# Online Examination System

Submitted in partial fulfillment of the requirement

for the degree of

**Bachelor of Software Engineering**

**Submitted by: Munib Ahmad "Hamid" And Mohammad Yousof "Masih"**

**Under The supervision of:**

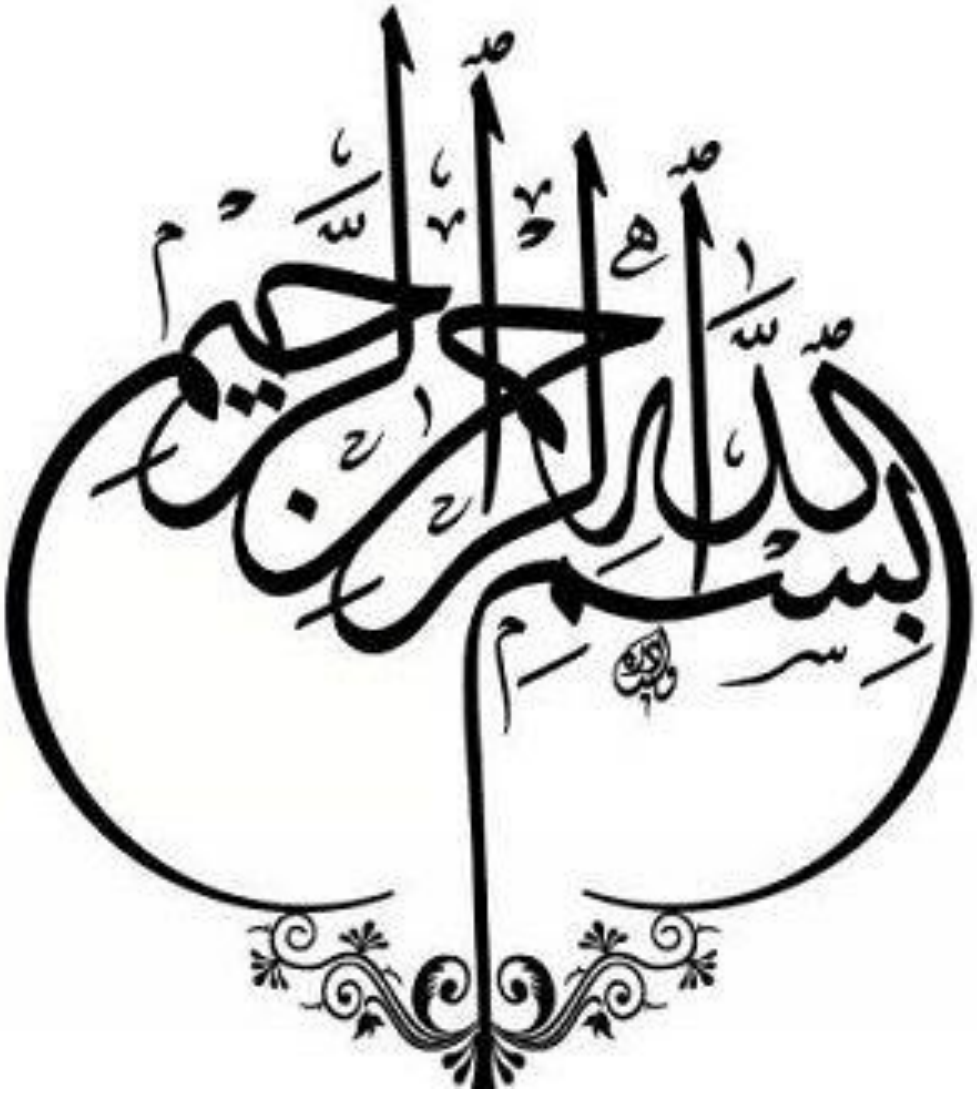
**Assistant Pro: Sayed Najmuddin Sadaat**


**Department of Software Engineering**

**Faculty of Computer Science**

**Kabul Afghanistan**

**2022**


بسم الله الرحمن الرحيم

# Certificate of approval

We certify that we have read “Online Examination System” report submitted by Munib Ahmad “Hamid” and Mohammad Yousof “Masih” as a partial Fulfilment for the award of the Bachelor of Software Engineering, Faculty of Computer Science at Kabul University. We have evaluated the report and found it up to the requirements in its scope and quality for the award of the degree.

Supervisor

Name: Sayed Najmuddin “Sadaat”

Signature: _____

Name: Dr. S. Hassan “Adelyar”

Head of the Software Engineering Department

Signature: _____

# Declaration

We declare that, the work we have done for this project is exclusively our own and it's report entirely is on the basis of our personal effort, under the diligent guidance and support of our supervisor. If any prove is encountered that we have copied out this project from any source or found to be reproduction of someone else, we shall stand by the consequences.

Mohammad Yousof "Masih"

Munib Ahmad Hamid

# Dedication

We dedicate our work to our parents and family members, our friends, our respected teachers and our supervisor who motivated, supported and helped us in doing this project as well as in other aspect of our life.

# Abstract

An online examination system is a software solution that allows a company or a teaching institute to prepare and manage examinations across an online platform. This can be done through Internet, Intranet and/or LAN environments. The main purpose of this software is to create an online examination system application that utilizes network laboratories available in any college. The application greatly reduces the time required to administer the examination and handout the results. The examination will consist of objective questions, and the system will provide an easy-to-use graphical user interface for lecturers to ask questions and for students to answer them. The application was developed with Laravel, and providing a better performance. This web application uses Laravel, bootstrap and JavaScript in the frontend and MySQL as the backend of the interface on the Apache Server Framework and supports the HTTP/HTTPs protocol with English.

