CIC Students Portal

Web Application and Android Application Development

A report submitted to Cluster Innovation Centre
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Project in Industry, Society and Villages

(Semester- VI)

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Certificate

The worth embodied in this semester long report entitled **"CIC Students Portal - Web Application and Mobile Application Development"** has been carried out by Ankit, Vikash Vaibhav, Zaleesh Ahmed and Ansh Gupta at the Cluster Innovation Centre,University of Delhi under my supervision. The manuscript has been subjected to plagiarism tests by the name of the software. I declare that the worth and language included in this project report is free from any kind of plagiarism.

Mentor's Signature

Dr. Nirmal Yadav

Declaration

All sentences or passages quoted in this document from other people's work have been specifically acknowledged by clear cross-referencing to author, work, and page(s). Any illustrations that are not the work of the author of this report specifically acknowledged. I understand that failure to this amounts to plagiarism and will be considered as grounds of failure.

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Acknowledgement

We take this opportunity to express our profound gratitude and deep regards to our mentor - **Dr. Nirmal Yadav** for providing us with this opportunity and for her exemplary guidance, monitoring and constant encouragement throughout the semester long project **"CIC Students Portal - Web Application and Mobile Application Development"**. This project was next to impossible without her innovative sight and practical approach towards learning. Her help and guidance given, time to time shall carry us a long way in the future journey.

Moreover, we would like to express our regards to our institution. The culture and environment of Cluster Innovation Centre is perfect when it comes to projects and hands-on Learning.

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Abstract

In this Semester Long project we have tried to develop a webapp and a mobile application where students, alumni and teachers can ask questions related to any field of interest which will be displayed to everyone to answer. Currently our institution has no common platform for the students to do the same which makes it difficult for the students to ask questions to and find answers to problems.

It can provide a common platform for anyone related to CIC to share and find information with others. This Web App will also provide a platform where students can upload question papers to be available for their juniors. Here students can add their projects and project reports for other students to take reference from. A discussion can also take place for these projects for better understanding and results. This will help create connectivity amongst the students and they can know the fields of interest of their fellow colleagues to contact when needed.

For the future we are going to add interest wise filtration of the content for the students as well i.e. when a student signs up with us he will be asked to mark fields of interest and content he will be shown by default will be related to those fields although they can view other content as well when explicitly searched.

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1. Introduction

Currently our prestige institution lacks a common platform for any student to ask questions and find solutions to problems they face during their journeys of gaining knowledge. Many students face the same problems and struggle to find the answers to them which their seniors, teachers or colleagues have already faced. This leads to limited sources of knowledge from the people they know and not the complete institution. We try to build a platform that will be used by everyone associated with Cluster Innovation Centre so that they reach everyone with their problems. These problems can be technical, guidance, administrative, related to subjects or about any other topic. This can lead to these people getting quicker responses to their problems and they can directly find answers if someone has already faced the same problem.

We have also aimed to solve the problem of finding previous years question papers. A huge part of examination preparations is solving previous years question papers as they give insight into what type questions can be asked but many students face the problem of this as many seniors don't preserve them and throw them and currently there is no online platform to store them for all the students. In the same app we have also given students a platform to the students and teachers to upload question papers so that students can find them easily without wasting time.

Through this platform students will be able to upload their own project with their reports which can be used by other students for references. In a research based institution like ours projects are an essential part of our learning process and currently students have less knowledge about what projects are currently active and completed in the college. This app will help them get to know what is going on and who is the correct person to approach with certain difficulties.

There will be a discussion platform for all these projects and question papers so that any discrepancies can be asked then and there itself. This project will not only help students to find resources it will also be great help for them to understand their fields of interests as they can understand everything about a field here without actually entering the fields.

2. Features Added

The following features are in our Web App and Mobile App

1. Sign Up and Login
2. Question And Answers Platform
3. Upload and View Question Papers
4. Upload and View Project Reports
5. Filtration of Questions according to interests
6. Filtration of Projects according to interests
7. Search QnA and Projects in search bar

2.1. Sign Up and Login

2.1.1. Web Application

For the Web application any person related to Cluster Innovation Centre can sign up using their email ids. While registering to the service they have to provide their First Name, Last Name, Email ID, Password and their Course (if applicable). Figure 1 shows the Web App Registration Form.

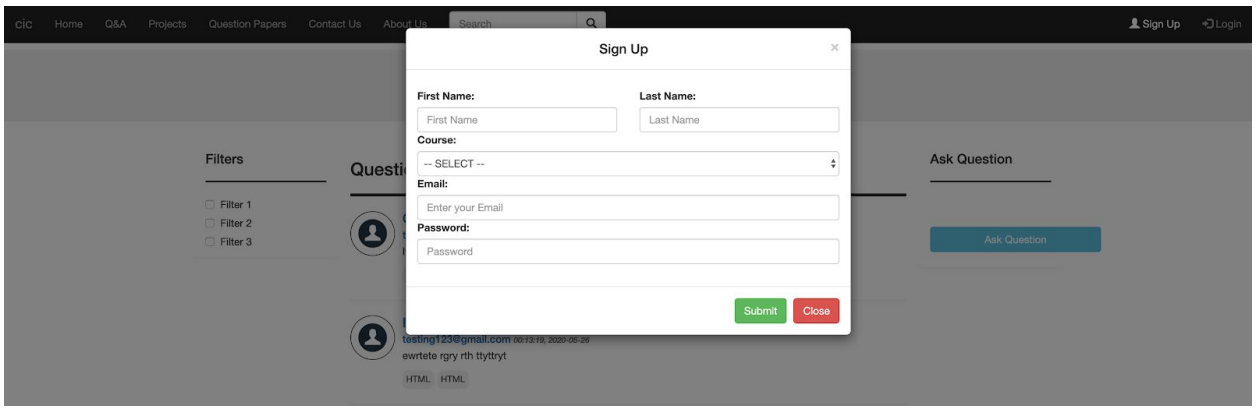

Figure 1: Sign Up Form for the Web App

Once a user has registered he will be sent a confirmation OTP (One Time Password) so that the Application can verify the email address which when entered will complete the registration process. Then User can Login to the application using the email id and Password created as shown in figure 2.

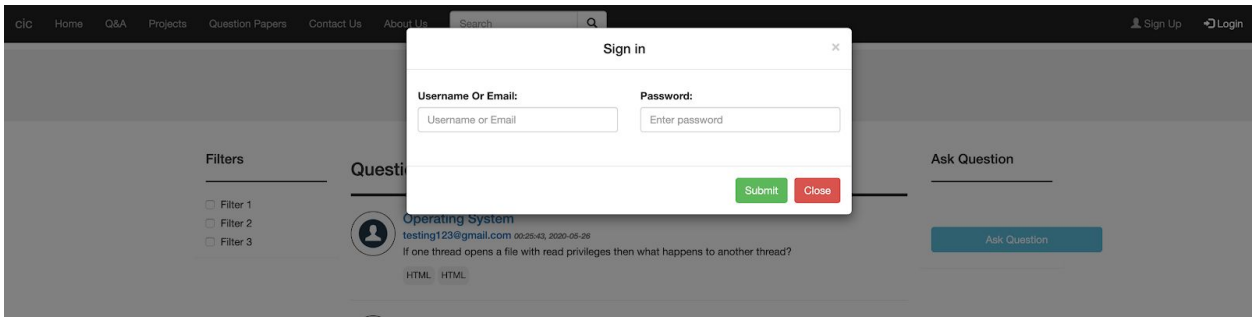

Figure 2: Login Popup for the Web App

2.1.2. Android Application

Similar to the Web App the Android App also has a sign up and login pages which lets the user sign up into an account. Figure 3 shows the Mobile app Sign up and Login Page.

