid. [Alt Course A]
		Step 6: Use case ends.

Alternate course of action	Alternative Course A: If user entered invalid user name and password, user is not eligible to login in to system. A.5. system displays "Please Enter valid user name and password". A.6. The use case continues at step 2 in the basic course of action.

Table 4.3: Use Case Description of Create Account

Use case name	Create Account
Use case ID	UC02
Actor	Admin

Description	System administrator can create user account for all user.
Pre-condition	1. User must be registered by responsible actor in to the system. 2. User have not account before it.
Post condition	User can use an account.
Basic course of action	Step1.The use cases begin when a system admin wants to create account for another user. Step2. System display user id and password field. Step3. The system admin input the new user id and password of user. Step4. System display "Account created successfully ". [Alt Course A] [Alt Course B] Step5. Use case end.
Alternate course of action	Alternative Course A: If the user is not registered. A.4. System displays "The user must be registered first.". A.5. The use case continues at step 2 in the basic course of action.
	Alternative Course B: If system admin entered already existing user name and password. B.4. system displays "User name and password already exist.". B.5. The use case continues at step 2 in the basic course of action.

Table 4.4: Use Case Description of Register Candidate

Use case name	Register Candidate
Use case ID	UC03
Actor	Registrar of Institute

Description	Register graduate student from SIMS in to the system in order to them can get account from system admin.
Pre-condition	1. User must be registered in SIMS before it. 2. Users have not registered before it.
Post condition	The candidate information can view by authorized user.
Basic course of action	Step1.The use case begins when a Registrar wants to register candidate in to the system and registrar click Register Candidate button. Step2. System displays the form of student information which receives input. Step3. The Registrar input the required information of student. Step4. The registrar Submit the form. Step5. Registered successfully. [Alt Course A] Step6. Use case end.
Alternate course of action	Alternative Course A: If Registrar entered already existing user. A.5. system displays "user already exists". A.6. The use case continues at step 2 in the basic course of action.

Table 4.5: Use Case Description of Register Exam Setter

Use case name	Register Exam Setter
Use case ID	UC04
Actor	Exam Agency
Description	Register Exam Setter in to the system in order to they can get account from system admin.

Pre-condition	1. Users have not registered before it.
Post condition	Registered successfully.
Basic course of action	Step1. Exam Agency click Register Exam Setter button. Step2. System displays the form of register exam setter which receives input. Step3. The Exam Agency input the required information. Step4. The Exam Agency click submit button Step5. Registered successfully. [Alt Course A] Step6. Use case end.
Alternate course of action	Alternative Course A: If Exam Agency tries to register already existing user. A.5. system displays "user already exists". A.6. The use case continues at step 2 in the basic course of action.

Table 4.6: Use Case Description of Set Exam

Use case name	Set Exam
Use case ID	UC05
Actor	Exam Setter
Description	Exam Setter can prepare exam.
Pre-condition .	User must have role to set exam.
Post condition	Exam display in exam page within a given time.
Basic course of action	Step1.The exam setter click Exam Set button. Step2. System prompt exam question and exam choice. Step3. The exam setters input the exam question and exam choice and submit the form. Step4. System display "Exam inserted successfully ". [Alt

	Course A] [Alt Course B]
	Step5. Use case end.
Alternate course of action	Alternative Course A: If there is missed input.
	A.4. system displays "you should input all required field".
	A.5. The use case continues at step 2 in the basic course of action.
	Alternative Course B: If the question is already existing.
	A.4. system displays "The question already exists."
	A.5. The use case continues at step 2 in the basic course of action.

Table 4.7: Use Case Description of Give Feedback

Use case name	Give Feedback
Use case ID	UC08
Actor	Registrar of Institute
Description	Registrar can give feedback to exam agency about the system and the exam which may raise high comment from student.
Basic course of action	Step1.The Registrar click Give feedback button.
	Step2. System prompts Text area.
	Step3. The exam setter types the required feedback.
	Step4. System display "Feedback sent successfully ".
	Step5. Use case end.

Table 4.8: Use Case Description of Set Schedule

Use case name	Set Schedule
Use case ID	UC09

Actor	Exam Agency
Description	The committee in Exam Agency can decide when the exam start/end, when and at which o'clock each individual course start/end and how much time is given for each individual exam.
Pre-condition	The committee must be the member of Exam Agency actor.
Post condition	Candidate can view the prepared schedule.
Basic course of action	Step1.The committee click Set Schedule button. Step2. System prompts Form of schedule. Step3. The committee fills the form. Step4. System display "Exam scheduled successfully ". [Alt Course A] Step5. Use case end.
Alternate course of action	Alternative Course A: If the committee is not the member of Exam agency. A.2. system displays "you have no role to set schedule". A.3. The use case continues at step 1 in the basic course of action.

Table 4.9: Use Case Description of Reply Feedback

Use case name	View Request
Use case ID	UC12
Actor	Exam Agency
Description	The committee in Exam Agency can provide response to

	request of candidates re exam request.
Pre-condition	The committee must be the member of Exam Agency actor.
Post condition	whether the candidate is allowed to re exam or not.
Basic course of action	Step1.The committee click View Request button. Step2. System display Requested content. Step3. The committee take action for the request. Step4. System display "You action is successful ". Step5. Use case end.

Table 4.10: Use Case Description of Update password

Use case name	Update password
Use case ID	UC13
Actor	Admin, Exam Agency, Exam Setter, Candidate, Registrar of Institute, Department Head, College Dean
Description	User can update their password which is given by admin. The old password may have chance to be predicted by other user. Because the system admin may be give the password consecutively for each user.
Pre-condition	User must input the old password first.
Post condition	The password of user is changed.
Basic course of action	Step1.The use case begin when a user login in to the system via UC01wants to update the given password and Candidate click Update password button. Step2. System display the Text area to receive the Current and new password. Step3. The User input the current and new password.

	Step4. The user click Submit button.
	Step5. System display "Password changed successfully". [Alt Course A]
	Step6. Use case end.
Alternate course of action	Alternative Course A: If user entered wrong string for current password.
	A.5. system displays "Incorrect password".
	A.6. The use case continues at step 2 in the basic course of action.

Table 4.11: Use Case Description of Take Exam

Use case name	Take Exam
Use case ID	UC16
Actor	Candidate
Description	Candidate can take the given exam. At this time, they can choose the radio button letter as an answer for each question and responsible to finish the given attempt. They can also re-attempt unless the given time expired. They can see how much time is used and the remaining time length.
Pre-condition	The scheduled exam time must be arrived first.
Post condition	System displays The correct answer of the question and the result of the respective student.
Basic course of action	Step1. Candidate click Take Exam button.
	Step2. System displays the question and choice. which have radio button in order to students click the answer choice as they want. [Alt Course A]
	Step3. The Candidate clicks the radio button answer.
	Step4. The Candidate click Finish button.

	Step5. System displays "You submit your answer successfully". Step6. Use case end.
Alternate course of action	Alternative Course A: If Candidate clicks Take Exam button before the starting exam time. A.3. system displays "This time is not allowed to take this exam". A.4. The use case continues at step 1 in the basic course of action.

4.1.1.3. Use case Scenario

They do not reflect the system's activities (except as experience by the user) Thy do not reflect the system. This describes a particular sequence of activities within a use case.

Scenario 1:

Scenario name: Login

Participating actor:

> ➢ Admin, Exam Agency, Exam Setter, Candidate, Registrar of Institute, Department Head, College Dean

Flow of event:

> ➢ User initiates the system
> ➢ System prompts user to enter user name and password
> ➢ User enters user name and password
> ➢ The system validates user name and password
> ➢ If user name and password is valid, access shall be granted
> ➢ If user name and password is invalid access is denied and then the system display error message.

Alternative case:

> ➤ If the Username and password are invalid, the system displays an error message and allows the User to try again.

Scenario 2:

Scenario name: Create Account

Participating actor:

> ➤ Admin

Flow of event:

> ➤ The system admin is click on create account button.
> ➤ System display user name and password field.
> ➤ The system admin input the new user name and password of user.
> ➤ System display Account created successfully.

Alternative case:

> ➤ If system admin entered already existing user name and password. System displays "User name and password already exist" message and allows the User to try again.

4.2. Object Model

In this model we will see a system or interface which is basically used to visualize elements in terms of objects in a software application. It is modeled using object-oriented techniques and before any programming or development is done, the object model is used to create a system model or architecture. It defines object-oriented features of a system like inheritance, encapsulation, and many other object-oriented interfaces.
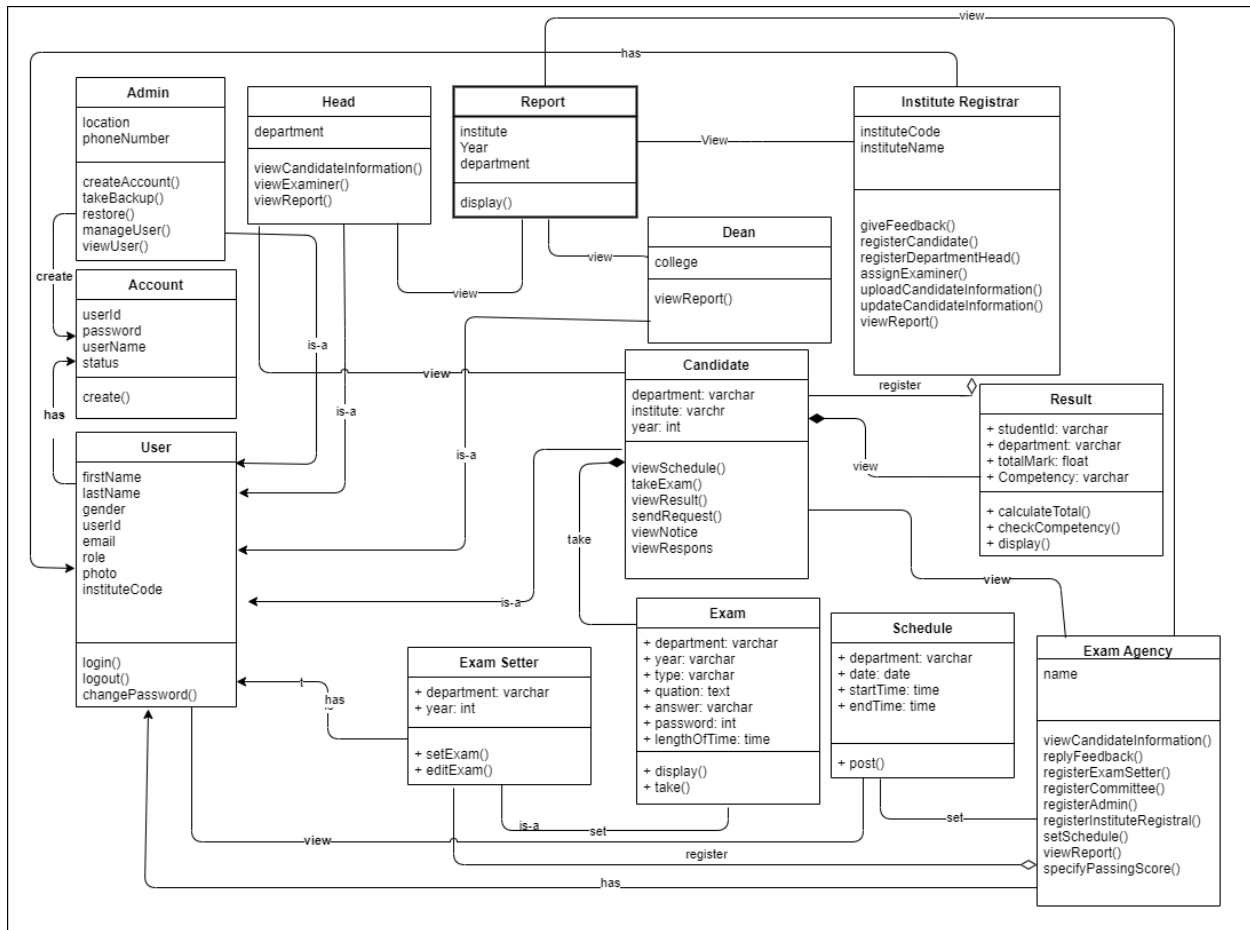
4.2.1. Class Diagrams

Figure 4.2. Normal or Conceptual class diagram [2]

4.2.2. Data Dictionary

The data dictionary is very important as it contains information such as what is in the database, who is allowed to access it, where is the database physically stored etc. The users of the database normally don't interact with the data dictionary; it is only handled by the database administrators

Table 4.13: Data dictionary for User table

Description name	Data type	Description	Constraint
firstName	Varchar	First Name of the user	Not-null
lastName	Varchar	Last Name of the user	Not-null

Sex	char	Identify men or women	Not-null
birthdate	Varchar	Birthdate of the user to know the age	Not-null
Password	Varchar	Password input of the user	Not-null
userId	Varchar	Holds the id number of the User	Primary key
Email	Varchar	Email address of the user	Not-null
Role	Varchar	The role of the user	Not-null
Photo	Blob	Personal identification of the user	Not-null
Institute	Varchar	Institute name of the user	Not-null

Table 4.14: Data dictionary for Candidate table

Description name	Data type	Description	Constraint
candidateId	Varchar	Holds the id number of the candidate	Primary key
firstName	Varchar	Holds first Name of the Candidate	Not-null
lastName	Varchar	Holds last Name of the Candidate	Not-null
Sex	Character	Identify men or women	Not-null
Email	Varchar	Email address of candidate	Not-null
department	Varchar	Hold department of the candidate	Not-null
StudentType	Varchar	Regular or irregular	

Table 4.15: Data dictionary for quetion Table

Description name	Data Type	Description	Constraint
quetionid	Varchar	Holds the id number of the Exam	Primary key
question	Text	Hold question of the exam	Not-null
answer	Char	Answer of the question	Not-null
Code	Int	Code of the exam type	Not-null
lengthOfTime	Time	Duration of the exam talking	Not-null

Table 4.19: Data dictionary for Exam Setter

Description name	Data type	Description	Constraint
setterId	Varchar	Holds the id number of the exam setter	Primary key
firstName	Varchar	Holds first Name of the exam setter	Not-null
lastName	Varchar	Holds last Name of the exam setter	Not-null
department	Varchar	Department of the exam setter	Not-null
sex	Char	Identify men or women	Not-null
email	Varchar	Email address of exam setter	Not-null
phoneNumber	int	It holds the phone number of exam setter	Not-null

Table 4.20: Data dictionary for Head table

			Constraint
headId	Varchar	Holds the id number of the Head of the department	Primary key
firstName	Varchar	Holds first Name of the Head of the Department	Not-null
lastName	Varchar	Holds last Name of the head of the department	Not-null
department	Varchar	Department of the exam setter	Not-null
sex	Char	Personal identification of who is men or women	Not-null
email	Varchar	Email address of the head	

Table 4.21: Data dictionary for Dean table

Description name	Data type	Description	Constraint
deanId	Varchar	Holds the id number of the Dean of the college	Primary key
firstName	Varchar	Hold First name of dean of the college	Not-null
lastName	Varchar	Hold last name of dean of the college	Not-null
sex	Char	Personal identification of who is men or women	Not-null
College	Varchar	Hold college of the	

		dean	
email	Varchar	Email address of the Dean	Not-null

Table 4.22: Data dictionary for Exam Date table

Description name	Data type	Description	Constraint
department	Varchar	Department in the schedule	Primary key
examId	Varchar	Identify the exam	Not-null
date	Date	Date of the exam	Not-null
Start time	Time	Specify the time when the exam start.	Not-null
End time	Time	Specify the time when the exam end.	Not-null

Table 4.23: Data dictionary for Result table

Description name	Data Type	Description	Constraint
studentId	Varchar	Holds the id number of the student	Primary key
total	Float	Students mark	Not-null
Competency	Varchar	Whether competence or not	Not-null

4.3. Dynamic Model

In these sections' behaviors of the object model, in terms of sequence, activity, and state chart diagrams.