# Contents

# Acknowledgment

As Human being is weak and they are not free of mistakes, they need guide. First of all, we are much thankful to the most compassionate and merciful Allah and our prophet Hazrat Muhammad (PBUH) to directly guide us the right way of Islam and gives us the ability to get knowledge. We are very appreciative to almighty Allah for giving us the ability, strength and courage to write and complete this research about Online Examination System. Without the help of our families, friends and teachers it was not possible for us to complete this research, hence we would like to thank our families especially our parents who always prayed for us and provided us with every kind of support that we needed in our childhood and our study life in the university. We would also like to thank our all university teachers for providing us with the knowledge and awareness during our academic life in university, we appreciate them so much. We are also thankful to Mr. Sayed Najamudin Sadat for their outstanding support and motivation during work on this system and no doubt that he provided us with time to time suggestions during writing this research. We will not be able to forget the kind and persuasive support of Mr. Ameer Kroor Shaheedzai (Dean of Faculty), during our academic life in computer science faculty. They all were proofed very assistive for us. We would really like to specially thank Mr. Bilal who help us in coding phase of the system when needed.

# List of Figures

## Chapter 4

# Chapter 1

# 1. Introduction

## 1.1 Background

Electronic learning (E-learning) has been a rapidly growing aspect of education systems, allowing the move from classic in class learning to virtual classrooms and online courses and examinations. Testing is a large part of assessing education outcomes; they require being fair through transparency and unbiased marking. Since most institutions around the world are moving away from paper-based framework to paperless, online examination systems can employ modern internet technologies to produce a testing environment that is time efficient, easy to use and specifically designed to meet the needs of students and teachers. Today, online examination systems can assess student achievement and help teachers deliver fair and open results. During an online examination, all students' computers must contact the examination server for examination subjects. This paper describes a system which, we can generally have applied in any university or collage aiming to reduce the demanding task of assessing student's test answers, then recording them and delivering them manually.

The purpose of online examination is to provide a good online test and save the time for papers checking. The prime goal of online examination is to efficiently assess the applicant completely by the help of an automated system that doesn't only saves the time but also provide the results rapidly. This way help student to submit their paper according to them convenience and the usability of paper and pen. The scope of online examination project is so large in terms of else manually taking exams. Some of them are listed below: It can be used in educational domain as well as within enterprise world. There's facility to use it anyplace and any time because it's a web based application. The location of user doesn't affect the application. There's no restriction that the controller or the examiner has to be present when assess is doing the exam.

## 1.1 Paper-Based versus Online Examination Systems

Paper-based examinations have been used, somewhat effectively, to measure students' knowledge and understanding of problem-solving techniques. While these tests are useful in many ways, they can be limited in how efficient it can be. Paper-based examinations can be

4. Paper based
5. Difficult to keep old records

## Time consuming

With manual systems the time is not efficiently controlled. Additionally, performing of the works and preparing of the accurate reports can take more time. We can say the most important factor for measuring the efficiency of any system is time, so retrieving and finding the specific records and information in manual systems is one of the reasons to bring the wastage of time which negatively affect the efficiency of our system.

## Lack of security

As we know the data is a very important asset for any organization, so therefore it is very necessary and compulsory to protect and secure the data but with existing system (Manual system) it is difficult to do it. The data or information of existing system is not safe, so unauthorized persons can easily access the data. With manual systems keeping the old records is difficult means that the old records maybe lost and we can't have access to the old information.

## Slow data processing

When someone customer refer to the company the company principle knows our self-customer and can't access information something because of that there is paper base system. This may take minutes, hours and even days to find specific record of students.

## Paper based

Furthermore, the exam's documents will typically need to be stored close to hand so that they can be accessed as quickly as possible, if they are located on another floor or in a different building, you could experience severe productivity losses when retrieving forms and also editing problem.

## Difficult to keep old records

# Chapter 4

With manual systems keeping the old records is difficult means that the old records maybe lost and we can't have access to the old information.

## 1.3 Project Methodology

Project Methodology is very important for developers.

Methodology provides rules and through guidelines for ordering and controlling the actions and decisions of project participants during the project development. Methodology can be defined as a set of guidelines for designing a database. The system approach to the analysis and design of (Online examination System) is Structured System analysis and Design Methodology (SSADM). SSADM revolves around the use of two key techniques, namely Logical Data Modeling and Data Flow/Behavioral modeling.

## 1.4 Literature Review

Many different researches have focused on the subject of an online examination system these work can be represented as following: SIETTE: Guzman and Conejo (2005) proposed an online examination system called System of Intelligent Evaluation using Tests for Tele-education (SIETTE). SIETTE is a web-based environment to generate and construct adaptive tests. It can be used for instructional objectives, via combining adaptive student self-assessment test questions with hints and feedback. SIETTE supports secure login and portability features. On the other hand, the other features of the SIETTE are: resumption capability, multi-instructor, random question selection, random questions distribution and random choices distribution are missing.

EMS: Rashad ET. Al. in 2010 proposed a web-based online examination system called Exam Management System (EMS). EMS manages the examination and auto-grading for student's exams and supports conducting exams, collects the answers, auto mark the submissions, and produce the reports for the test. EMS supports secure login, multi-instructor, and portability features. However, the other features: resumption capability, random question selection, random questions distribution, and random choices distribution are missing.

ArvindSingh, NirajShirke, KiranShette 2011: The project evaluates the examiners by using the online examination system concept. The exams will be totally customizable. This system will check results automatically basing on students answers.

CBTS: Fagbola ET. al. in 2013 developed a Computer Based Test System (CBTS). CBTS is a web-based online examination system developed to address issues such as lack of timing flexibility for automation candidates log-off upon expiration of allowed time, result integrity, guaranty, stand-alone deployment, need for flexibility, robustness, designed to support the examination processes and overcome challenges framing the conduct of examination, auto-marking, auto- submission, and generation report of examination result.