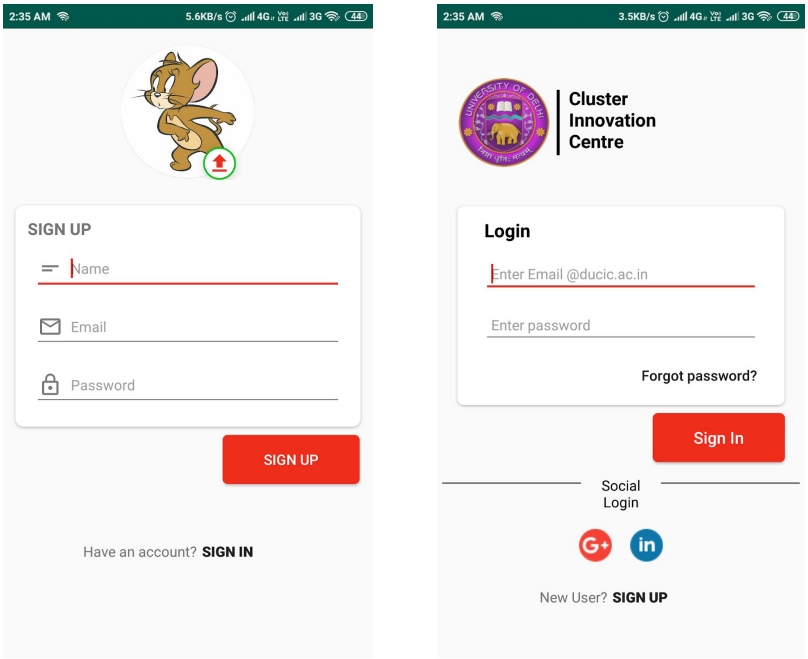

Figure 3: Sign up and Login for the Android App

2.2. Question and Answer Platform

One of the primary features of this Application is the question and answers platform. Users can enter any question that can be technical, guidance, administrative, related to subjects or related to any other which will be visible to all the students who can answer these questions which will open up a thread.

2.2.1. Web Application

In the web app you can upload a question by filling the field of question topic in which you can enter the topic or the category of the questions and the main question in the body. Figure 4 shows how to upload a question through the Web App.

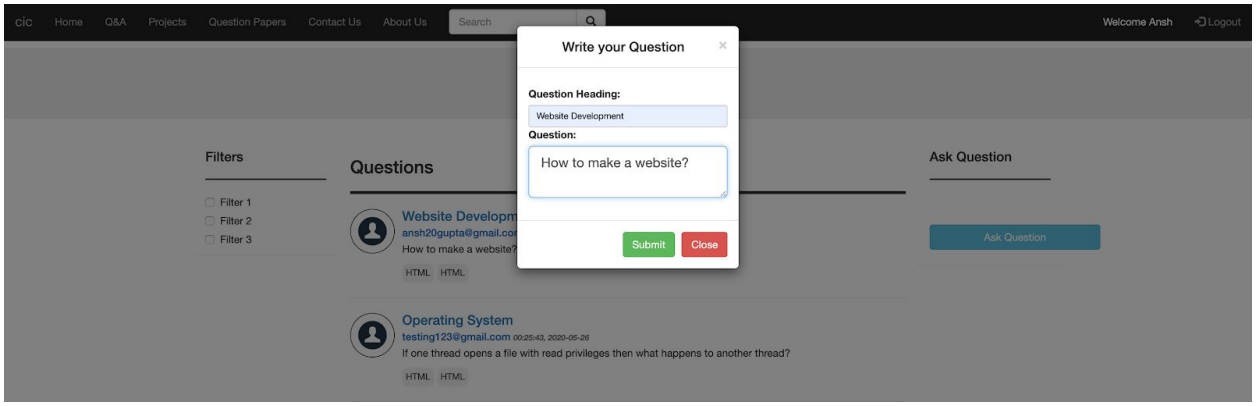

Figure 4: Upload a question in the Web App

This question will be visible amongst other questions in the app as shown in figure 5 on the next page.

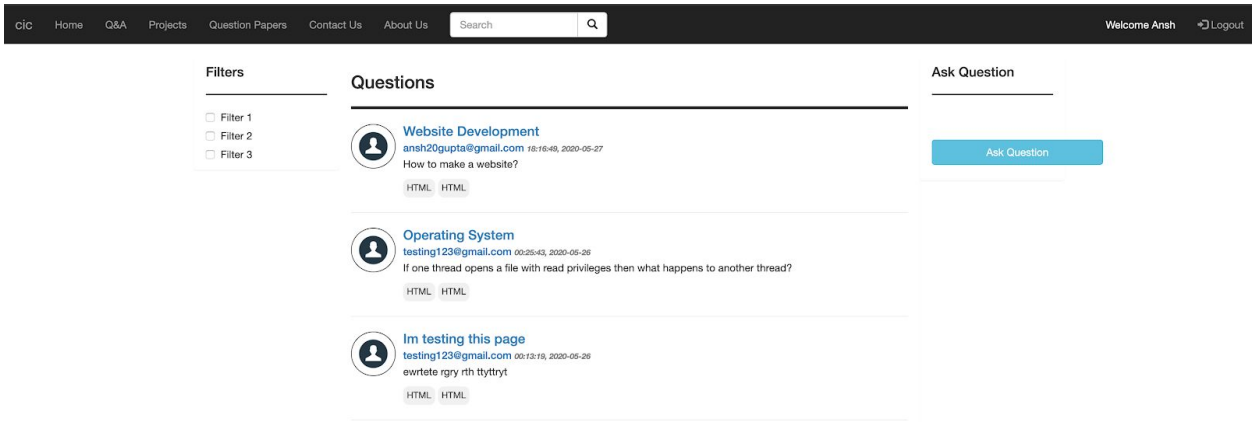

Figure 5: List of questions

By clicking on the question the thread opens and all the answers are visible and you can enter a new answer as well as shown in Figure 6.