4.3.1. Sequence Diagram

A sequence diagram shows object interactions arranged in a time sequence. It depicts the objects involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the logical view of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.
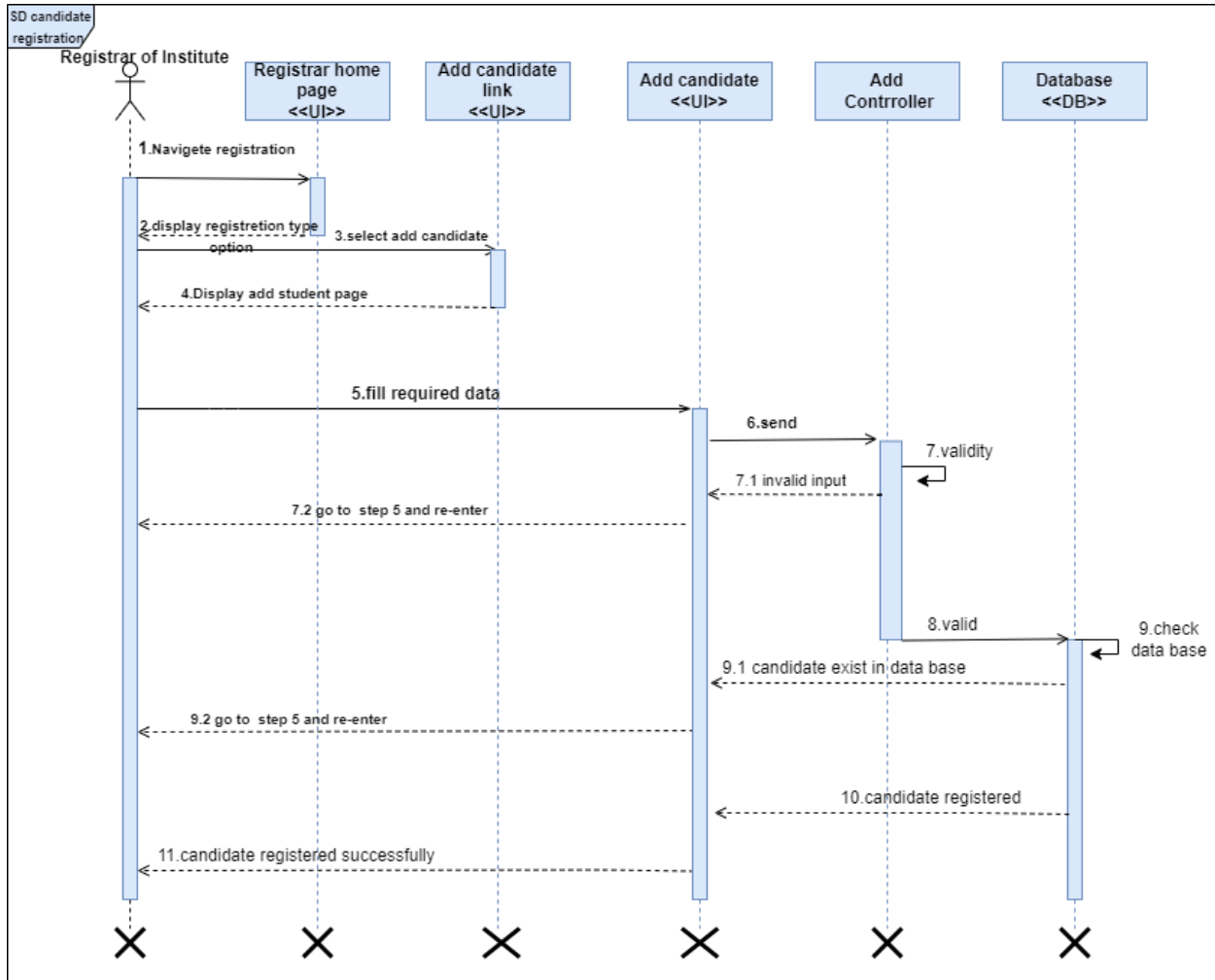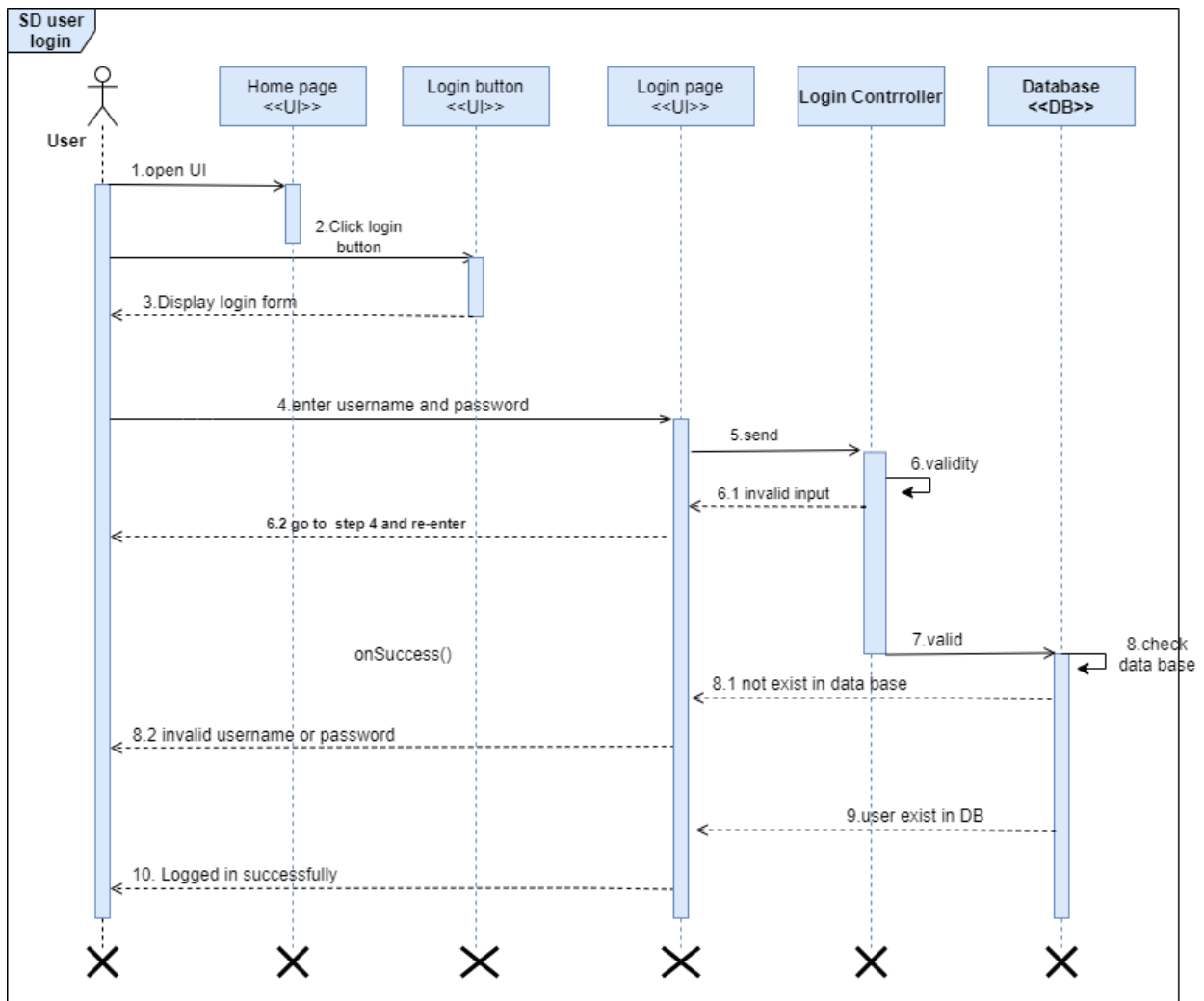