### Logical Data Modeling

This is the process of identifying, modeling and documenting the data requirements of an Online Examination System. A Logical Data Model consists of a Logical Data Structure and the associated documentation. Logical Data Structure represents Entities and Relationships.

## Waterfall Model

In this system we used the waterfall model because we don't have interaction every time with customer. The Waterfall model is the earliest SDLC approach that was used for software development. The waterfall Model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete. In this waterfall model, the phases do not overlap. Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In The Waterfall approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

## Why choose waterfall model

This model is simple and easy to understand and use. It is easy to manage due to the rigidity of the model each phase has specific deliverables and a review process. In this model phases are

processed and completed one at a time. Phases do not overlap. Waterfall model works well for smaller projects where requirements are very well understood.

## Requirement Engineering and analysis

Requirements engineering is, as its name suggests, the engineering discipline of establishing user requirements and specifying software systems. The hardest single part of building a software system is deciding precisely what to build. No other part of the conceptual work is as difficult as establishing the detailed technical requirements. No other part of the work so cripples the resulting system if done wrong. No other part is as difficult to rectify [1]. Requirements are statements of what the system must do, how it must behave, the properties it must exhibit, the qualities it must possess and the constraints that the system and its development must satisfy.

### 1.5 Purpose of project

The purpose of online examination system is to provide a good computer based exam system and save the time for paper checking. The prime goal of online examination system is to efficiently asses the applicants completely by the help of automated system that doesn't only save the time but also provide the exam result rapidly. This will help students to submit their paper to them convenience and usability of paper and pen.

## Scope

The scope of online examination system is to large in term of else manually taking system. Some of them are listed below:

- It can be used in educational domain such as school, university or any educational training center.
- The system handles all the operation from conducting the exam to deliver the result.
- The type of question is only multiple choices. We are still work on the system to add new features as well like how teacher add complex math question and how user solve it and submit his or her answer to system.

- Due to web based feature of the system user can access the system at any place and any time.
- There no restriction that the controller or examiner has to be present while conducting the exam.
- Teachers prepare the tests and questions for each exam.
- The candidates can login through username and password to system to join exam.

### Project Significance Accurate Information:

Accurate Information can be obtained and overcome the problems arise due to the acceptance of wrong information. All information and data that has been stored become more safe and dynamic towards the user's requirement.

### Information Safety

The safety of data stored is more assured. This is because it is implemented through safety procedures in the system such as password authentication for altering the data by the high authority only.

## 1.6 Outline

**Chapter 2- Requirement analysis** in this chapter we talk about functional requirement and none function requirement for online examination system and talk about problems in existing system

**Chapter 3- Overview of technologies used** in this chapter we describe all technologies we used for frontend and backend development of online examination system

**Chapter 4- User interface of system** in this chapter we insert some Images of system and describe some functionality of system

**Chapter 5- UML Diagrams** in this chapter we talk about all diagrams we draw for connection to databases and also for adding, editing, deleting and updating of data in databases

to fetch and display the referenced page. Recently, another markup language, XML has been defined to facilitate the sharing of data across different information systems. Uniform resource locator (URL) is a universal system for referencing resources on the web. Together, these standards form a simple and effective platform for sharing information. Due to this, and the fact that computers and Internet access have become more available, the World Wide Web has undergone an exponential growth, both in number of computers and users. As the World Wide Web continues to grow at an exponential rate, the size and complexity of web pages grow along with it. Different techniques have been applied to develop systems that help users find the information they seek. These techniques belong to the fields in software technology called information retrieval and information filtering.

## 2.3 Information retrieval and filtering

The rapidly expanding Internet has given the users the ability to choose among a vast variety of information. Whether it is information concerning their profession, events in their world, or information that allows them to maintain their lifestyle. The information that is needed to fulfil these continuously increasing demands can come from different sources. Example are web pages, emails, articles, news, consumer journals, shopping sites, online auctions and multimedia sites. Even though the users profit from the enormous amount of information that the sources provide, they are not able to handle it. This information overload problem is the reason why several techniques for information retrieval and information filtering is to deal with the information overload problem by examining and filtering big amounts of data, there is often made a distinction between the two.

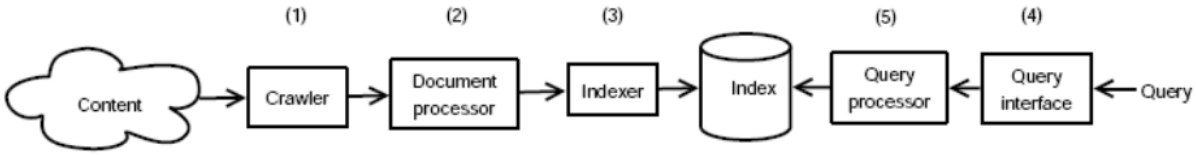



*Figure 3.2.1.1.1 information retrieval and filtering*

# Chapter 2.

## 2. Related work

This chapter will introduce the problem that online Examination system will solve. And different approaches for solving this problem. And comparison between computers based system as well as paper based.

### 2.1 The World Wide Web

The World Wide Web (WWW or web) emerged in the early nineties. The enormous amount of information growing and big amount of data make it the most important source of information for people. The technology behind the web can be characterized as an information system composed of agents. Agents are programs that act on behalf of a person, entity or process to exchange or process information. The main types of agents are server agents and client agents. A server agent offers services that are used by the client agents, as shown in figure 2.1. When a user follows a link on a web page in the browser, the browser performs a request to the server, which responds by returning a web page.