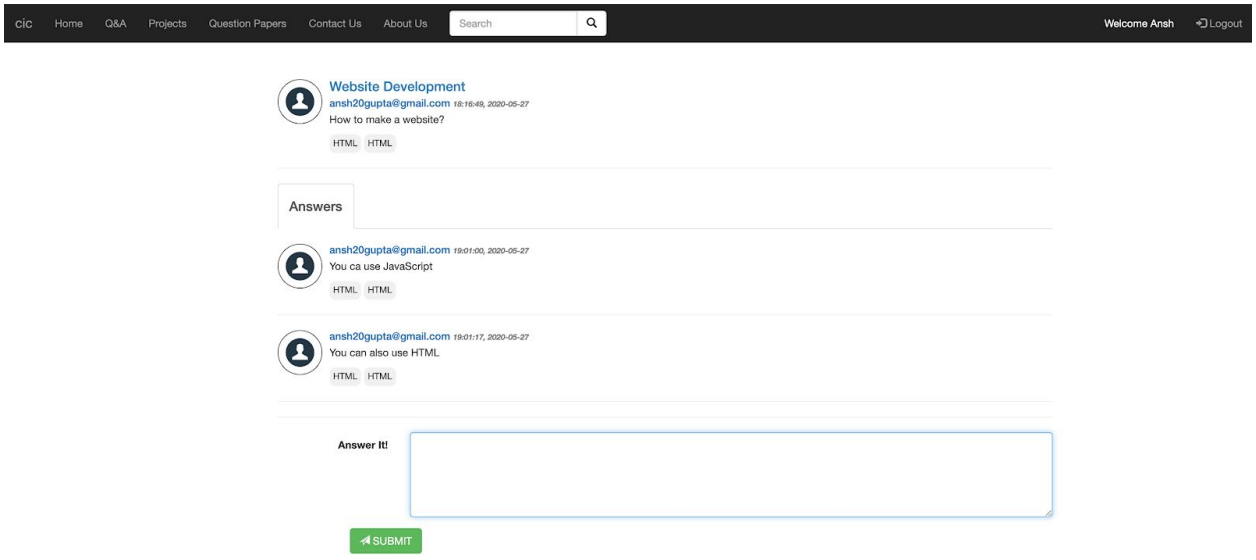

Figure 6: Answer thread of a Question

2.2.2. Android Application

Similarly a question can be uploaded and answered in the Android Application as well. In the Android there is a page to view all the questions, a page to add a question and a page to view and post answers. It is shown in Figure 7.

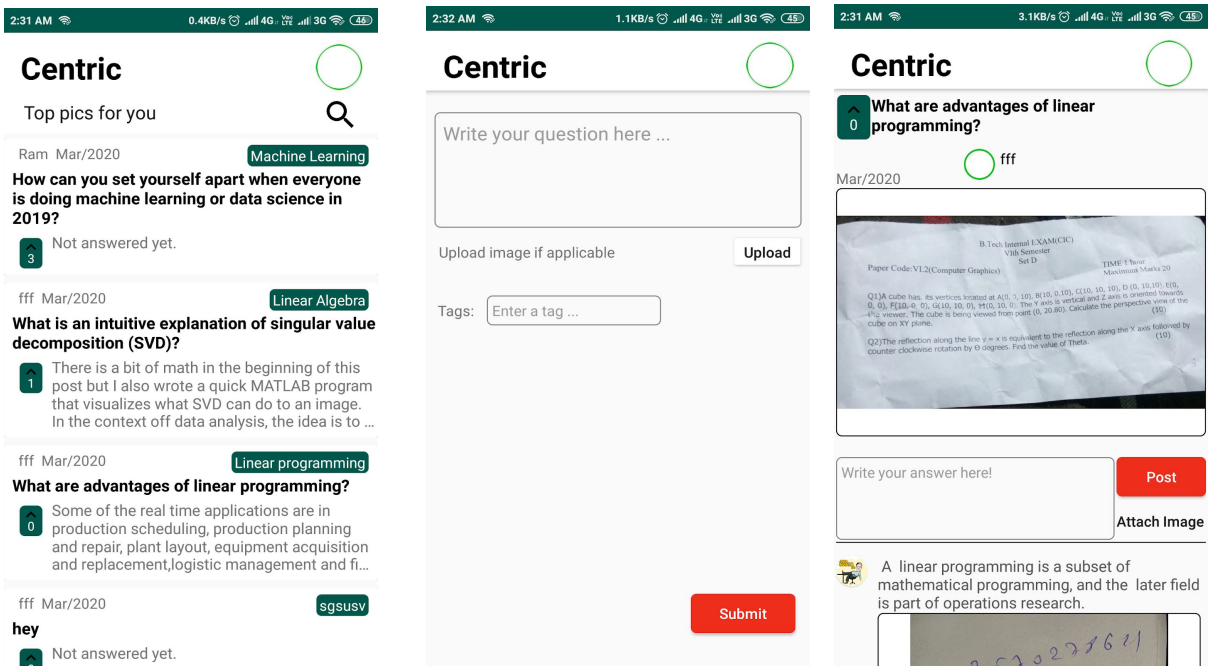

Figure 7: (From Left to Right): All the Questions Page, Add Question Page, View and Post Answer Page.

2.3. Upload and View Question Papers

Question Papers can be uploaded from our web application and mobile application both. As mentioned they are integral part for exam preparation therefore the process of uploading these and viewing them is very easy and intuitive. Users just need to go to the Question Paper tab and can upload or download them as shown in Figure 8, 9 and 10.