Figure 4. 5. Sequence diagram for Register Candidate

Figure 4.6. Sequence diagram for user login
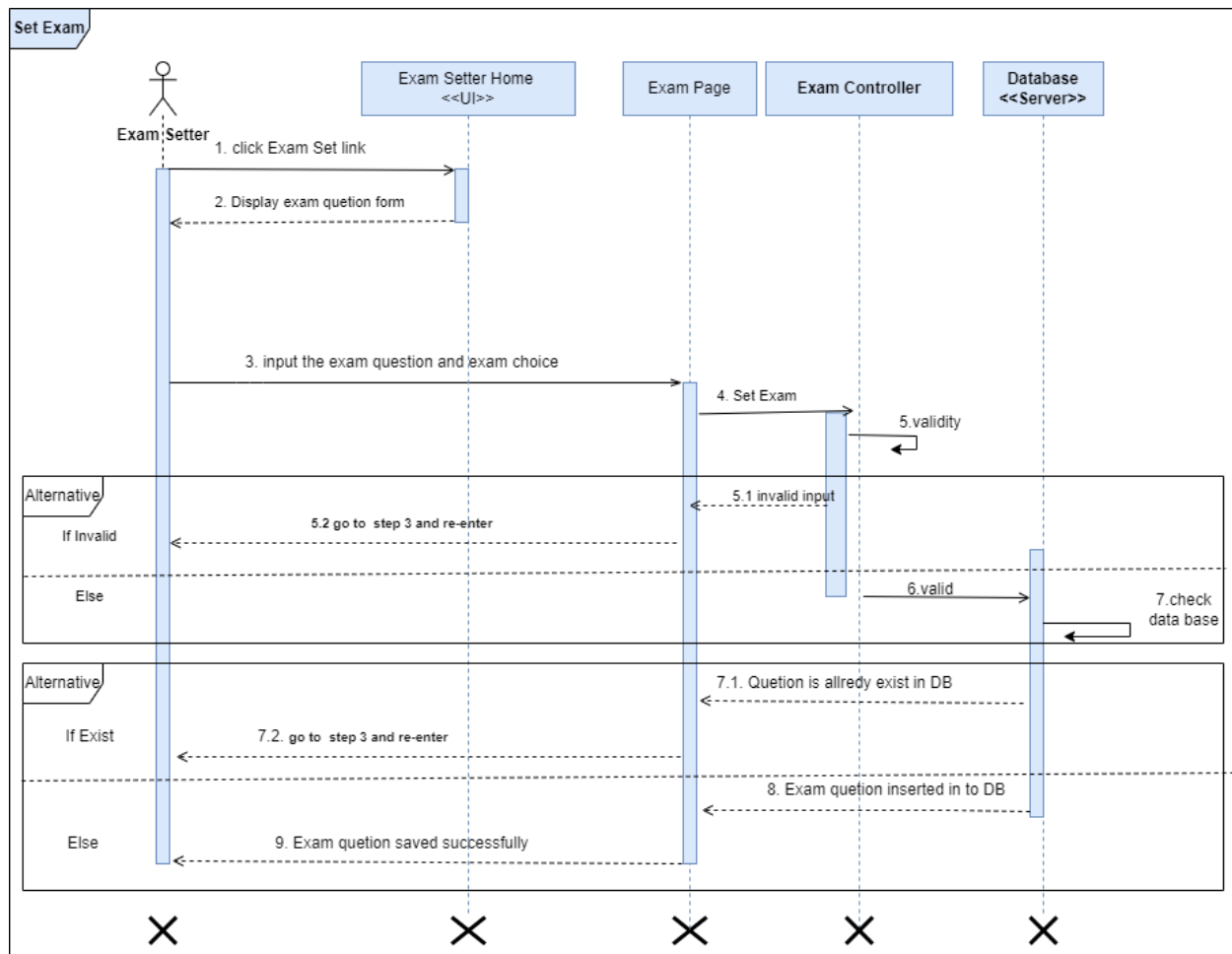
Figure 4.6. Sequence diagram for Set Exam
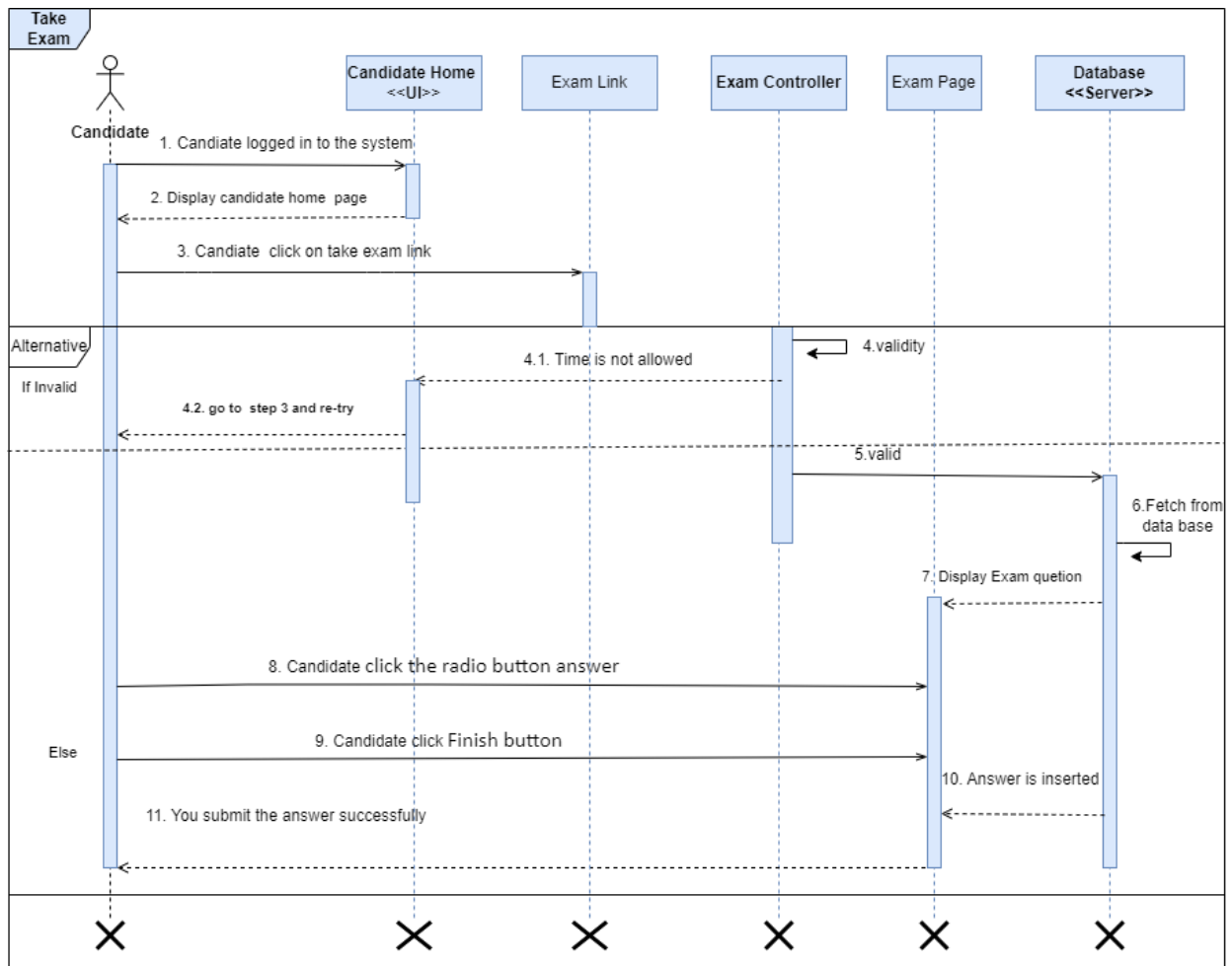
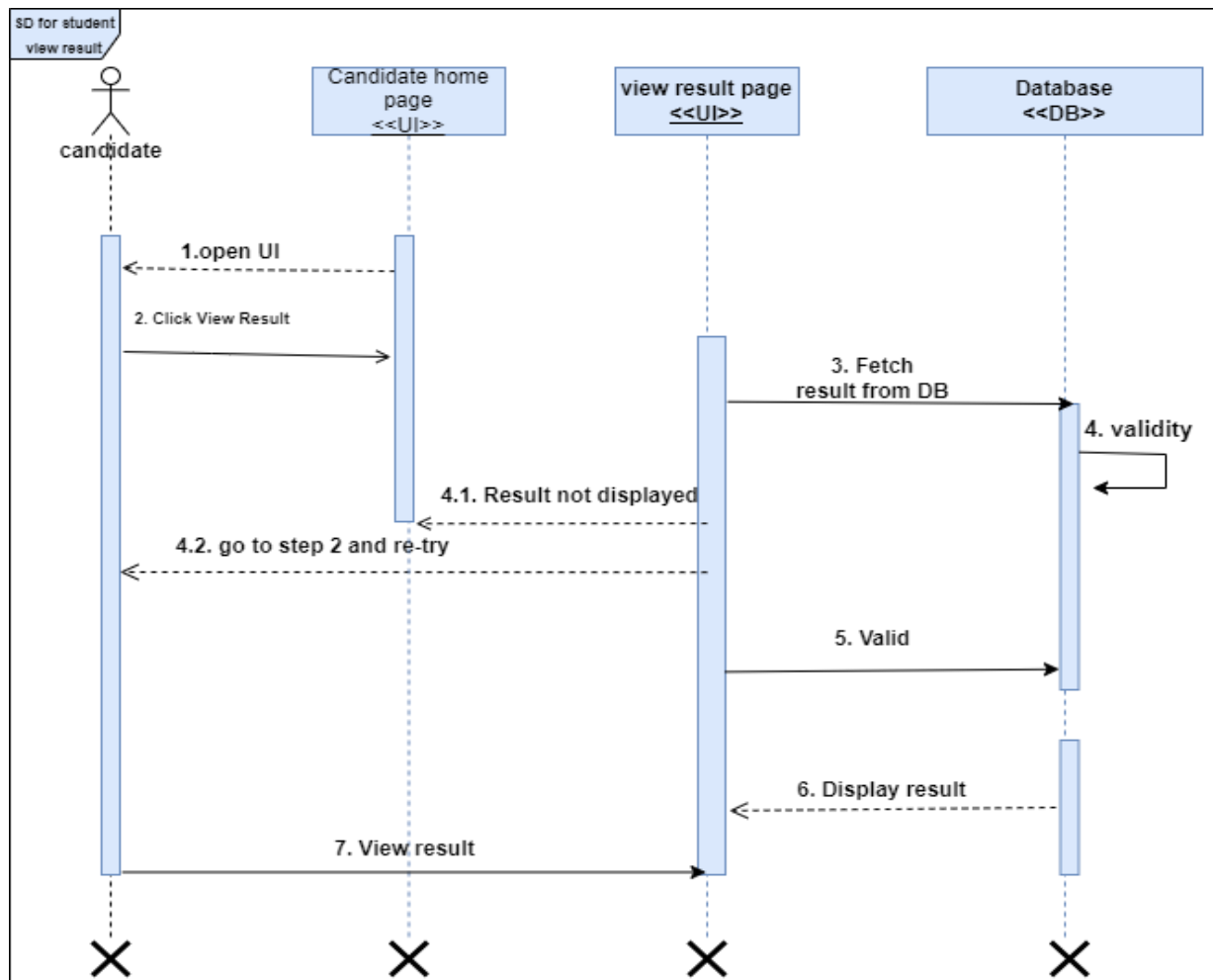Figure 4.7 Sequence diagram for Take Exam

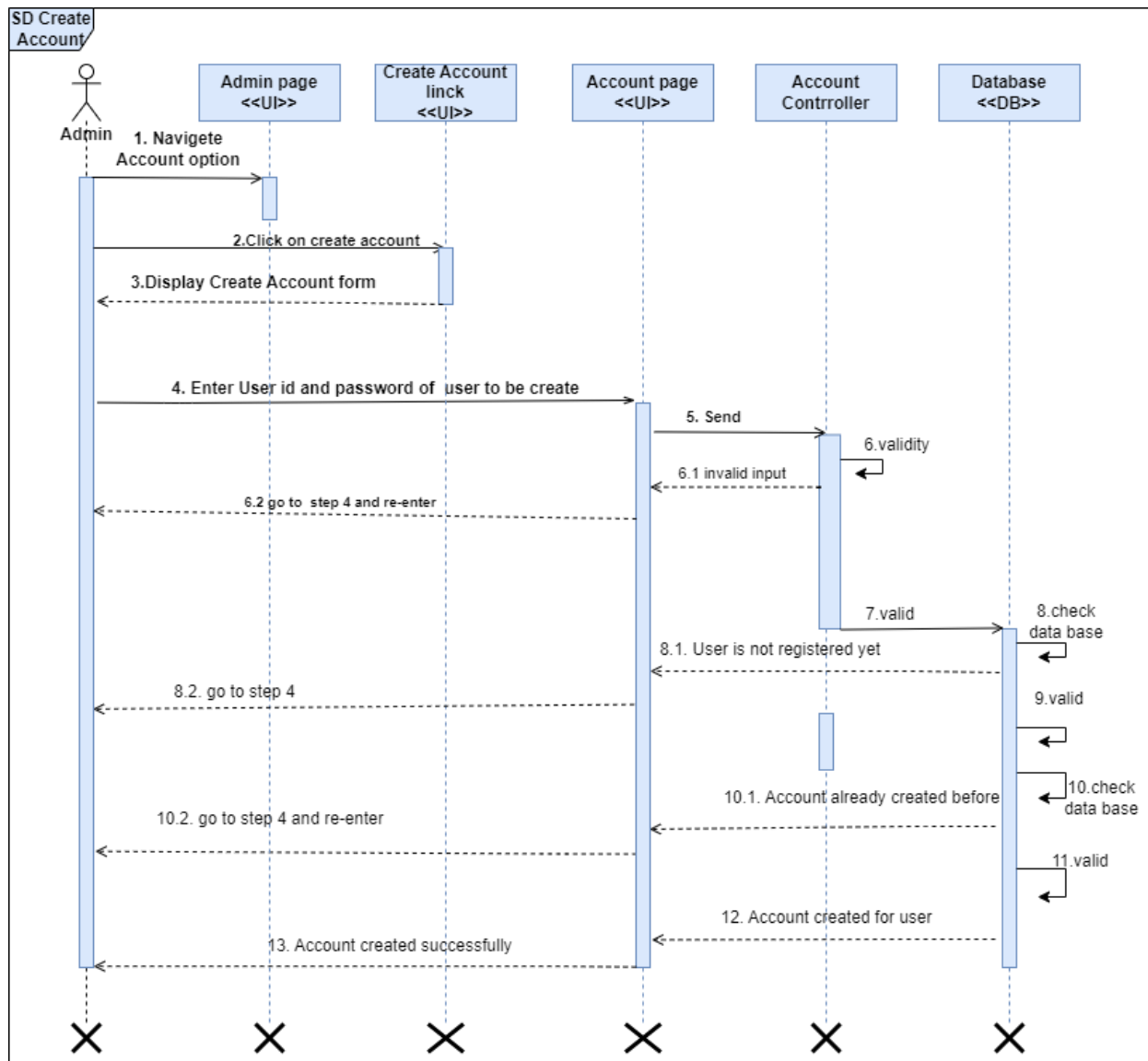Figure 4.8 Sequence diagram for View Result

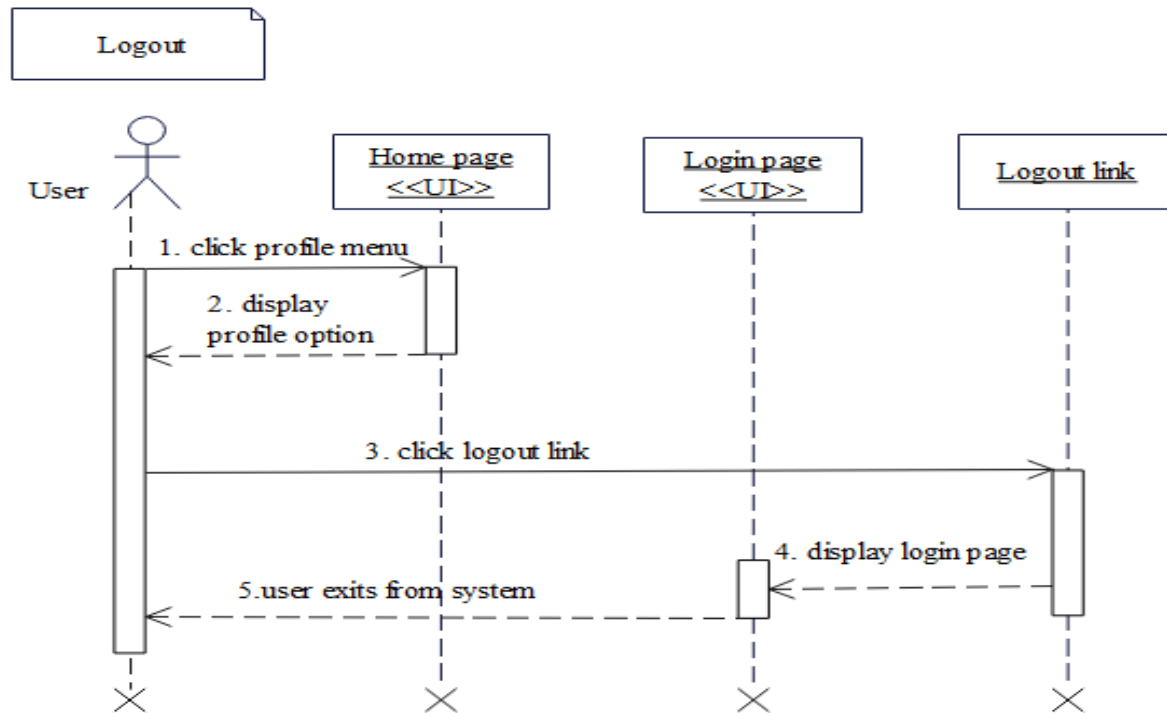Figure 4.9. Sequence diagram for Create Account