The European organization for Nuclear Research

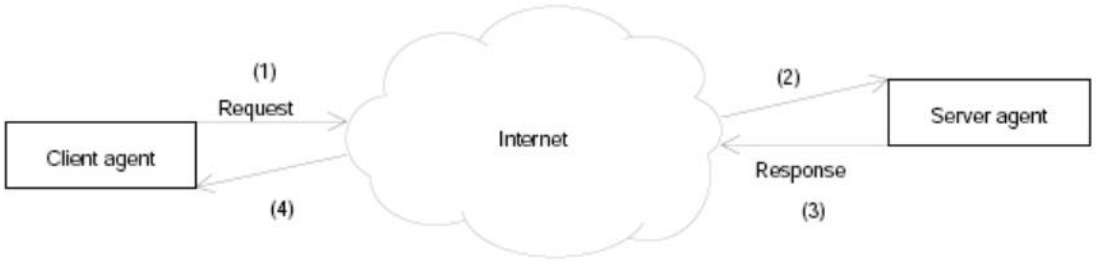



*Figure 3.2.1.1.1 Client-Server Connection through Internet*

### 2.2 HTTP

Hypertext transfer protocol (HTTP) is a transfer protocol that specifies how the server and client communicate with each other. When a user types the URL of a web page or follow a link on a web page, the user browser performs a HTTP request to the server. The server responds by returning the web page content in quick successions. The Hypertext mark-up language (HTML) is used to define the structure of a web page. The language has notions for embedding references to other documents. These references appear on web page as hyperlinks that the users can select

### 2.3.1 Information retrieval

Information retrieval (IR), often associated with data search, is a technology that may include crawling, processing and indexing of content, and querying for content. The normal process of IR is showed in figure 2.2. Crawling is the act of accessing web servers and/or file systems in order to fetch information. By following links, a crawler is able to traverse web content hierarchies based on a single start URL. The document-processing stage may add, delete or modify information to a document, such as adding new Meta information for linguistic processing, or extracting information about the language that the document is written in. Indexing is a process that examines content that has been processed and makes a searchable data structure, called Index that contains references to the content. Queries are requests for information. IR systems let a user write a query in form of keywords describing the information needed. The user can interact with the IR system through a Query interface. A Query-processor will use the index to information reference based on the keywords and then display the reference. The goal is to analyze and identify the essence of the user's intent form the query, and to return the most relevant set of results. Filtering information in IR systems is done by letting the user specify what information is needed by manually typing keywords describing the information. IR is very successful at supporting users who know how to describe exactly what they are looking for in a manner that is compatible with the descriptions of the content that were created during the indexing.

### 2.3.2 Information filtering

Information filtering (IF) systems focus on filtering information based on a user's profile. The profile can be maintained by letting the user specify and combine interests explicitly, or by letting the system implicitly monitor the user's behavior. Filtering within IF systems is done when the use automatically receives the information needed based on the user's profile. The advantage of IF is its ability to adapt to the user's long-term interest, and bring the information to the user. The latter can be done by giving a notice to the user, or by letting the system use the information to take action on behalf of the user. Closely related to IF is the idea of have a book system that show a default book loading to the user to give him options of choosing books. It about filtering form so many books a showing the interest of user on the web page.

## 2.4 Online examination system

An online examination system is a computer-based test system that can be used to conduct computer based tests online. This examination system uses fewer resources and reduces the need for question papers and answer scripts, exam room scheduling, arranging invigilators, coordinating with examiners, and more.

### 2.4.1 Online examination process

Recruiters or educational institutions can easily set up exams through online assessment platforms. There is a plethora of options to choose from, and often one test can be combined with another for quick evaluation of various parameters. Subject-matter experts prepare the test questions, and most of the online examination platforms have auto evaluation features to facilitate rapid result generation.

### 2.4.2 How online examination system works

All the processes involved in a paper-based examination are digitized through online examination systems. Right from student learning assessment and entry-level candidate assessment during campus placements can be done online.

### 2.4.3 Comparison with Paper based or Manual system

Schools, colleges and universities have benefited by migrating to the online examination format. If you are yet to upgrade, the below factors may convince you to do so.

### 2.4.4 Evaluate a test effortlessly:

Most of the online examination platforms come with an auto evaluation feature. The questions featured are mostly multiple-choice or true or false. It helps the system to auto evaluate the answers by comparing it with a set of predefined answers.

Digital evaluation improves the accuracy of evaluation and makes it easy for educators to submit test quicker and with minimal effort.

## 2.6 Advantages of online examination system

The developed system has the following features:

- In comparison to the present system the proposed system will be less time consuming and is more efficient.
- Result will be very precise and accurate and will be declared in very short span of time because calculation and evaluations are done by the simulator itself
- The proposed system is very secure as no chances of leakage of question paper as it is dependent on the administrator only.
- The logs of appeared candidates and their marks are stored and can be backup for future use.

### 2.4.5 Save time and money:

With the help of online exam solutions, organizing an examination becomes even simpler and more efficient. You can conduct an exam by emailing the link for the questions or sending an invite to the students to participate in the exam.

Students do not have to be physically present in a classroom. If they have access to a web-enabled device, they can appear for the test from any location.

### 2.4.6 Improved security:

Students appearing for the exam can be verified using biometrics-based authentication features. Most of the online examination solutions also provide remote proctoring during the examination, so you do not have to assign staff members for invigilation.

### 2.4.7 Cut costs on paper and save the environment:

Schools and educational institutions use a lot of paper made products like books and journals. The use of question and answer papers in educational institutions can be reduced drastically by conducting exams online.

Online question papers are created digitally, and students can answer these questions online by choosing the right answer or by typing in their answers.