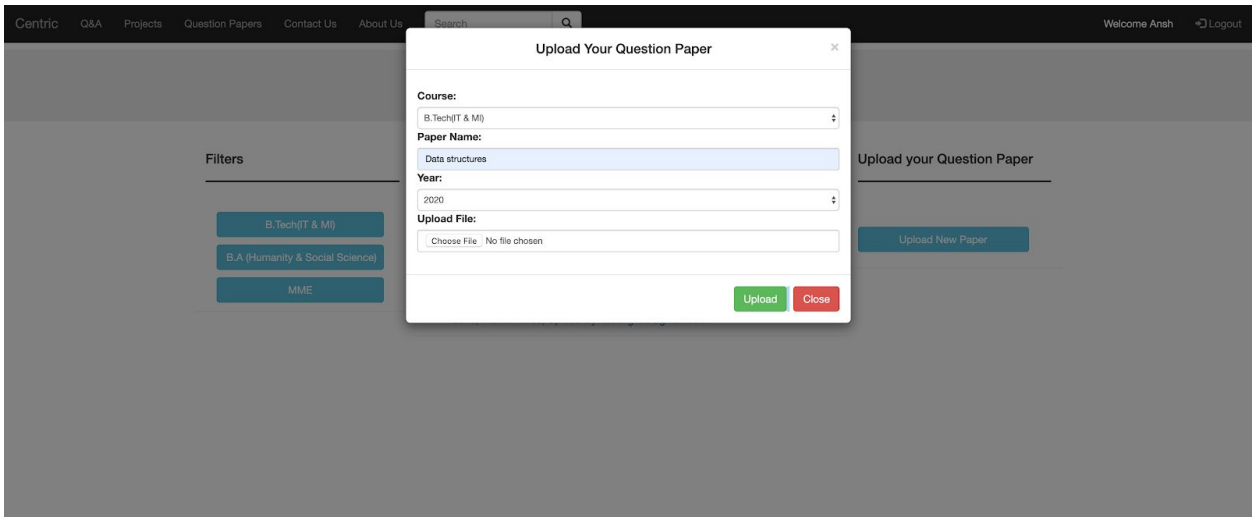

Figure 8: Uploading a question Paper in web app

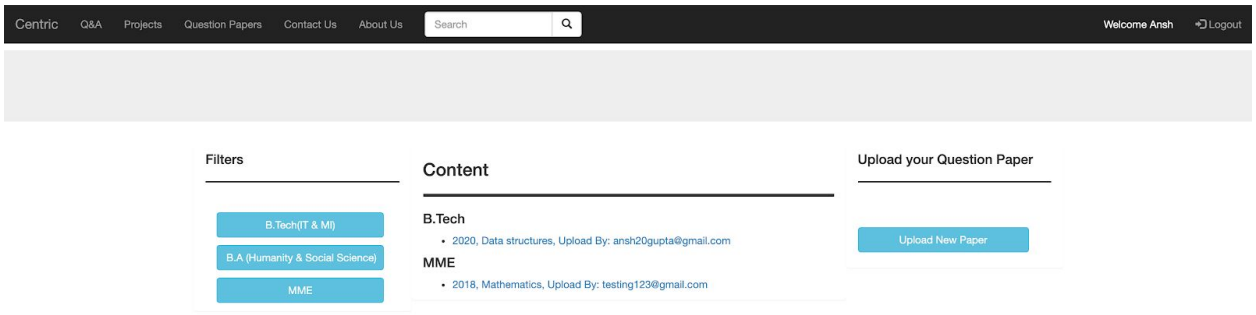

Figure 9: List of question papers and downloading them

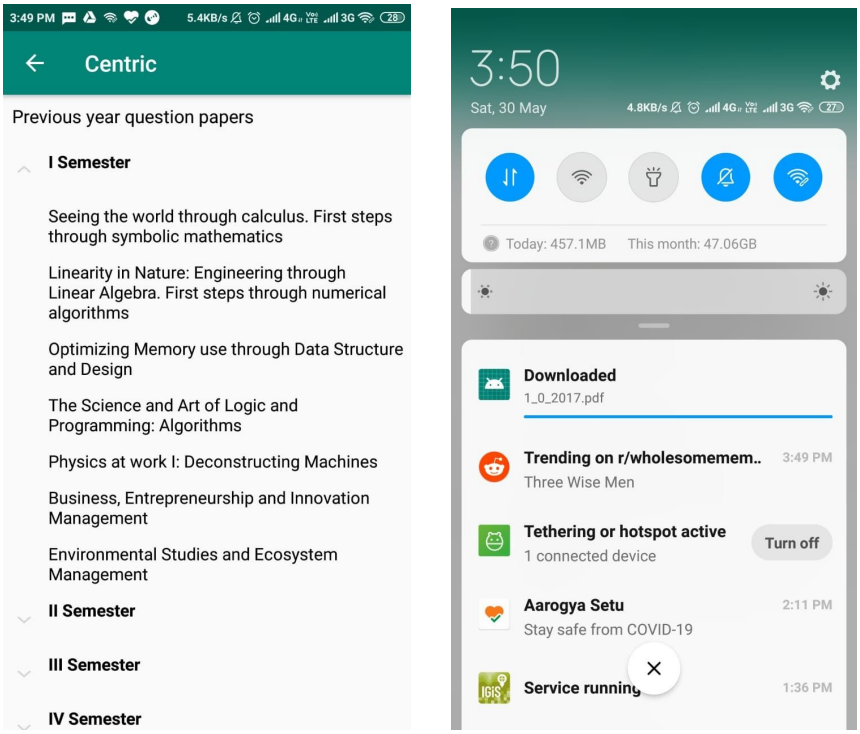

Figure 10: (From Left to Right): List of question papers, Downloading a question paper in android app

2.4. Upload and View Project Reports

Similar to the question papers project reports can also be uploaded from web application and android application. Projects can be uploaded as files such as pdfs, code snippets or folders that have complete project details including the report. This is shown in Figures 11, 12, 13.