Figure 4.11. Sequence diagram for Logout

4.3.2. Activity Diagram

In this section we draw activity diagram which show a flow chart to represent the flow from one activity to another activity.
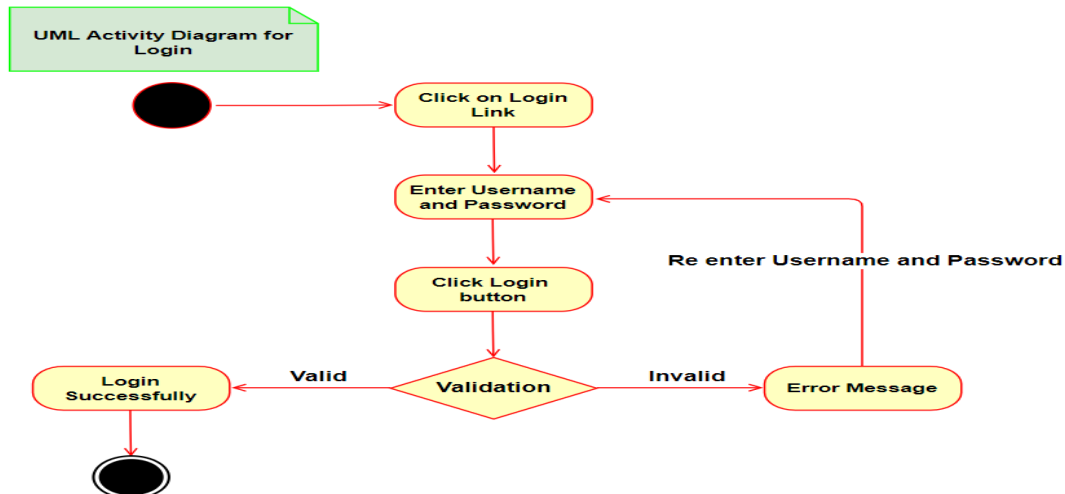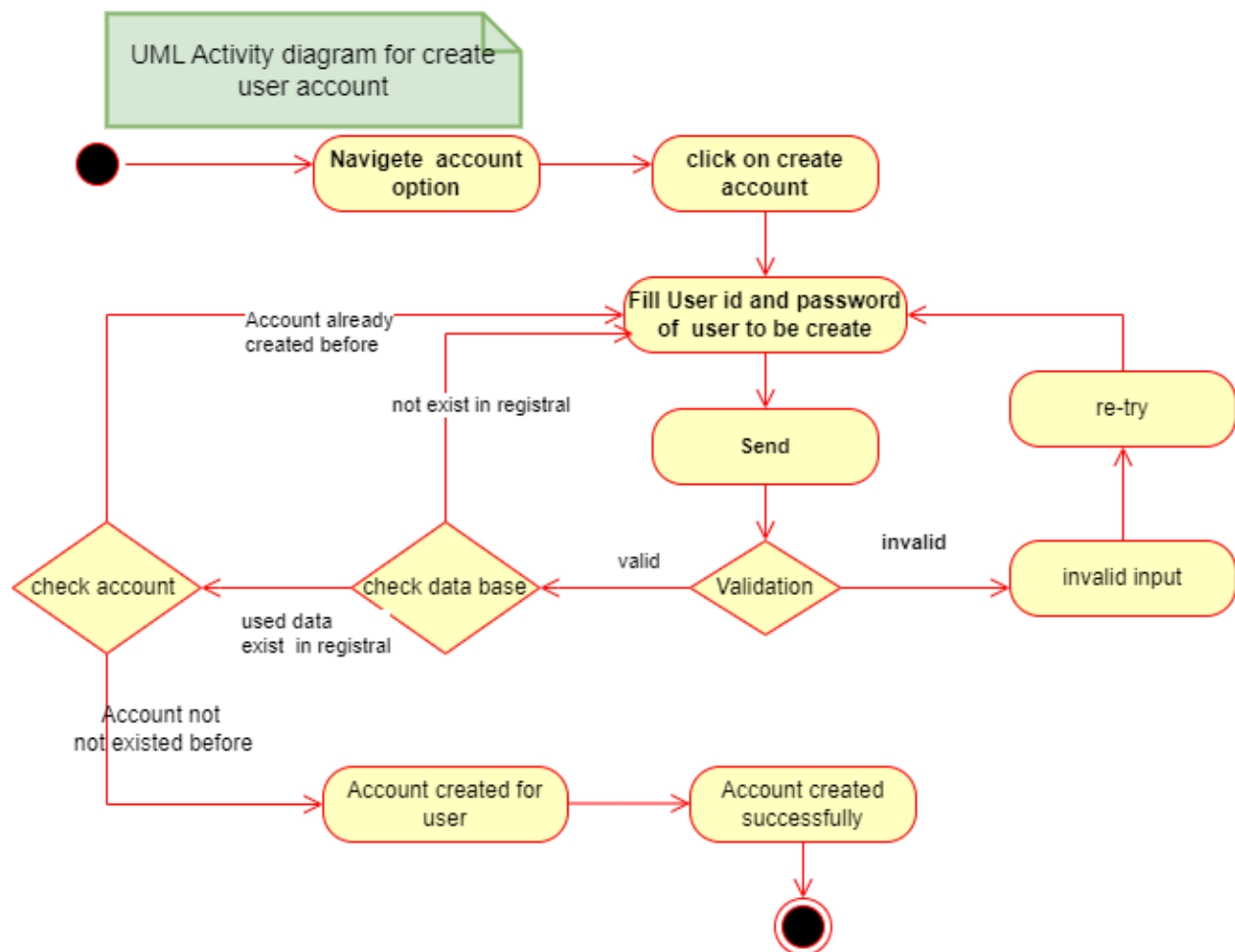
Figure4.12 Activity Diagram for Login

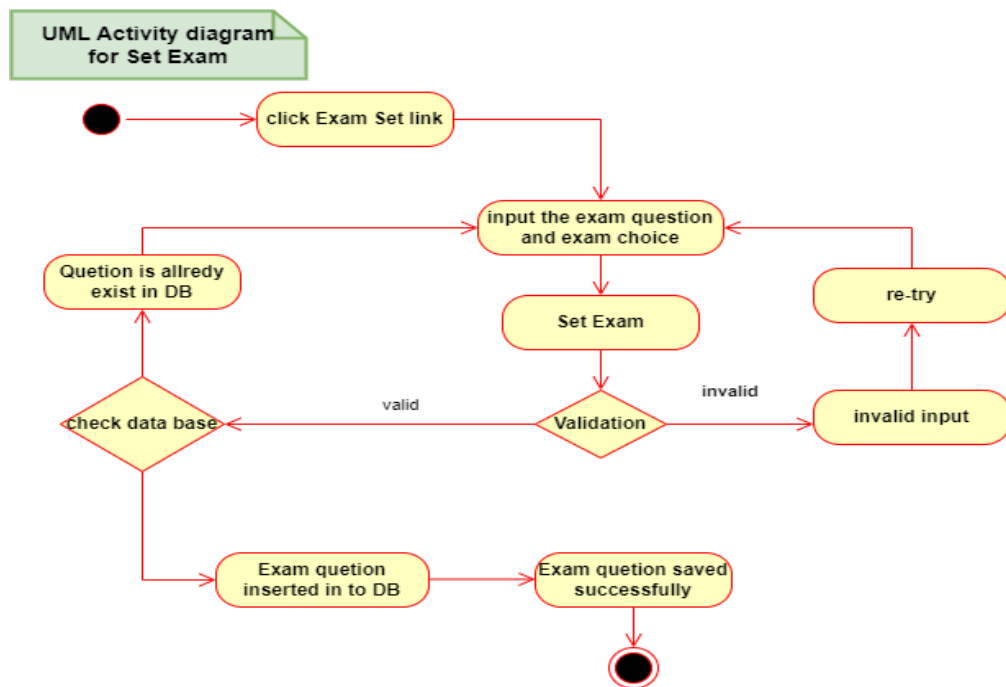Figure 4.13 Activity Diagram for Create User Account

Figure 4.14 Activity Diagram for Set Exam
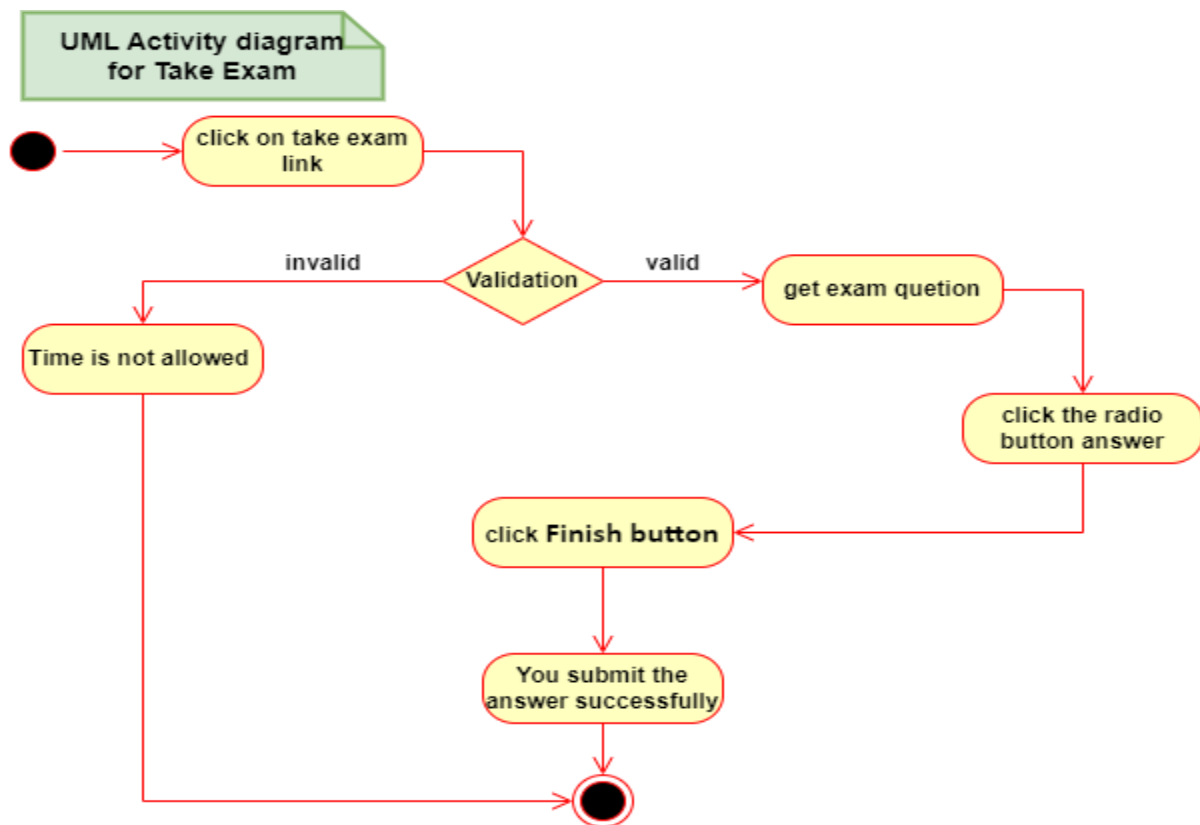
Figure 4.15 Activity Diagram for Take Exam
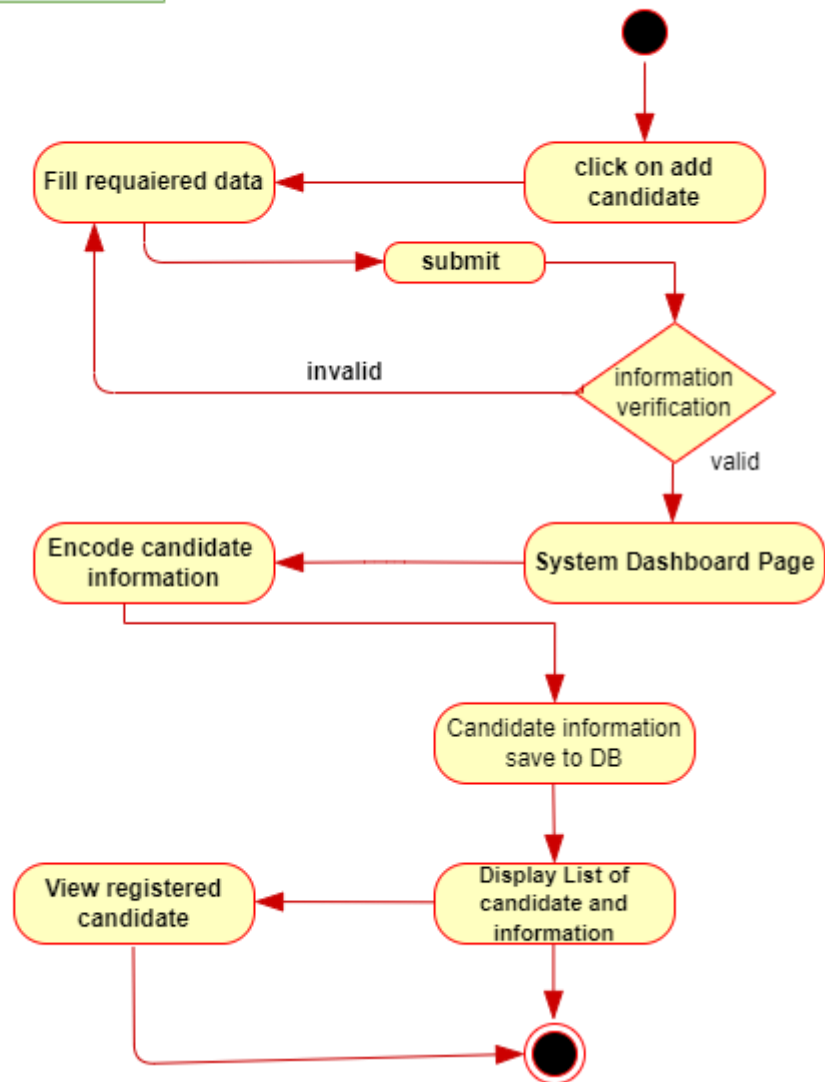
Figure 4.17 Activity Diagram for Register Candidate
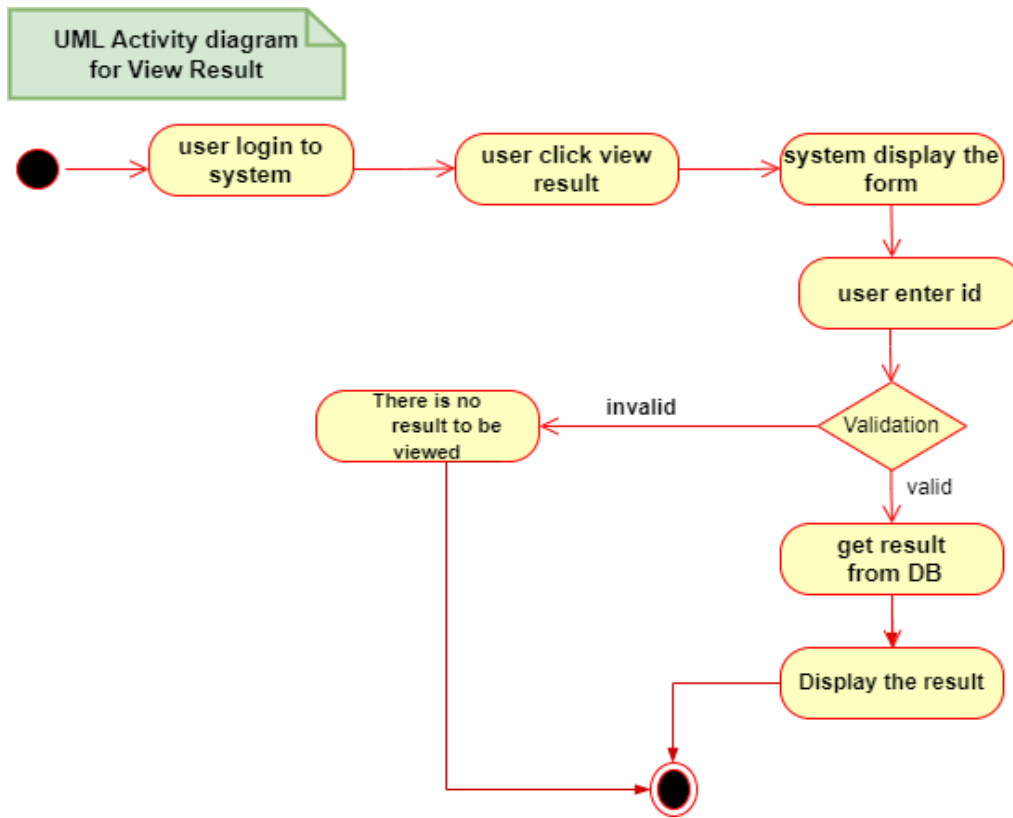
Figure 4.18 Activity Diagram for View Result

4.3.3. State Chart Diagram

In this diagram we model the dynamic nature of a system. It is simply a presentation of a state machine that shows the flow of control from state to state.