## 2.5 Disadvantage of paper based examination

- The existing systems are very time consuming.
- It is difficult to analyze the exam manually.
- Results are not precise as calculation and evaluations are done annually.
- Result processing after summation of exam takes more time as it is done manually.
- To take exam of more candidates more invigilators are required but no need of invigilator in case of online examination.
- The chances of paper leakage are more in current system as compared to proposed system.

which affect the behavior of HTML processors like Web browsers; and Cascading Style Sheets (CSS) to define the appearance and layout of text and other material. The W3C, maintainer of both HTML and CSS standards, encourages the use of CSS over explicit presentational markup.

Hyper Text Markup Language (HTML) is the encoding scheme used to create and format a web document. A user need not be an expert programmer to make use of HTML for creating hypertext documents that can be put on the internet.

Most graphical e-mail clients allow the use of a subset of HTML (often ill-defined) to provide formatting and semantic markup not available with plain text. This may include typographic information like colored headings, emphasized and quoted text, inline images and diagrams. Many such clients include both a GUI editor for composing HTML e-mail messages and a rendering engine for displaying them. Use of HTML in e-mail is controversial because of compatibility issues, because it can help disguise phishing attacks, because it can confuse spam filters and because the message size is larger than plain text.

#### 3.2.3.2 JavaScript

JavaScript is an object-oriented scripting language used to enable programmatic access to objects within both the client application and other applications. It is primarily used in the form of client-side JavaScript, implemented as an integrated component of the web browser, allowing the development of enhanced user interfaces and dynamic websites. JavaScript is a dialect of the ECMAScript standard and is characterized as a dynamic, weakly typed, prototype-based language with first-class functions. JavaScript was influenced by many languages and was designed to look like Java, but to be easier for non-programmers to work with

### 3.2.4 Technologies used in backend

Backend is needed for some project. Specially the project where user store, update, remove their data. It's mean that when user work with data, backend is necessary for that kind of project. We have used the most known framework of PHP language which called Laravel. As we know Laravel is the most used PHP programming language framework for developing different types of web based project. For example, E-commerce site and etc.

### 3.2.5 UML diagram

#### 3.2.5.1 Actor:

A coherent set of roles that users of use cases play when interacting with the use `cases.

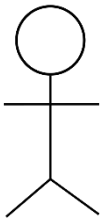


*Figure 3.2.5.1.1 Actor icon*

#### 3.2.5.2 Use case:

A description of sequence of actions, including variants, that a system performs that yields an observable result of value of an actor.

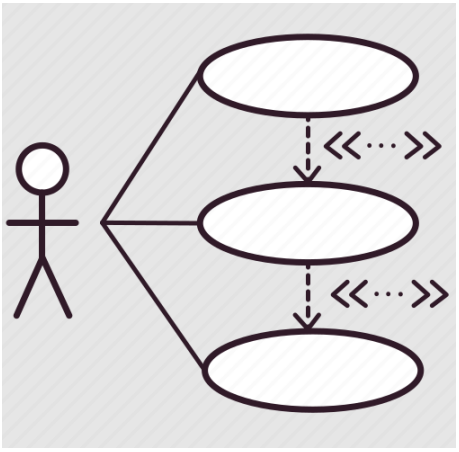


*Figure 3.2.5.2.1 Use case*

UML stands for Unified Modeling Language. UML is a language for specifying, visualizing and documenting the system. This is the step while developing any product after analysis. The goal from this is to produce a model of the entities involved in the project which later need to be built. The representation of the entities that are to be used in the product being developed need to be designed. There are various kinds of methods in software design:

They are as follows:

a. Use case Diagram

b. Sequence Diagram
c. Collaboration diagram
d. Activity Diagram

#### 3.2.5.3 Use Case Diagram

To model a system, the most important aspect is to capture the dynamic behavior. To clarify a bit in details, dynamic behavior means the behavior of the system when it is running /operating. So only static behavior is not sufficient to model a system rather dynamic behavior is more important than static behavior. In Unified Modeling Language (UML) there are five diagrams available to model dynamic nature and use case diagram is one of them. Now as we have to discuss that the use case diagram is dynamic in nature there should be some internal or external factors for making the interaction. These internal and external agents are known as actors. So use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system. To model the entire system numbers of use case diagrams are used. In short we can say that we use the use case diagram for following purposes.

- The purpose is to show the interactions between the use case and actor.
- To represent the system requirements from user's perspective.
- An actor could be the end-user of the system or an external system.

## Use case diagram of Student

Based on figure 2 below, it can be explained as below:

(one) system that includes online exam processing activities.

Actor who performs activities including: Students

Use cases that are commonly performed by students

Students login - select work menu to do the exam download result, or check mark or score.

# Chapter 4.

# 4. Implementation and testing

## 4.1 Development code of the online examination system

The data methodology approach adopted for the data collection of this system is interview. During the interview process both staff and students were interview in order to know the challenges they faced from the existing examination system. The technique adopted for the data analysis is the descriptive statistical methodology. Flow chart is used to break the system design in to module in order to comprehend what the structure of this software will look like. In my system coding, programming language that support the operation of the develop system was used. PHP is the preferred programming language used for the realization of this software because of the dynamic features of the language. PHP MYSQL is a web based programming language that supports the features of the software. Microsoft structure query language is used for the data manipulation of the software. Microsoft structure query language is database application software.

Here we have implemented the logic that, if the exam date is the today's date, the background color of the exam will be green. This is something like warning to the students. And if the exam date was expiring then the background color of the exam will be red. And If the exam is tomorrow then the background color of the exam will be blue, this mean that the exam is in padding.