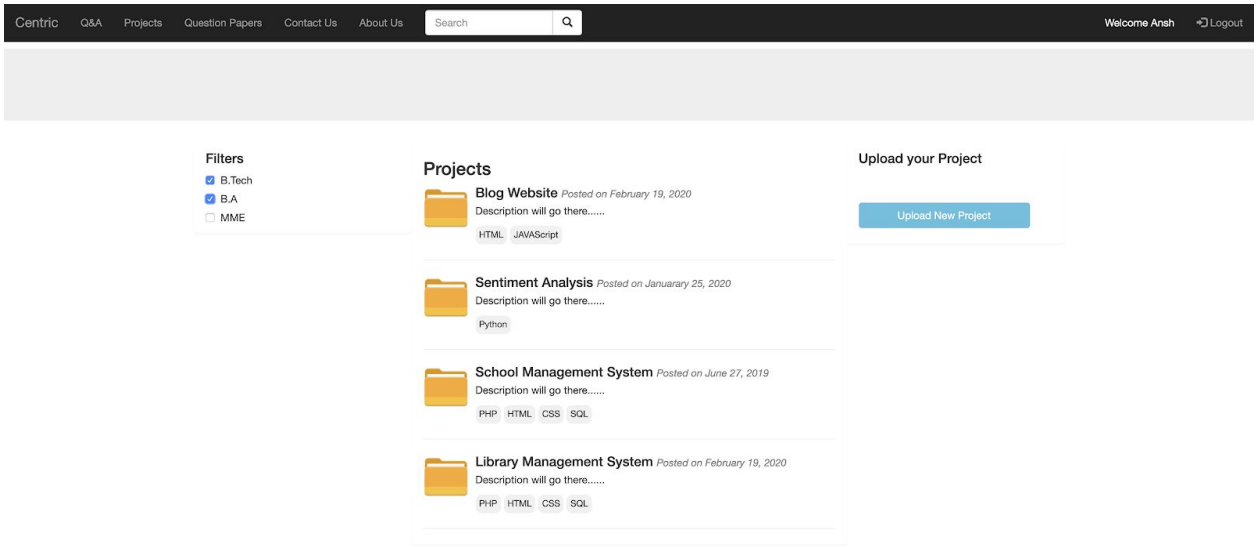

Figure 11: List of projects in web application

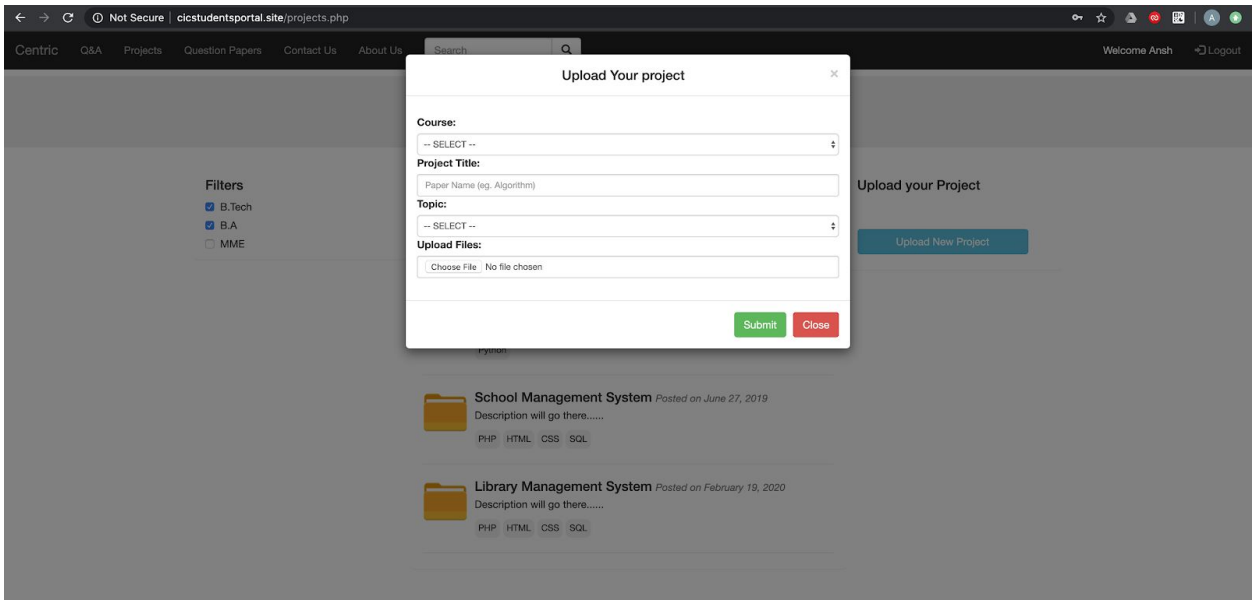

Figure 12: Uploading a project in Web App

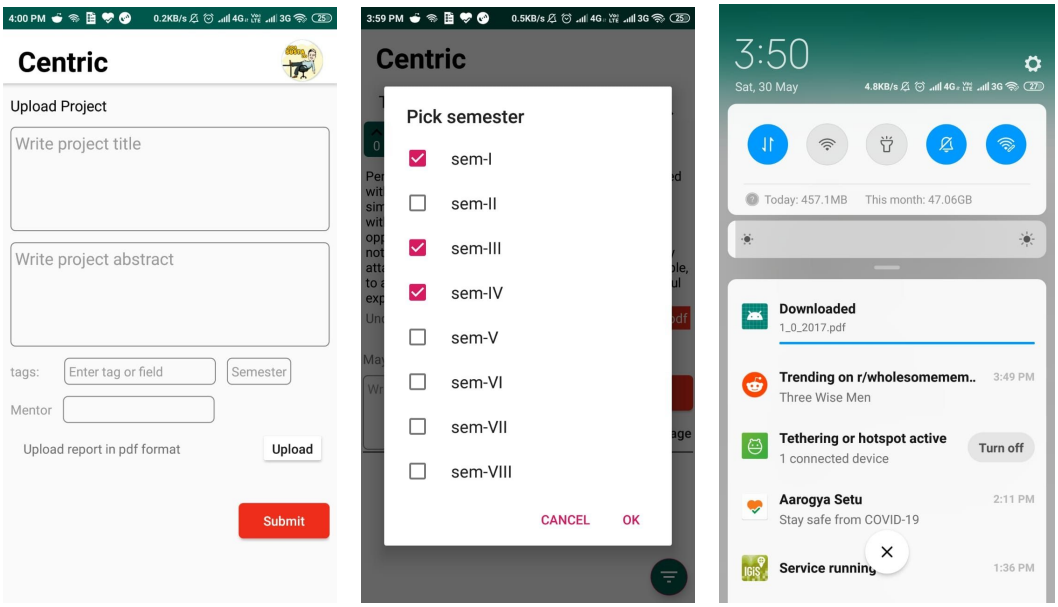

Figure 13: (From Left to Right): Upload a project, List of projects, Download a project from Android App.

2.5. Filtration of Question and Projects according to interests

The questions can also be filtered according to the interest field of the user. On the right column in the web app filters can be added that will return the questions related to that specific interest only. Currently these filters are the course of the students but once the database gets bigger more specific interests can be added. Refer to Figure 14 on the next page.

Similar to the questions Projects can also be filtered according to the user interests. This is shown in Figure 15 on the next page.

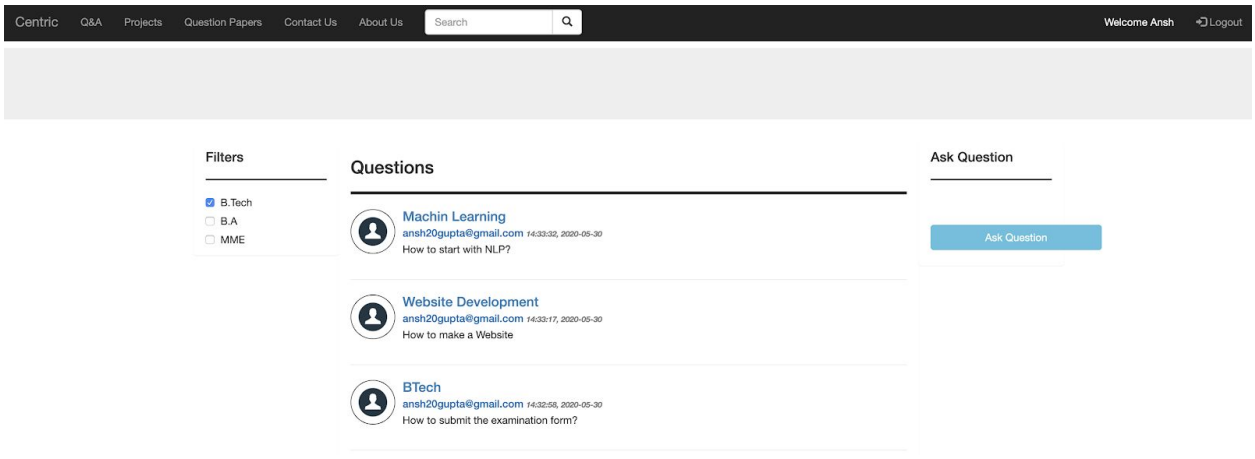

Figure 14: Questions with B.Tech filter on web app

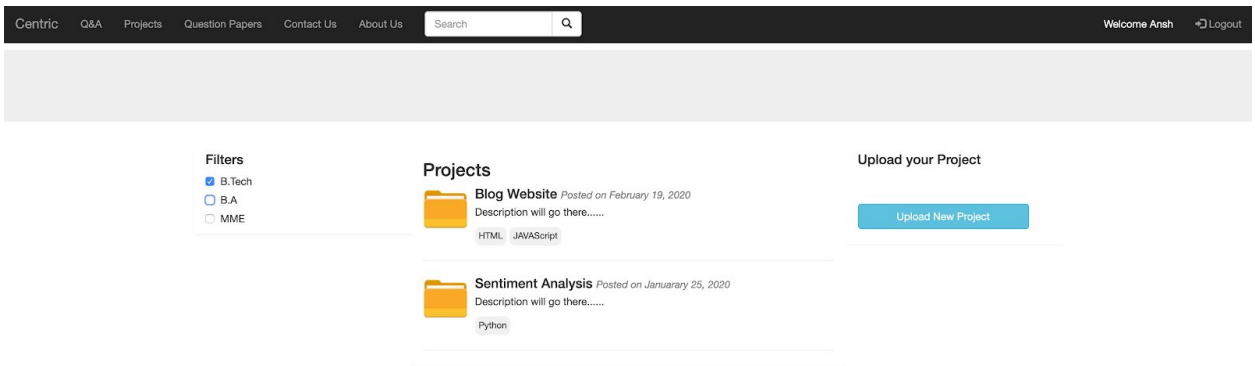

Figure 15: Projects with B.Tech filter on the web app

2.6. Search QnA and Projects in search bar

Apart from filtering these questions and projects can be searched from the search bar as well. Figure 16 and 17 describe this feature.