Figure 4.19 State chart Diagram for Create User Account

Figure 4.20 State chart Diagram for Create Set Exam

Figure 4.21 State chart Diagram for Create Take Exam

Figure 4.23 State chart Diagram for Register Candidate

Figure 4.24 State chart Diagram for View Result

CHAPTER FIVE

5. SYSTEM DESIGN

5.1. Introduction

The online exit examination system will provide students with a web-based platform to take and submit their final exams and also to view their result. Our system will be built using a client-server archit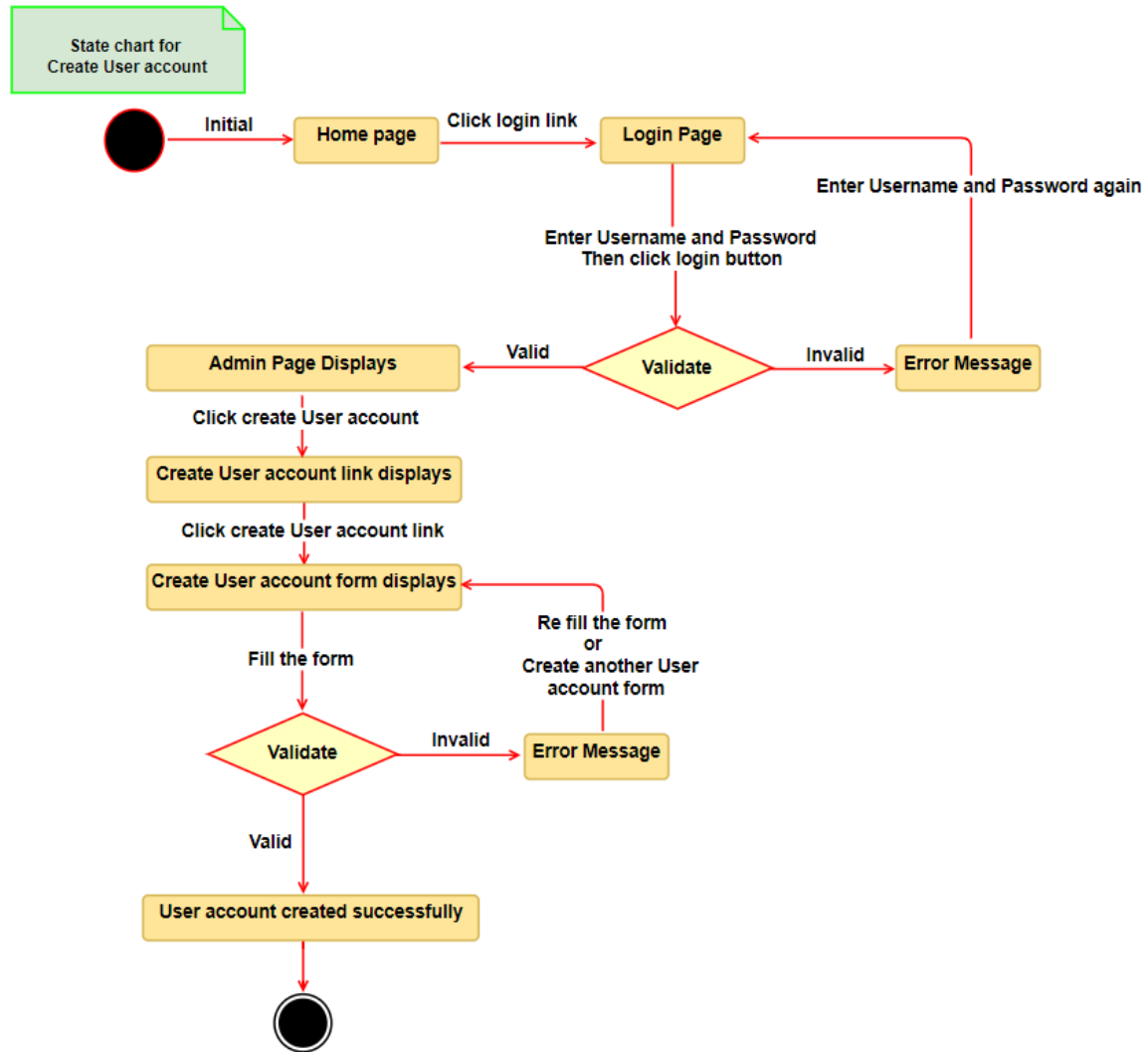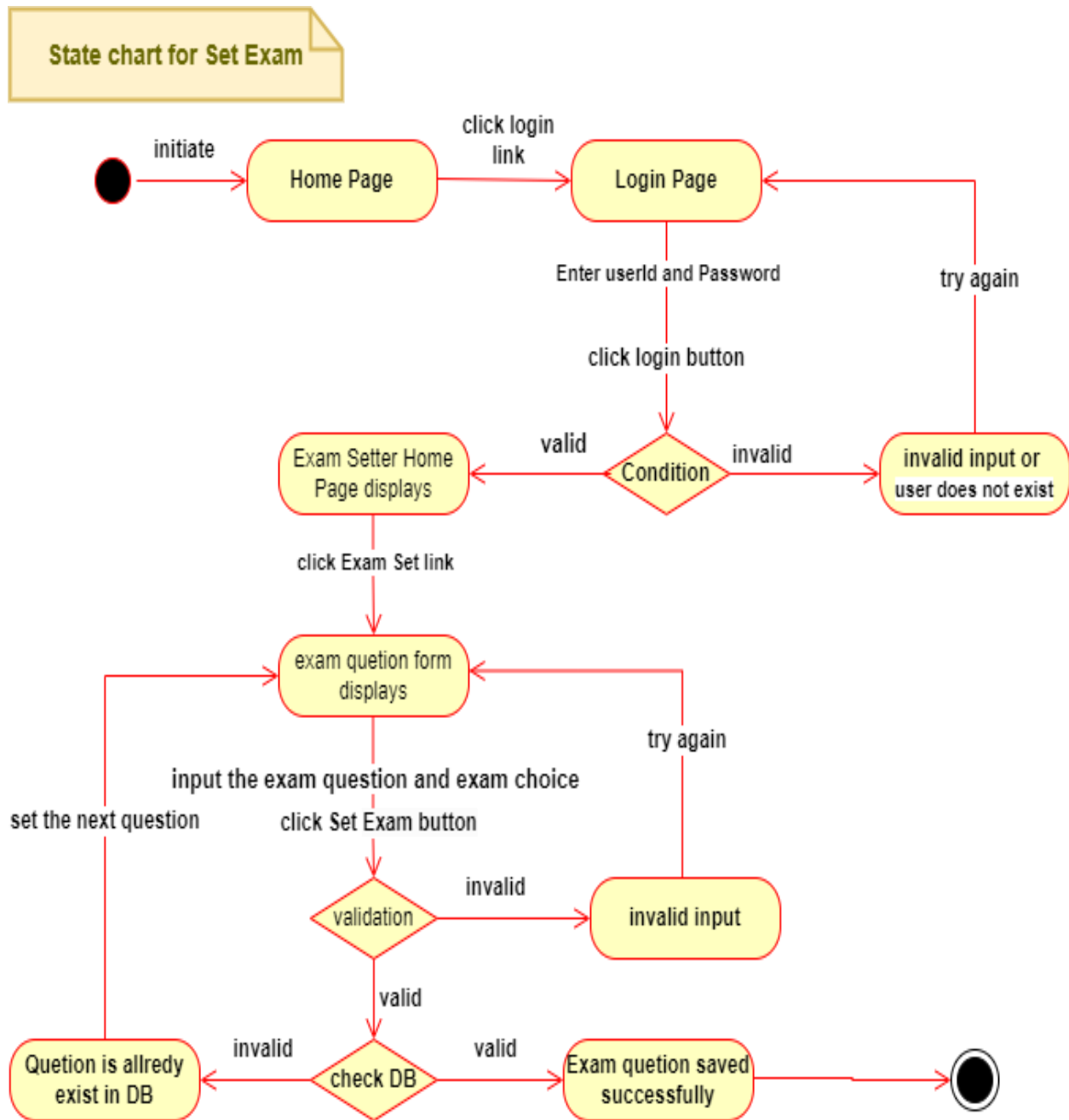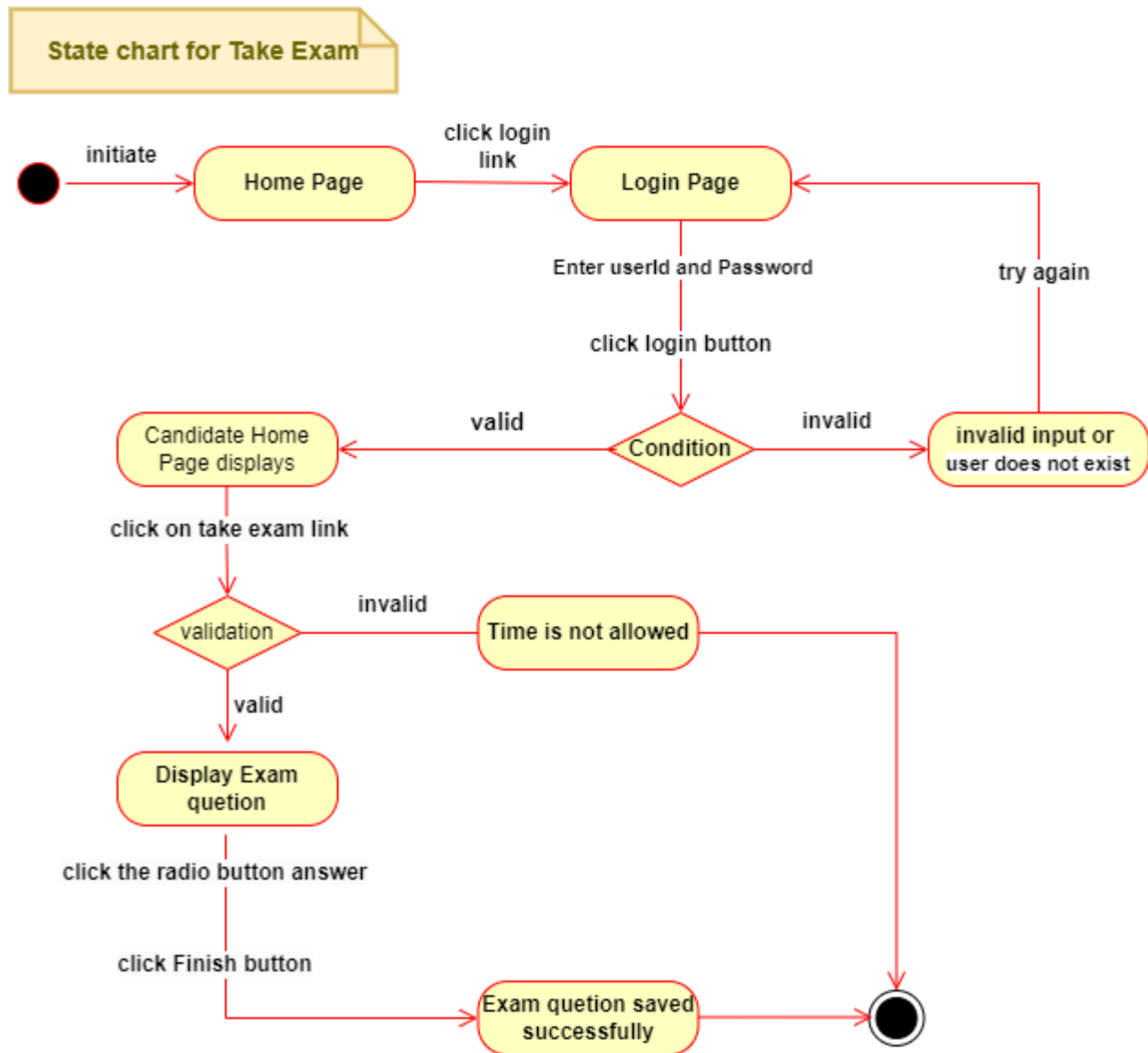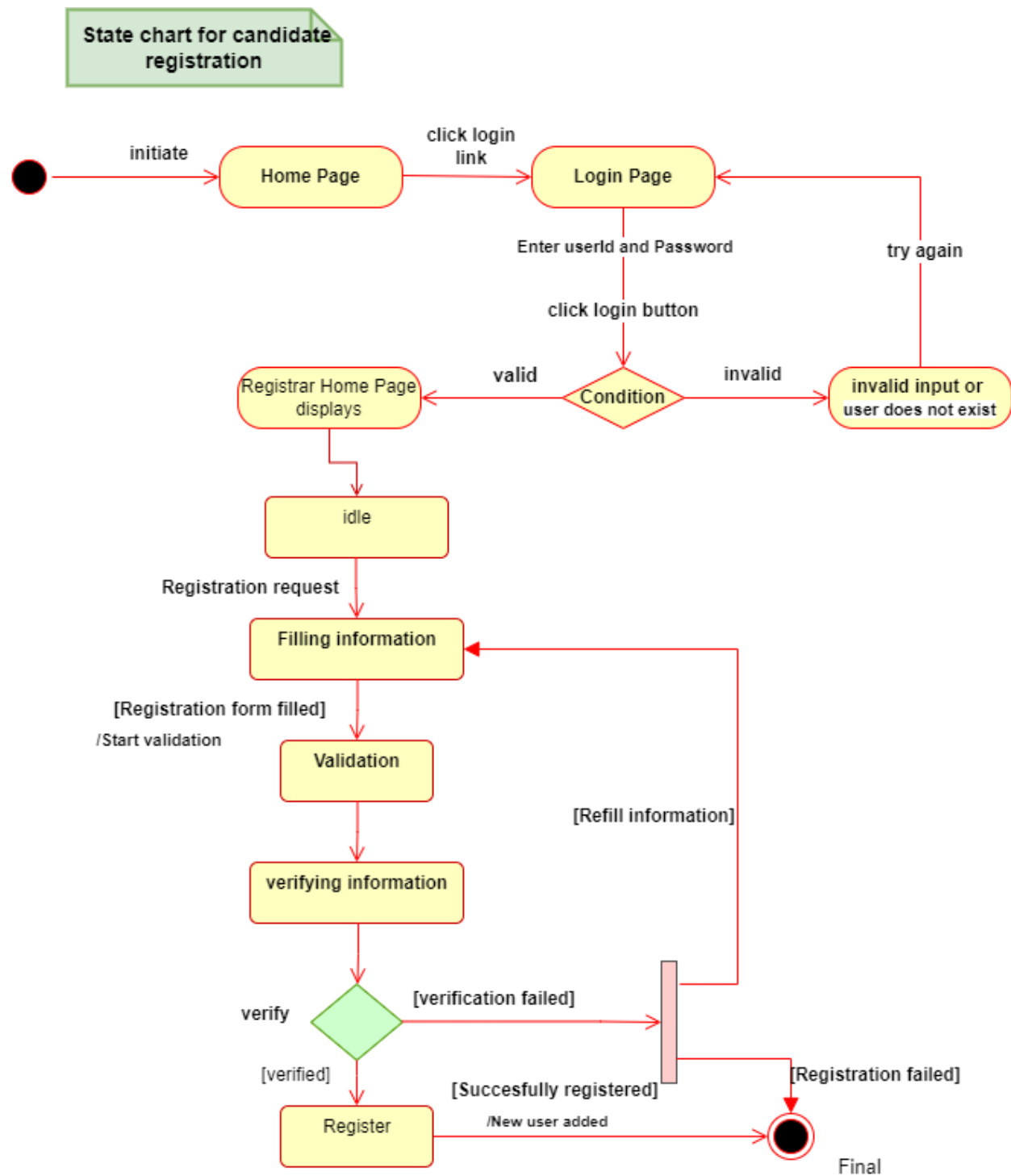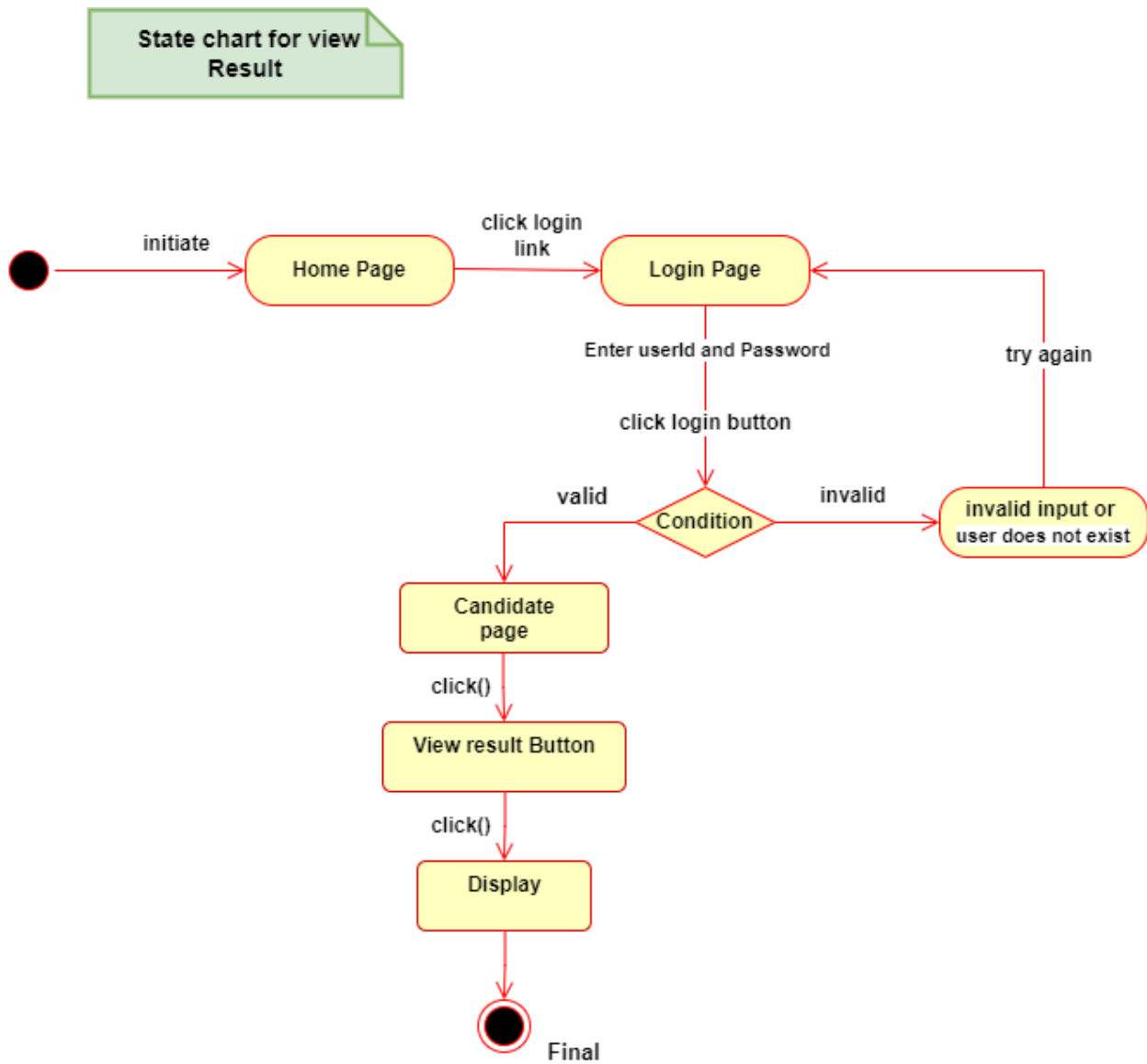ecture, with a web application as the client and a database server as the backend. The system will use a secure login system to authenticate users and will store all user data in an encrypted database. The system will also be designed to handle a large number of concurrent users and will incorporate load-balancing and caching techniques to optimize performance. Finally, the system will include a backup and recovery mechanism to ensure that data is not lost in the event of a system failure.