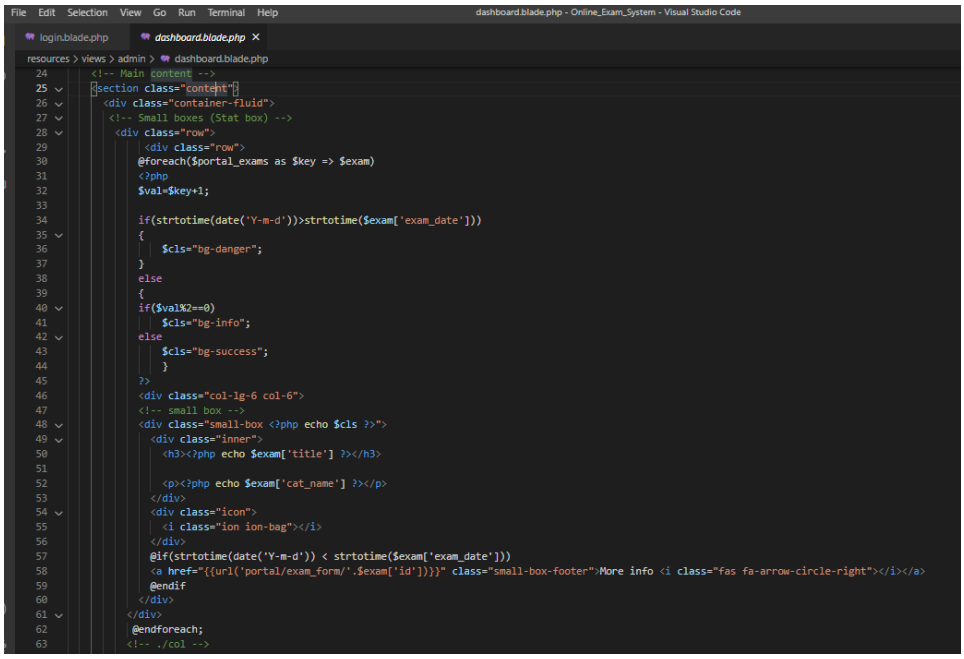



*Figure 3.2.5.11.1 Implementation part 1*

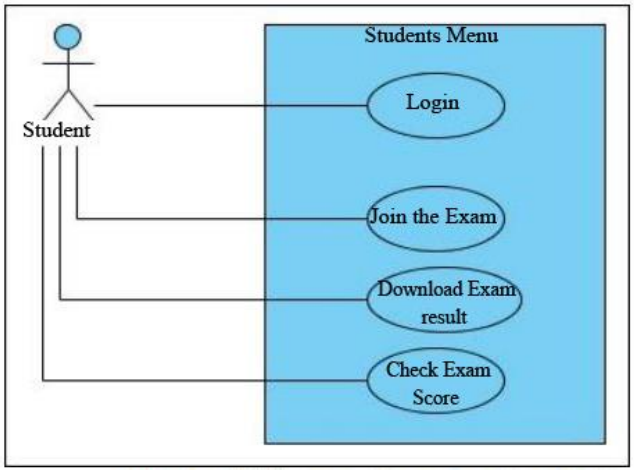



*Figure 3.2.5.3.1 Use case diagram of student*

## Use case diagram of teacher

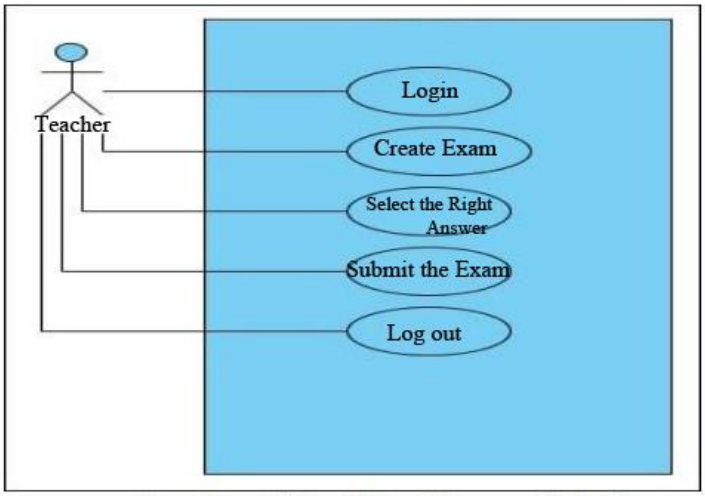



*Figure 3.2.5.3.2 Use case diagram of teacher*

Based on Figure 3 above, there are:

(one) system that includes online exam processing activities.

Actor who performs activities including: teacher

Use case is commonly done by the teacher

Login and select menu for test or upload task, score change, score print, select the right answer, creating exam and submit the exam after creating.

## Use case diagram of Admin

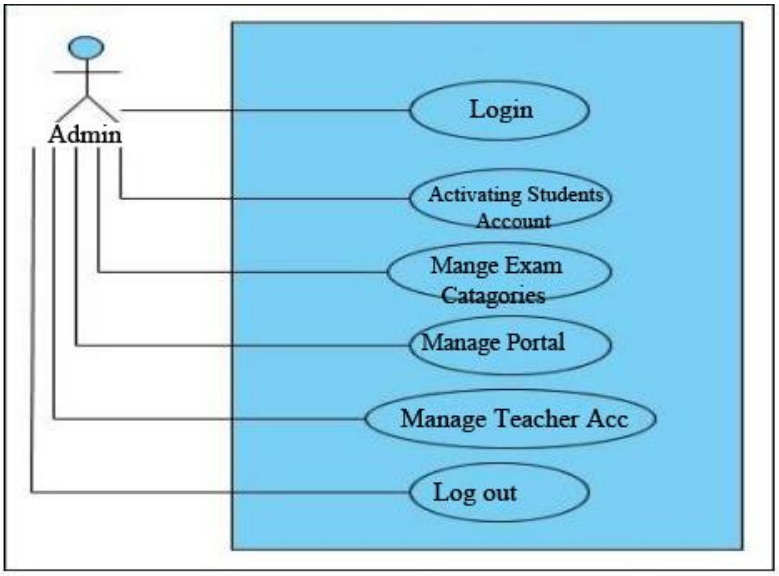



*Figure 3.2.5.3.3 Use case diagram of adman*

Based on Figure 4 above, it can be explained as below:

(one) system that includes online exam processing activities.