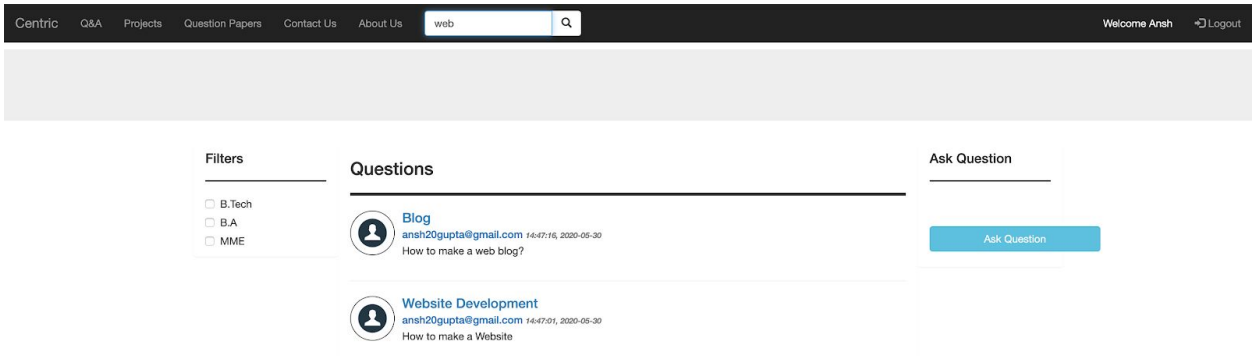

Figure 16: Search for the questions in web app

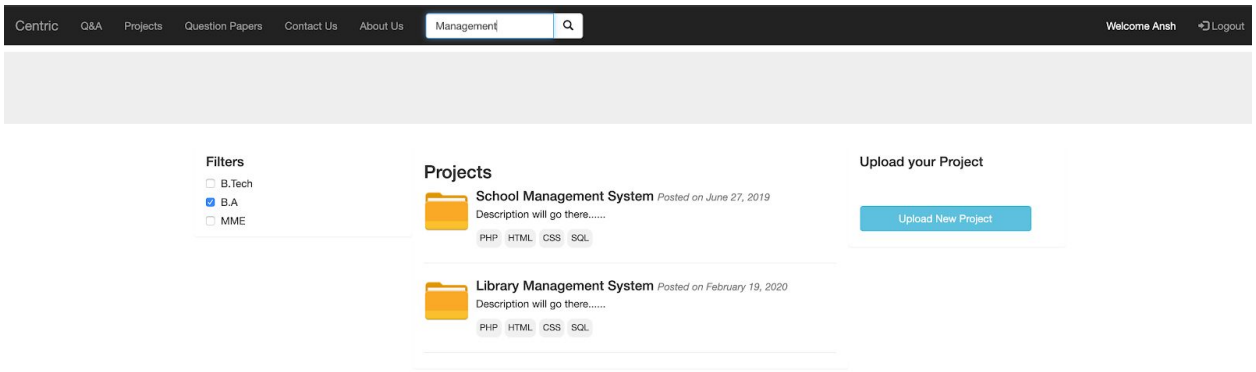

Figure 17: Search for the projects in web app

3. Programming Tools Used

As a web Application and a Mobile Application both were implemented during this project many programming tools were used to complete it.

3.1. Tools used in Web Application

Numerous programming tools were used in the development of the Web Application which are listed below:

S.No	Programming Tool	Used For
1	PHP	Backend
2	HTML	Frontend
3	CSS	Frontend
4	Bootstrap	Frontend
5	JavaScript	Frontend
6	SQL	Database

Table 1: Programming Tools Used for Web Application

3.1.1. PHP

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML.[1]

Instead of lots of commands to output HTML (as seen in C or Perl), PHP pages contain HTML with embedded code that does "something". The PHP code is enclosed in special start and end processing instructions <?php and ?> that allows you to jump into and out of "PHP mode."

What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. You can even configure your web server to process all your HTML files with PHP, and then there's really no way that users can tell what you have up your sleeve.[1]

The best things in using PHP are that it is extremely simple for a newcomer, but offers many advanced features for a professional programmer. Figure 1 below shows an example of a php script which prints a single line “Hi, I’m a PHP script!”.

```
<!DOCTYPE HTML>
<html>
    <head>
        <title>Example</title>
    </head>
    <body>

        <?php
            echo "Hi, I'm a PHP script!";
        ?>

    </body>
</html>
```

Figure 18: An example .php script (Source: www.php.net)

3.1.2. HTML

Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web.[2]

Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects such as interactive forms may be embedded into the rendered page. HTML provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. HTML elements are delineated by tags, written using angle brackets. Tags such as <img /> and <input /> directly introduce content into the page. Other tags such as <p> surround and provide information about document text and may include other tags as sub-elements. Browsers do not display the HTML tags, but use them to interpret the content of the page.[3]

3.1.3. CSS

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

CSS is designed to enable the separation of presentation and content, including layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file, and reduce complexity and repetition in the structural content.

The name cascading comes from the specified priority scheme to determine which style rule applies if more than one rule matches a particular element. This cascading priority scheme is predictable.

3.1.4. Bootstrap

Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS- and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.

Bootstrap is the sixth-most-starred project on GitHub, with more than 135,000 stars, behind freeCodeCamp (almost 307,000 stars) and marginally behind Vue.js framework. According to Alexa Rank, Bootstrap is in the top-2000 in the USA while vuejs.org is in the top-7000 in the USA.

3.1.5. JavaScript

JavaScript often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just-in-time compiled, and multi-paradigm. It has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.

Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web. JavaScript enables interactive web pages and is an essential part of web applications. The vast majority of websites use it for client-side page behavior, and all major web browsers have a dedicated JavaScript engine to execute it.

3.1.6. SQL

SQL (Structured Query Language) is a domain-specific language used in programming and designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS). It is particularly useful in handling structured data where there are relations between different entities/variables of the data. SQL offers two main advantages over older read/write APIs like ISAM or VSAM. First, it introduced the concept of accessing many records with one single command; and second, it eliminates the need to specify how to reach a record, e.g. with or without an index.[4]

Originally based upon relational algebra and tuple relational calculus, SQL consists of many types of statements, which may be informally classed as sublanguages, commonly: a data query language (DQL), a data definition language (DDL), a data control language (DCL), and a data

manipulation language (DML). The scope of SQL includes data query, data manipulation (insert, update and delete), data definition (schema creation and modification), and data access control. Although SQL is often described as, and to a great extent is, a declarative language (4GL), it also includes procedural elements.

SQL was one of the first commercial languages for Edgar F. Codd's relational model. The model was described in his influential 1970 paper, "A Relational Model of Data for Large Shared Data Banks". Despite not entirely adhering to the relational model as described by Codd, it became the most widely used database language.[5]

3.2. Tools used in Android Application

Numerous programming tools were used in the development of the Android Application as well which are listed below:

S.No	Programming Tool	Used For
1	Java	Backend
2	HTML	Frontend
3	JavaScript	Frontend
4	NoSQL	Database
5	Firebase-Firestore	Database

Table 2: Programming Tools Used for Mobile Application

3.2.1. Java

Java is a general-purpose programming language that is class-based, object-oriented, and designed to have as few implementation dependencies as possible. It is intended to let application developers write once, run anywhere (WORA), meaning that compiled Java code can

run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM) regardless of the underlying computer architecture. The syntax of Java is similar to C and C++, but it has fewer low-level facilities than either of them. As of 2019, Java was one of the most popular programming languages in use according to GitHub, particularly for client-server web applications, with a reported 9 million developers.