5.2. Design Goals

The design goals of our system are focused on providing a secure and user-friendly platform for students to take and submit their final exams. Different types of system modeling techniques that are used to make the implementation of our system such as deployment and component modeling are show in detail. Finally, the system will be designed with scalability in mind to accommodate potential future growth and expansion.

5.2.1. User Interface and Human Factors

Our online exit examination system's user interface and human factors (aspects) are crucial because they influence how users engage with the system and have an impact on its usability, user satisfaction, and overall success. Here are some goals and issues we aim to tackle with our project's user interface and human aspects: -

1. **Simple and intuitive user interface design:** The system's user interface will be made to be simple and intuitive for all users.
2. **Responsive and adaptive design for various screen sizes and devices:** The system will be accessible via a web-based interface that will be responsive and adaptive to various screen sizes and devices.

3. **Easily distinguishable color schemes for users with color vision deficiencies:** The system will incorporate color schemes that are easily distinguishable for users with color vision deficiencies.

4. **Minimization of user frustration and errors:** The system will be designed to minimize user frustration and errors through careful system design and testing.

5. **Validation checks to prevent user errors:** The system will incorporate validation checks to prevent user errors.

6. **Clear error messages when errors occur:** Clear error messages will be displayed when errors occur.

5.2.2. Hardware Consideration

The hardware considerations for our system are focused on ensuring that the system can handle a large number of concurrent users while maintaining a high level of performance. The system will be deployed on a server infrastructure with a high-speed internet connection to ensure that users can access the platform quickly and reliably. Additionally, to ensure that the system is highly available and reliable, redundant hardware and storage will be implemented to provide fault tolerance in case of hardware failures. Finally, the system will be designed to scale easily to accommodate potential future growth and expansion.

5.2.3. Security Issues

User authentication and authorization: To guarantee that only authorized users can access the system and its resources, our system will include a reliable authentication and authorization method.

Secure data storage and transmission: Strong encryption techniques will be used by the system to guarantee that all data is safely transported and stored, preventing illegal access and data breaches.

Protection against malicious attacks: The system will have measures in place to prevent and detect malicious attacks, such as DDoS attacks, SQL injection attacks, and other common attack vectors.

Access control and user permissions: The system will employ granular access control and user permissions to ensure that users only have access to the resources and data that they need to complete their tasks.

Regular user training and awareness: Regular user training and awareness programs will be implemented to ensure that all users understand the importance of security and their role in keeping the system secure.

5.2.4. Performance Consideration

Performance is a crucial factor to take into account when our system because it can affect user happiness and the system's overall success. When constructing your system, the following performance factors where considered: -

1. **Response time:** The system will be built to respond quickly to user requests, such as page loading and query executions.
2. **Scalability:** The system will be built to accommodate or handle a big number of users and a lot of traffic.
3. **Resource utilization:** The system should be designed to make efficient use of available resources, such as CPU, memory, and disk space.
4. **Availability:** The system should be designed to ensure high availability and minimal downtime. This can be achieved through the use of failover mechanisms, redundancy, and disaster recovery plans.
5. **Testing:** we will performance testing to identify bottlenecks and ensure that the system can handle the expected load. This can include load testing, stress testing, and capacity testing.
6. **User experience:** The system will be designed to provide a good user experience, with fast page load times and smooth navigation.

5.2.5. Error Handling and Validation

1. **Data validation:** Data validation will be used by the system to make sure that all input data is accurate and in the right format, lowering the possibility of data errors or system failures.

2. **Error messages:** If there is a problem with their input or if the system meets an error, users will see clear and succinct error messages, which will aid them in fixing the problem.

3. **Exception handling:** The system will have well-defined exception handling procedures in place to handle unexpected errors or issues that may arise.

4. **Testing:** Error handling and validation procedures will be regularly tested to ensure that they are functioning correctly and that the system is operating as expected.

By implementing these error handling and validation considerations, our system will be better able to handle user input and unexpected errors, reducing the risk of data loss or system downtime. This will help ensure the system is reliable and that users can have confidence in the accuracy and security of their examination results.

5.2.6. Quality Issues

1. **Reliability:** The system will be designed to ensure a high level of reliability and availability, with redundant hardware and storage, fault-tolerant software, and regular backups and recovery procedures in place.

2. **Scalability:** The system will be designed to scale easily to accommodate potential future growth and expansion, with the ability to handle a large number of concurrent users.

3. **Maintainability:** The system will be designed to be easy to maintain and update, with clean code, and good documentation.

4. **Security:** The system will be designed to be secure, with strong authentication and authorization mechanisms, encryption of sensitive data, and protection against malicious attacks.

5. By addressing these quality issues, the system will be reliable, scalable, maintainable and secure. This will ensure that the system is of high quality and meets the needs of its users, both now and in the future.

5.2.7. Backup and Recovery

1. **Regular backups:** The system will be set up to perform regular backups of all data, including user information, examination results, and system logs.

2. **Automated backup procedures:** The backup process will be automated to reduce the risk of human error and ensure consistency.

3. **Recovery procedures:** The system will have well-defined recovery procedures in place, including documentation of the steps needed to restore the system in the event of a failure.

4. **Testing:** Backup and recovery procedures will be regularly tested to ensure that they are functioning correctly and that data can be recovered in the event of a failure.

5. By implementing these backup and recovery considerations, our system will be protected against data loss and system failures. This will help ensure the system is reliable and that users can have confidence in the accuracy and security of their examination results.

5.2.8. Physical Environment

The physical environment for our system will be designed to provide a secure and stable location for the system hardware. Adequate physical security measures should also be put to prevent unauthorized access, theft, or damage to the server hardware. By ensuring a secure and stable physical environment, the system will be able to operate reliably and provide a consistent user experience. The system will deploy on the university's main server and any authorized user can access the system on the computer by using a web browser.

5.2.9. Resource Issues

When designing and implementing our online exit examination system, resource considerations are one of the key factors. The system will be made to make optimal use of resources, such as decreasing CPU utilization, shrinking memory footprint, and improving network traffic. A great user experience and smooth system operation are also dependent on effective resource management.

5.2.10. Documentation

The development process should be recorded in such documents as the proposal, project report, and final document, in addition to a document for users and technical documentation for maintainers. Users benefit from documentation's instructions on how to use the system. Because of this, it is necessary and also useful for maintenance.

5.3. Current System Architecture

The current exit examination process is being done manually, with no existing system or software architecture in place. The process involves several steps, beginning with the creation of exam materials by the examiners. Exam materials are then distributed to the exam takers, who complete the exam and submit it for grading. The examiners then grade the exams and provide feedback to the exam takers. The results of the exam are then recorded and stored in a physical format.

While the current manual process has been successful in meeting the needs of the organization, there are several pain points that have been identified. These include the time-consuming nature of the process, the potential for errors in grading, and the lack of centralized storage and management of exam results.

By implementing an online exit examination system, we are aims to streamline the process and address these pain points. The new system will provide a centralized platform for creating, distributing, and grading exams, as well as storing and managing exam results. This will reduce the time required for the exam process, improve accuracy and consistency in grading, and provide a more efficient and effective solution for managing the exit examination process.