Actor who performs activities including: Admin

6 Use cases commonly done by the admin

Login then select the entry Data menu of teachers and students, enter the exam title, manage Exams Categories, manage portal, manage teacher account, activating user account, upload task assignment, but it cannot edit student score.

### 3.2.5.4 SEQUENCE DIAGRAM

Sequence diagram and we have another kind of diagram called collaboration diagram, the combination of these two diagrams are called INTERACTION DIAGRAMS. An interaction

diagram shows an interaction, consisting of set of objects and their relationship including the messages that may be dispatched among them. A sequence diagram is an introduction that empathizes the time ordering of messages. Graphically a sequence diagram is a table that shows objects arranged along the X-axis and messages ordered in increasing time along the Y-axis

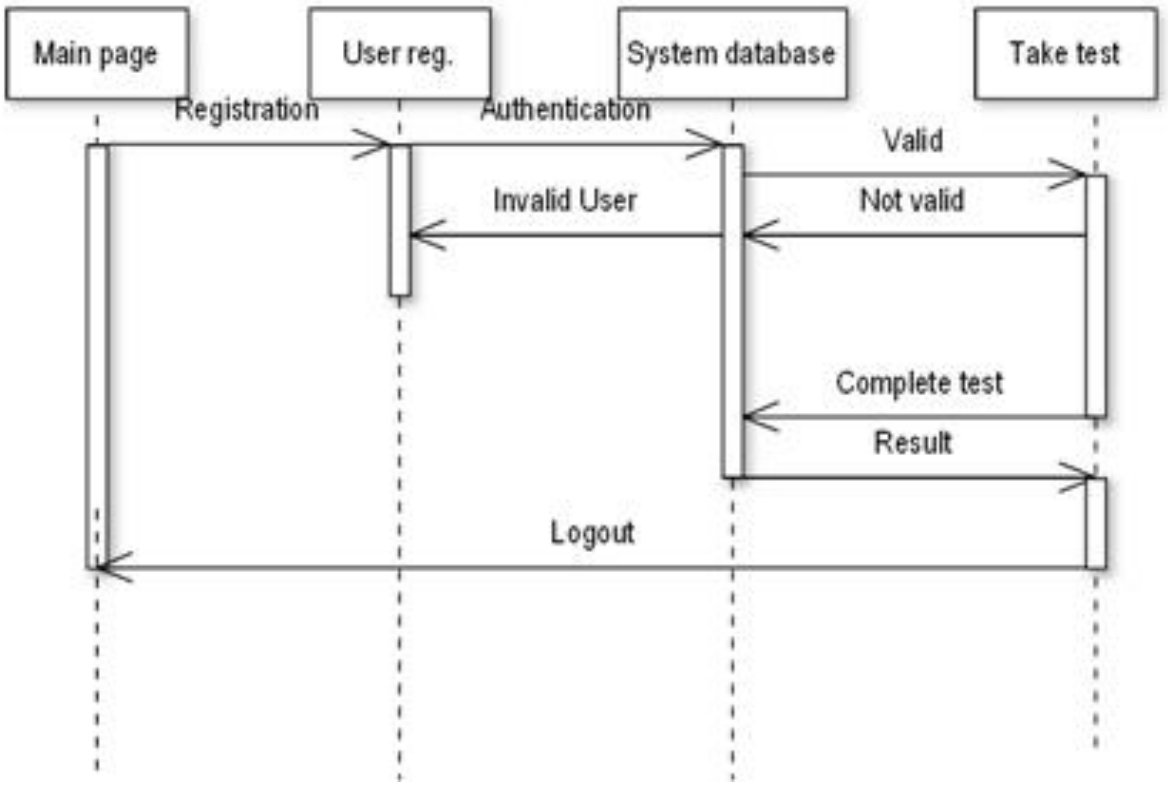



*Figure 3.2.5.4.1 Sequence diagram*

### 3.2.5.5 COLLABORATION DIAGRAM:

A collaboration diagram is an introduction diagram that emphasizes the structural organization of the objects that send and receive messages. Graphically a collaboration diagram is a collection of vertices and arcs.

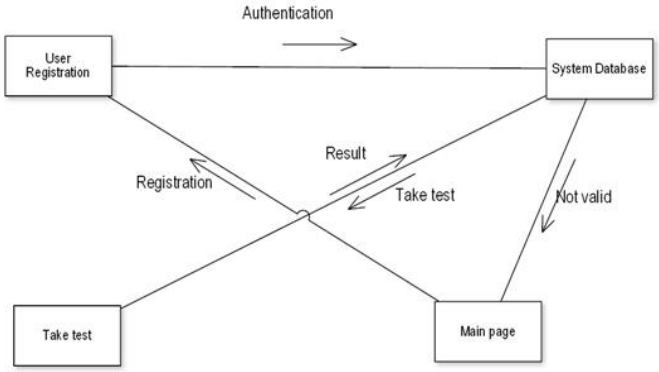



*Figure 3.2.5.5.1 Collaboration diagram*

### 3.2.5.6 CLASS DIAGRAM:

Class is nothing but a structure that contains both variables and methods. The Class Diagram shows a set of classes, interfaces, and collaborations and their relating ships. There is most common diagram in modeling the object oriented systems and are used to give the static view of a system. It shows the dependency between the classes that can be used in our system. The interactions between the modules or classes of our projects are shown below. Each block contains Class Name, Variables and Methods.