3.2.2. NoSQL

A NoSQL (originally referring to "non SQL" or "non relational") database provides a mechanism for storage and retrieval of data that is modeled in means other than the tabular relations used in relational databases. Such databases have existed since the late 1960s, but the name "NoSQL" was only coined in the early 21st century, triggered by the needs of Web 2.0 companies. NoSQL databases are increasingly used in big data and real-time web applications. NoSQL systems are also sometimes called "Not only SQL" to emphasize that they may support SQL-like query languages, or sit alongside SQL databases in polyglot persistent architectures.

Motivations for this approach include: simplicity of design, simpler "horizontal" scaling to clusters of machines (which is a problem for relational databases), finer control over availability and limiting the object-relational impedance mismatch. The data structures used by NoSQL databases (e.g. key-value, wide column, graph, or document) are different from those used by default in relational databases, making some operations faster in NoSQL. The particular suitability of a given NoSQL database depends on the problem it must solve. Sometimes the data structures used by NoSQL databases are also viewed as "more flexible" than relational database tables.

3.2.3 Firebase-Firestore

Cloud Firestore is a flexible, scalable database for mobile, web, and server development from Firebase and Google Cloud Platform. Like Firebase Realtime Database, it keeps your data in sync across client apps through real time listeners and offers offline support for mobile and web so you can build responsive apps that work regardless of network latency or Internet connectivity. Cloud Firestore also offers seamless integration with other Firebase and Google Cloud Platform products, including Cloud Functions.

Cloud Firestore is a cloud-hosted, NoSQL database that your iOS, Android, and web apps can access directly via native SDKs. Cloud Firestore is also available in native Node.js, Java, Python, Unity, C++ and Go SDKs, in addition to REST and RPC APIs.

Following Cloud Firestore's NoSQL data model, you store data in documents that contain fields mapping to values. These documents are stored in collections, which are containers for your documents that you can use to organize your data and build queries. Documents support many different data types, from simple strings and numbers, to complex, nested objects. You can also create subcollections within documents and build hierarchical data structures that scale as your database grows. The Cloud Firestore data model supports whatever data structure works best for your app.

4. Methodology

4.1.1. The Frontend

The frontend is one of the 3 pillars of a successful web or android application. A good UI/UX (User Interface/ User Experience) defines whether a user will use the application or not. Designing the UI was an integral Part of our project and it should have conveyed CIC when someone looked at it first. Therefore our web application and android application both were made simple, easy to use and intuitive. Most of our UI is described in section 2 - Features added. Figure 19 and 20 shows the home page of our web app and android app respectively.

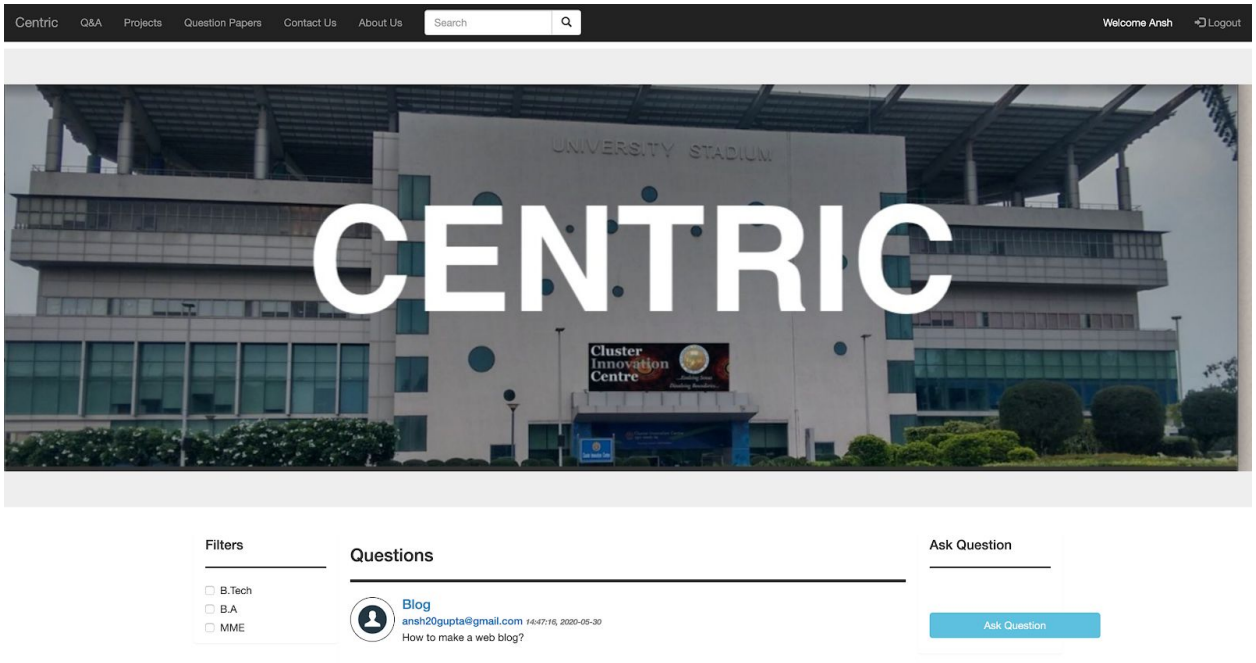

Figure 19: Web Application Home Page

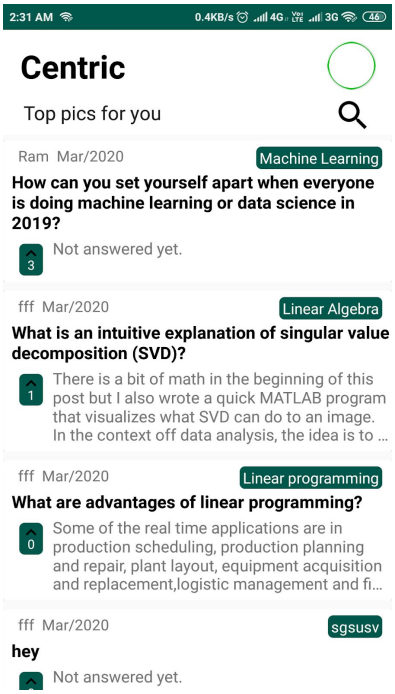

Figure 20: Home page of Android App

For the Front end of the web app and android app both we have used integration programming tools such as HTML, Bootstrap, CSS and JavaScript. These tools have been discussed in detail in section 3.1. A code snippet has been shown in Figure 21 on the next page.

```
<style>
.chip {
  display: inline-block;
  padding: 0 5px;
  height: 25px;
  font-size: 12px;
  line-height: 25px;
  border-radius: 8px;
  background-color: #f1f1f1;
}
</style>
<div class="container">
    <div class="row">
<div class="col-sm-1"></div>
<!---------------------- Question Section ---------------------->
<div class="col-sm-11">
<br>
<br>
<?php

$qid= $_GET['id'];
  $qustion_query="select *from question_table WHERE QID = '$qid' ";
  $qustion_fetch = mysqli_query($conn, $qustion_query);
  while($row  = mysqli_fetch_array($qustion_fetch)){

            $QID = $row['QID'];
            $user_name= $row['username'];
            $q_heading = $row['question_heading'];
            $question = $row['question'];
            $q_date = $row['date'];
            $q_time = $row['time'];
            echo "<div id=\"btech_sem_list\">
      <div class=\"media\">
    <div class=\"media-left\">
```

Figure 21: Code Snippet of the Web Application Front End

4.1.2. The Backend

The backend can be easily the most important part of a Web Development project as it is the backbone of any working website. There are many programming languages that can be used to solve the purpose of backend programming, however we have decided to use the programming language PHP. Figure 22 shows a snippet Web Application Backend Code.

```php
<?php
require 'connection.php';
$add_answer = $_POST['add_answer'];
$UID_q = $_SESSION['UID_login'];
$username = $_SESSION['email_lg'];
$c_date = date("Y-m-d");
date_default_timezone_set('Asia/Kolkata');
$c_time = date("H:i:s");
$qid= $_SESSION['c_qid'];

$data_to_insert_ans = "INSERT INTO answer_table (QID, UID, username1, answer, date, time) values ('$qid', '$UID_q','$username', '$add_answer', '$c_date', '$c_time' )";
if($question_submit = mysqli_query($conn, $data_to_insert_ans)){

$home_page = "answer.php?id=".$qid;
header("Location: $home_page");
}
else{
      echo "Error: " . $data_to_insert_ans . "<br>" . mysqli_error($conn);
}
mysqli_close($conn);
  ?>
```

Figure 22: Code Snippet of the Web Application Back End

For the Backend of the Android App we have used Java which has been integrated with JavaScript. More about the same has been discussed in Section 3.2.1. Figure 23 shows a snippet of Android application Backend Code.

```java
public static class QuestionFilter implements Predicate<Question> {
    private Pattern pattern;

    public QuestionFilter(String regex) {
        pattern = Pattern.compile(regex);
    }

    @Override
    public boolean apply(final Question input) {
        return pattern.matcher(input.getQuestion()).find() || pattern.matcher(input.getTag()).find();
    }

}
```

Figure 23: Code snippet of the Android application Back End

In our project which is a question answer platform backend is the main protagonist that serves the working of the website. The backend controls the user registration, login and logout and also the Admin login and logout. It is also responsible for the addition of the books, viewing of them, update of the cart, orders and books themselves.

Backend supports the basic service of the application to work.

4.1.2. The Database

Database management is another important aspect of an E-Commerce Web Development project. It is part that handles the database where we can add, update and delete the data stored in the server or the directory.

For both a common database has been used which is stored at Firebase-Firestore. But the database is accessed using SQL and NoSQL in the web application and android application respectively. Figure 24 is a screenshot of our database.

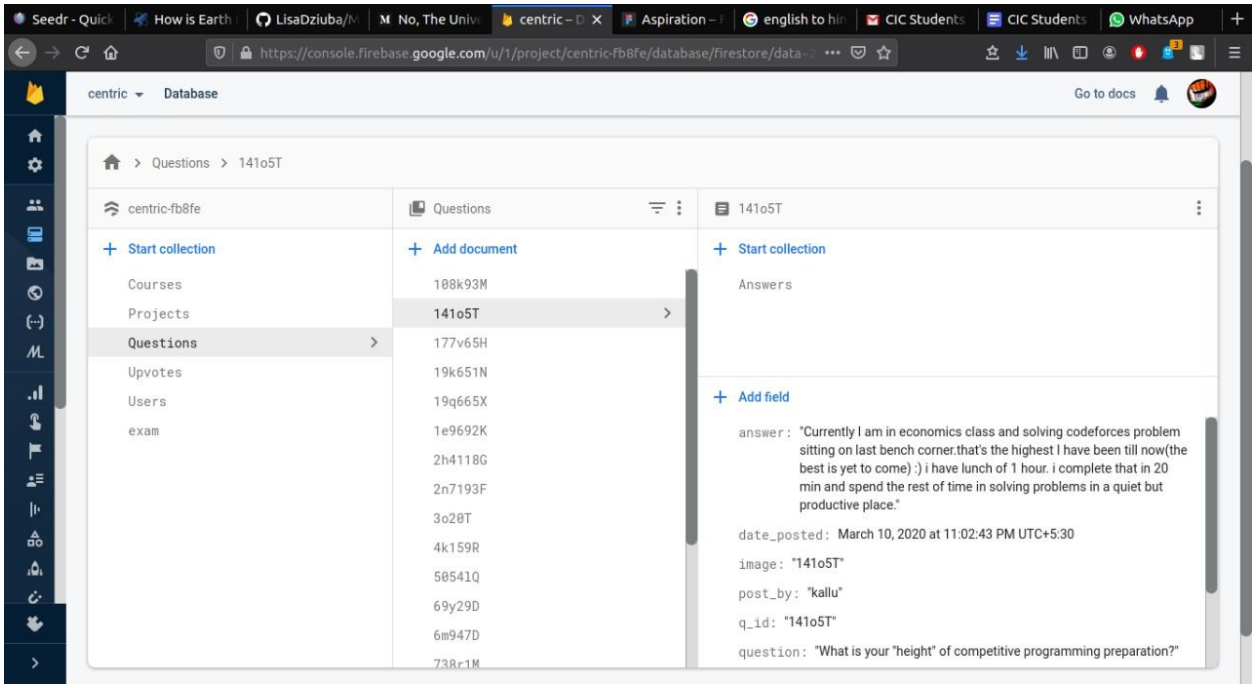

Figure 24: Database

5. Conclusion

Our goal was to create an application where people associated with CIC can ask questions and give answers. The current application has fulfilled these goals. We have also added features such as Questions Papers and Projects for the convenience of the students of this prestige organisation. We followed the specifications strictly but enhanced some of the features when there was need for it to be done. With the goals achieved the basis of the application and this project has been achieved. Building this web application and android application has been challenging and enriching because throughout the project we learnt a lot about various programming tools and understood what it takes to build a question answer based forum.

6. Future Prospects

The web application we have created is the best we could have done with limited skills, resources and the time we had but there are still upgrades twe will be looking forward to make:

6.1. Interest Based Filtration of the content using Artificial Intelligence

Every user will have fields of interest that they will be able to fill during the time registration and which will also get updated according to the content they view and answers they will give. This can help get data on them which will help filter out content for him using Artificial Intelligence which the user is doing manually currently.

6.2. Higher Security of the content uploaded

Any project or question paper uploaded by the user can be secured more adding a user given password that is only users with that particular password can download the said content.

6.3. Integrated Chat System

Inclusion to the public forum of discussion and question answers a personalised chat platform can also be added for users to chat with fellow colleagues through the app only.

6.4. Notifications for the User

Notifications for any update in the question they have asked or an answer they have given can be shown to them on login or on their Android devices. This notification can also be used with Artificial Intelligence for showing them any update in their fields of interest as well

6.5. Scores for every User

For every answer a user gives other users will be able to give an upvote or a downvote which will determine the users score. More the user's score, the more reliable his answer will be. This will help user's to filter out correct answers amongst many.

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