5.4. Proposed System Architecture

The Proposed system architecture for our system will likely involve a client-server model, where the clients are the students taking the exam and the server is responsible for delivering the exam content, receiving the student's answers, and grading the exams. This model can support multi-tier architecture. so, we will use multi-tier architecture in our system:

- ❖ presentation tier
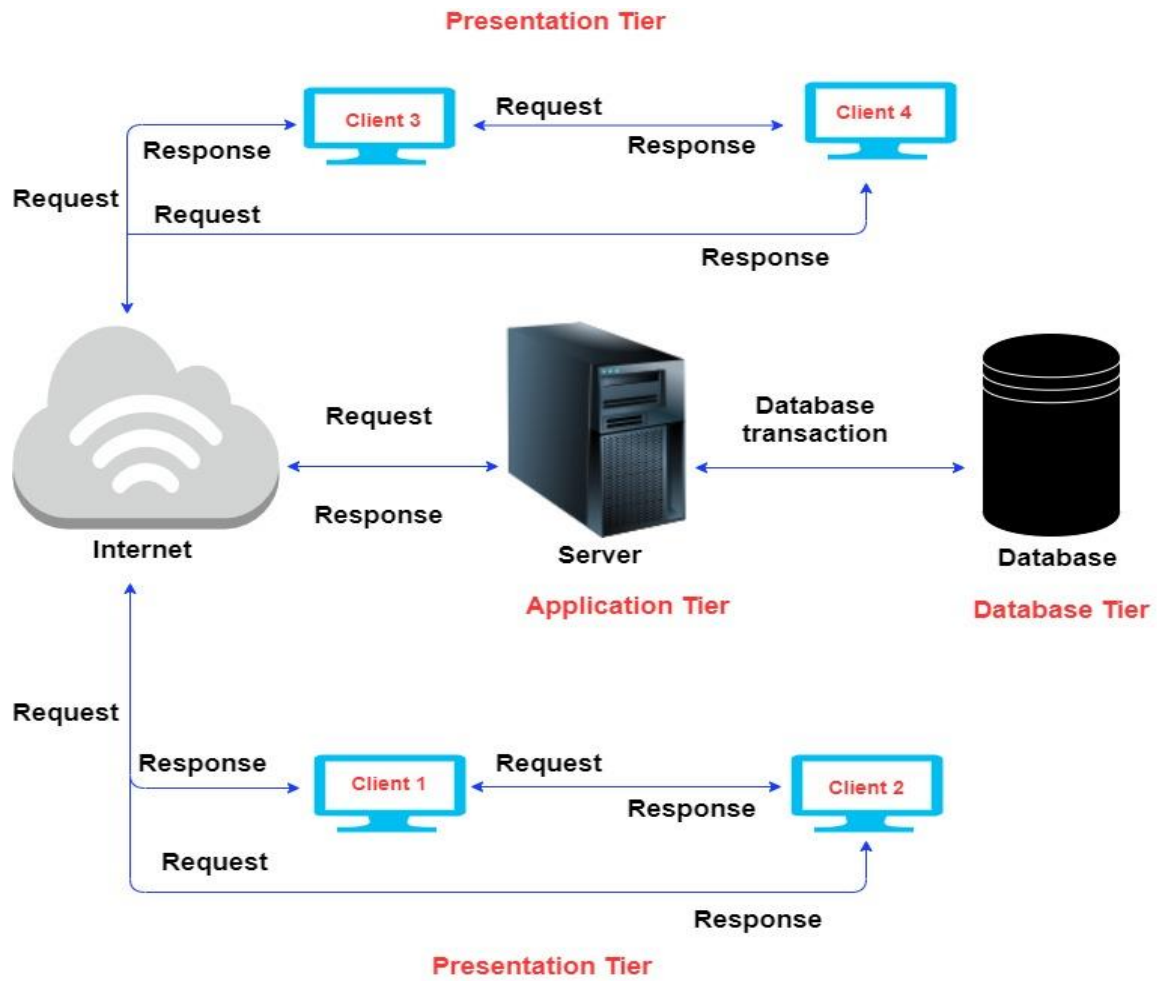
- ❖ application tier, and

- ❖ database tier

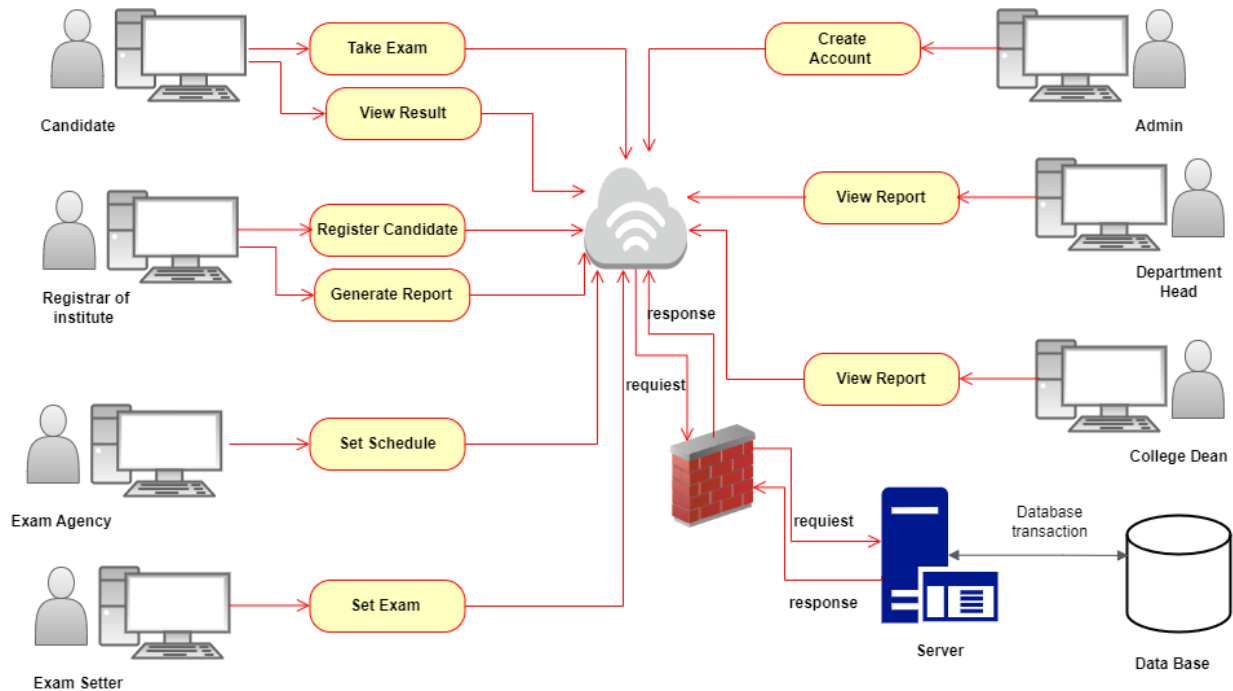Figure 5.1: General proposed system Architecture

Figure 5.2: Proposed System Process

5.4.1. Subsystem Decomposition and Description

Our Subsystem decomposition will break down a complex system into smaller, more manageable parts, or subsystems. Each subsystem is a functional unit that performs a specific set of tasks within the larger system. Subsystems identified from our system are: -

1. **User Management Subsystem**: This subsystem is responsible for managing user accounts and providing authentication and authorization for system users. It handles all the activities related to user login, logout, and password management.

2. **Exam Management Subsystem:** This subsystem is responsible for managing the online exit examination process. It provides functionalities for creating and scheduling exams, setting passing scores, and managing exam feedback. It is further divided into two independent subsystems:

   a. **Exam Setter Subsystem Description:** This subsystem allows authorized exam setters to create and edit exams.

   B.**Exam Agency Subsystem - Description:** This subsystem is responsible for registering exam setters, scheduling exams, and setting passing scores, and managing exam feedback.

3. **Reporting Subsystem:** This subsystem is responsible for generating reports based on exam results, candidate information, and examiner feedback.

4. **Feedback Management Subsystem:** This subsystem is responsible for giving response.

5. **Student Information Subsystem:** This subsystem is responsible for Student Information.

6. **Backup and Restore Subsystem:** This subsystem provides functionalities for taking system backups and restoring them in case of system failures.

Each of these subsystems can be further divided into modules to implement specific functionalities as required. Additionally, the subsystems can communicate with each other to share data and provide the desired functionalities to users.
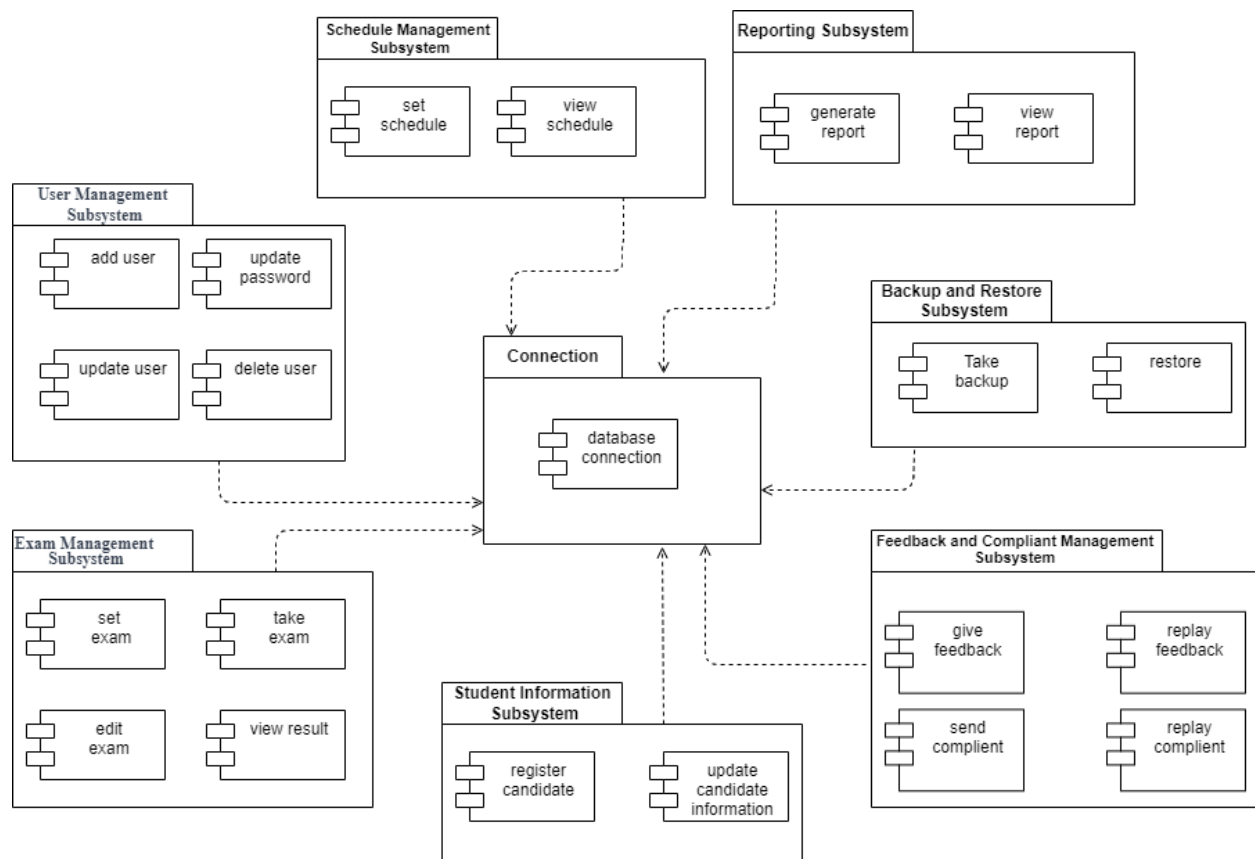

Fig 5.3**:** Subsystem decomposition

5.4.2. Hardware/Software Mapping

Here is a Hardware/Software mapping for the online exit examination system:

Hardware:

- **Server(s):** The system will be hosted on many servers, depending on the expected load and redundancy requirements. Each server should have sufficient processing power, memory, and storage to handle the system's workload.
- **Network infrastructure:** A reliable network infrastructure is necessary to ensure smooth communication between the system components and users. The infrastructure should include routers, switches, firewalls, and other necessary components.

Software:

- **Operating system:** The server(s) can run an operating system Windows Server.
- **Web server**: The system will use a web server like Apache to serve the web-based user interface and handle HTTP requests.
- **Database management system:** The system will use SQL DB to store and manage data related to candidates, exams, examiners, and other system components.
- **Programming language and framework:** The system will be developed using a programming language and a web application framework React and PHP.

Deployment diagram
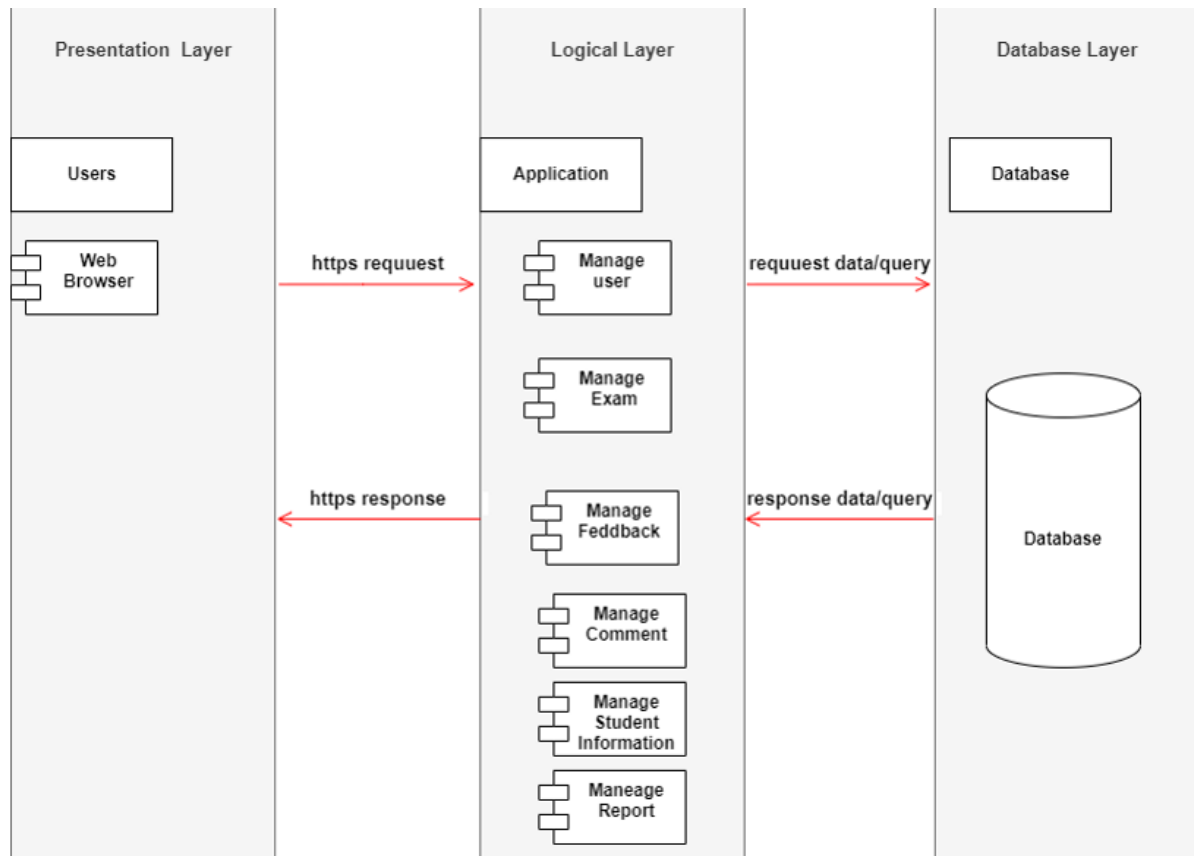
Figure 5.4: UML deployment diagram [8]

5.4.3. Detailed Class Diagram

In this diagram we want to shows classes, attributes, methods, attribute data types, visibility ((Public (+), Private (-), Protected (#)) of attributes and methods), inheritance, association, aggregation, and multiplicities (cardinality and optimality). Below we use the detailed class UML diagram to show how the aforementioned concepts are organized and designed for a better understanding of the system's detailed class diagram.
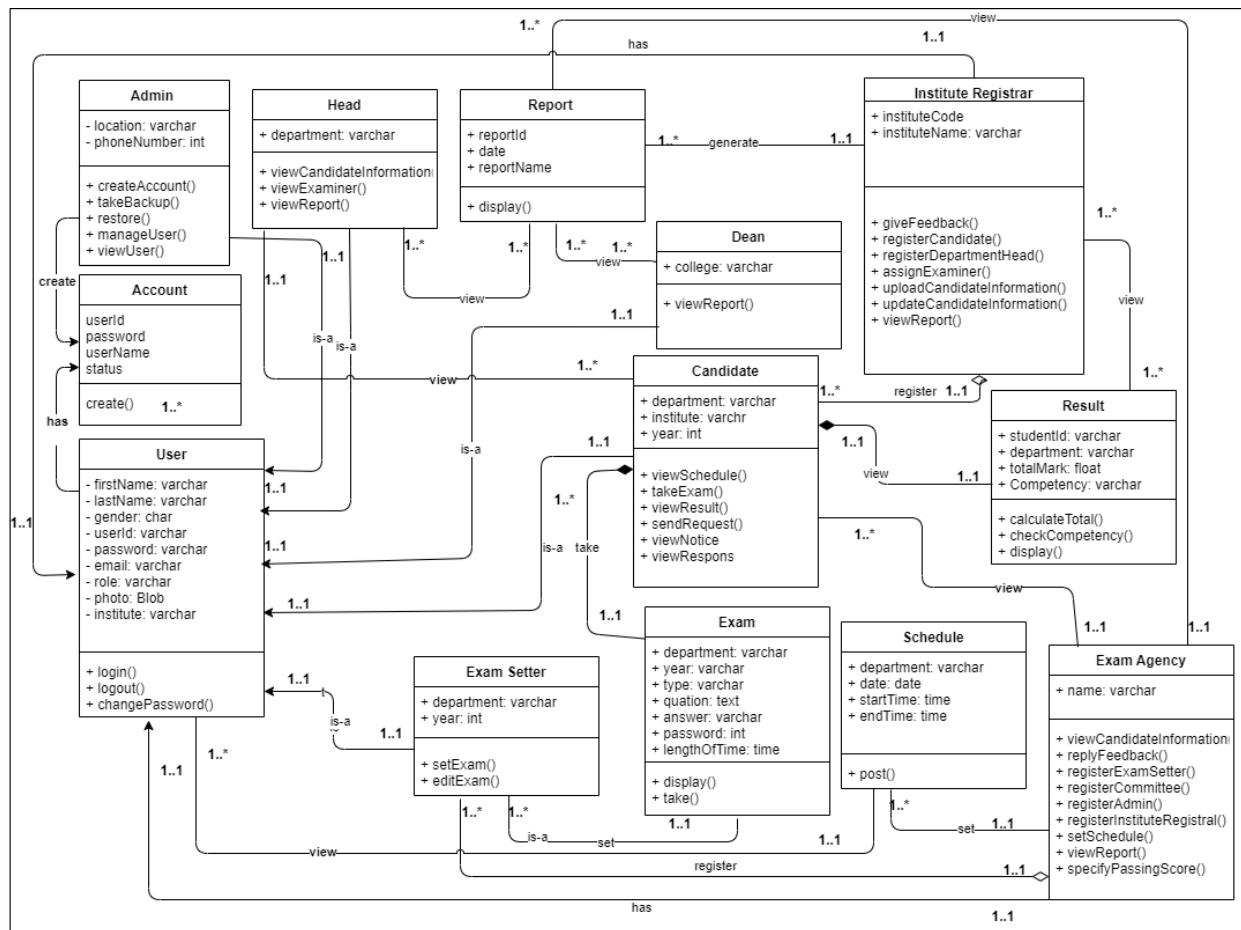
Figure 5.5: Detailed Class Diagram

5.4.4. Persistent Data Management

Persistent data management is a critical consideration for the success of our system. It will be implemented using SQL database management system. The data schema will be designed to represent the various data entities, including user profiles, examination questions, and results. The data will be stored in collections, with each collection representing a data entity, and the documents within a collection representing individual instances of that entity.

Figure 5.6: Persistent Diagram

5.4.5. Access Control Security

Access control and security in our system involves defining user roles and privileges, as well as managing their access to system resources. This section includes a description of the user model, which outlines the access privileges of different types of users. In addition, tables can be used to indicate the privileges assigned to each user of the system, providing a clear overview of who has access to what resources.

Table 5. 1: Access Control Security

Activity	Actors						
	Admin	Candidate	registrar	Exam Agency	Collage dean	Department head	Exam setter
Login	✓	✓	✓	✓	✓	✓	✓
Create Account	✓						
Register Candidate			✓				
Register Exam Setter				✓			
Set Exam							✓
Edit Exam							✓
Assign Examiner			✓				
Give Feedback			✓	✓			
Set Schedule				✓			
View Schedule		✓					
View Examiner			✓			✓	
Reply Feedback				✓			
Update password	✓	✓	✓	✓	✓	✓	✓
Manage User	✓						
Take Exam		✓					
Update Candidate Information			✓				

Specify Passing Score				✓			
View Result		✓	✓	✓			
View Candidate Information	✓		✓	✓		✓	
Send Compliant		✓					
Reply Compliant			✓				
Take backup	✓						
Restore	✓						
Generate Report			✓				
Logout	✓	✓	✓	✓	✓	✓	✓

5.5. Package

In this section, we relate classes and modules within a subsystem. The package diagrams provide a visual representation of the relationships between the packages, including dependencies and inheritance. The goal is to make it easy for developers to locate and work on specific modules and for future updates and maintenance of the system.
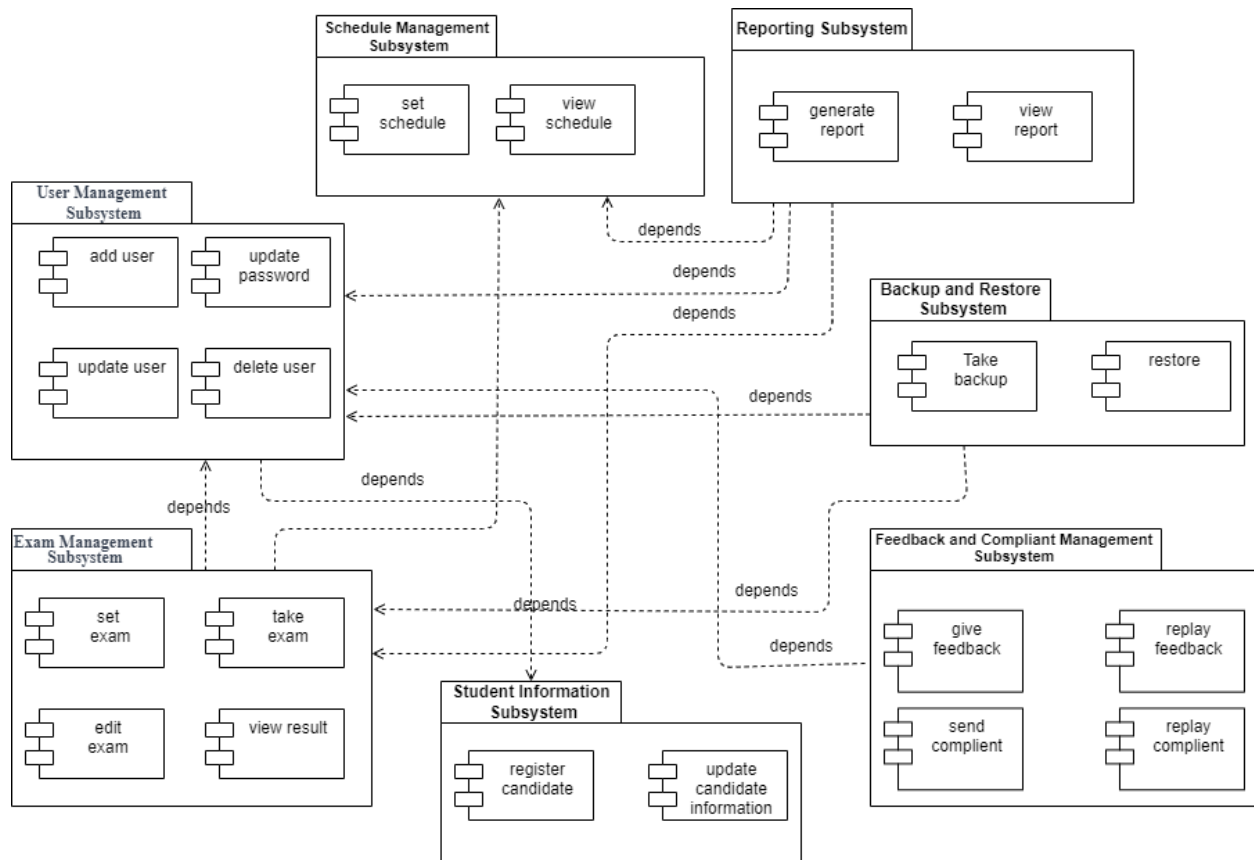
Figure 5.7: Package Diagram

5.6. Algorithm Design

Some algorithms of our project are the following.

Algorithm: Login ()

This method enables the user to log in to the system:

BEGN

Login (username, password)

INPUT: Username and Password

IF (User exists)

THEN

READ Password FROM database

IF (Password == Entered Password)

Login successful

ELSE

PRINT "incorrect password "

END IF

ELSE

PRINT "incorrect Username or password "

END IF

END

Algorithm: takeExam ()

This method allows a student to take the exam:

BEGN

STUDENT ENTERS THE EXAM

function takeExam (studentId, examId) {

AUTHENTICATE STUDENT

If (authenticateStudent (studentId)) {

RETRIEVE THE EXAM QUESTIONS FROM THE DATABASE

const questions = getExamQuestions(examId);

SHUFFLE THE QUESTIONS TO PREVENT CHEATING

shuffleQuestions(questions);

DISPLAY EACH QUESTION TO THE STUDENT AND WAIT FOR THEIR ANSWER

for(const question of questions) {

```
    displayQuestion(question);

    const answer = getStudentAnswer ();
```

STORE THE STUDENT'S ANSWER FOR LATER GRADING

```
    SaveStudentAnswer (studentId, examId, question.id, answer);

  }
```

GRADE THE STUDENT'S ANSWERS

```
    Const grade = gradeStudentAnswers (studentId, examId);
```

DISPLAY THE STUDENT'S FINAL GRADE

```
    DisplayGrade (grade);

  } else {

    DisplayError ("Invalid student ID");

  }

}
```

5.7. User Interface Design

The proposed system has a graphic user interface to interact with the user. Below different user interfaces that are visible to all users of the system are described. In addition, can get information posted and different links to other pages.
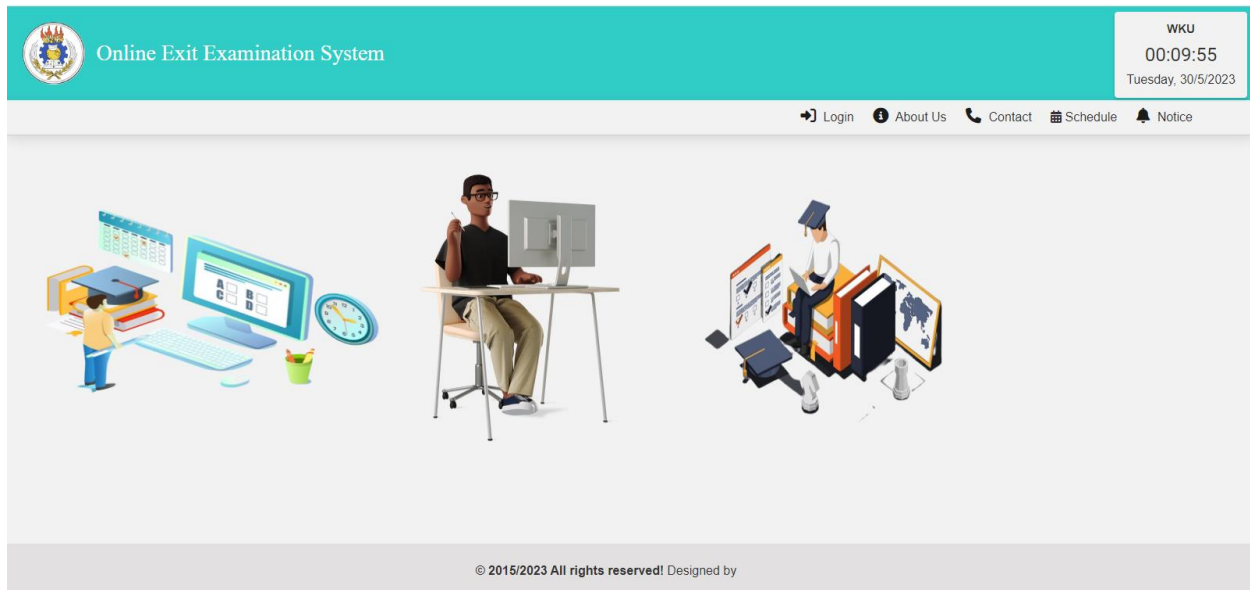
Figure 5.8: Home page

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