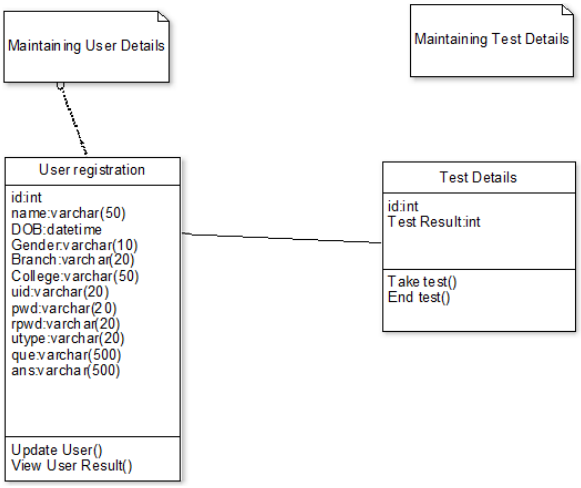



*Figure 3.2.5.6.1 Class diagram*

### 3.2.5.7 DATA FLOW DIAGRAMS:

The DFD takes an input-process-output view of a system i.e. data objects flow into the software, are transformed by processing elements, and resultant data objects flow out of the software. Data objects represented by labeled arrows and transformation are represented by circles also called as bubbles. DFD is presented in a hierarchical fashion i.e. the first data flow model represents the system as a whole. Subsequent DFD refine the context diagram (level 0 DFD), providing increasing details with each subsequent level. The DFD enables the software engineer to develop models of the information domain & functional domain at the same time. As the DFD is refined into greater levels of details, the analyst performs an implicit functional decomposition of the system. At the same time, the DFD refinement results in a corresponding refinement of the data as it moves through the process that embody the applications. A context-level DFD for the system the primary external entities produce information for use by the system and consume information generated by the system. The labeled arrow represents data objects or object hierarchy.

### 3.2.5.8 RULES FOR DFD:

- Fix the scope of the system by means of context diagrams.
- Organize the DFD so that the main sequence of the actions
- Reads left to right and top to bottom.
- Identify all inputs and outputs.
- Identify and label each process internal to the system with Rounded circles.
- A process is required for all the data transformation and Transfers. Therefore, never connect a data store to a data Source or the destinations or another data store with just a Data flow arrow.
- Do not indicate hardware and ignore control information.
- Make sure the names of the processes accurately convey everything the process is done.
- There must not be unnamed process.
- Indicate external sources and destinations of the data, with Squares.
- Number each occurrence of repeated external entities.
- Identify all data flows for each process step, except simple Record retrievals.
- Label data flow on each arrow.
- Use details flow on each arrow.

- Use the details flow arrow to indicate data movements.

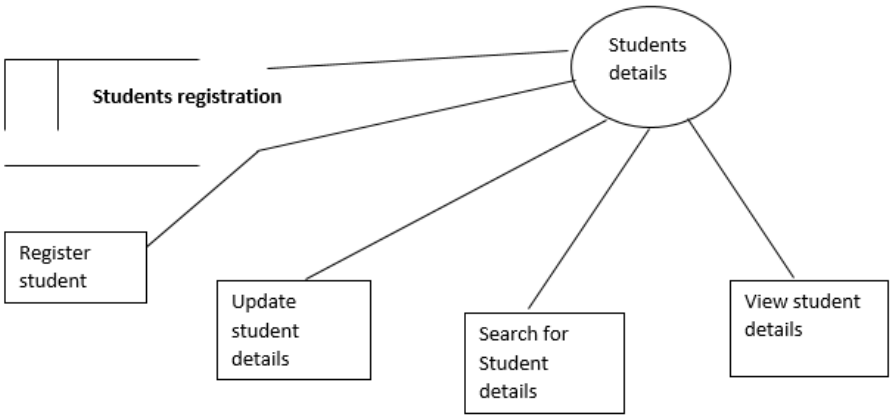



*Figure 3.2.5.8.1 Student registration*

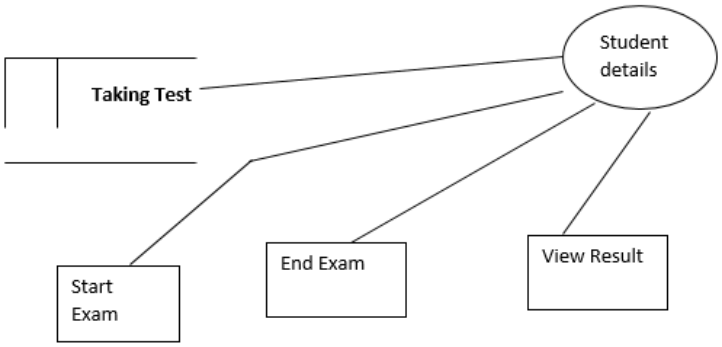



*Figure 3.2.5.8.2 Taking exam*

### 3.2.5.9 E-R Diagrams:

The Entity-Relationship (ER) model was originally proposed by Peter in 1976 [Chen76] as a way to unify the network and relational database views. Simply stated the ER model is a conceptual data model that views the real world as entities and relationships. A basic component of the model is the Entity-Relationship diagram which is used to visually represents data objects. Since Chen wrote his paper the model has been extended and today it is commonly used for database design For the database designer, the utility of the ER model is: