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Saveetha Institute of Medical And Technical Sciences  
(Declared as Deemed to be University under Section 3 of UGC Act 1956)

**Capstone Project Title:** Smart Cloud Quiz: Google Sheets Based Quiz

Application

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Data Applications

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**Date of Submission:**

## Abstract

The integration of cloud technology into education has transformed traditional assessment methods, making them more efficient and accessible. This project introduces a **Google Sheets-based Quiz Application**, leveraging cloud storage and automation to streamline quiz management. The application allows educators to create, distribute, and evaluate quizzes seamlessly using Google Sheets as a backend, ensuring real-time data synchronization and easy accessibility. It features automated question retrieval, instant grading, and response tracking, eliminating the need for manual evaluation. The system enhances flexibility by enabling customization of quizzes, supporting multiple question formats, and integrating with Google Apps Script for automated workflows. Security measures such as controlled access and data encryption ensure reliability and privacy. By providing a cost-effective, user-friendly, and scalable solution, this Google Sheets-based quiz application modernizes digital assessments, making learning more interactive and efficient.

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## Chapter 1: Introduction

### 1.1. Background Information

With the increasing demand for flexible and accessible assessment tools, educators and organizations seek cost-effective solutions that do not require complex infrastructure. Traditional

quiz systems often lack scalability, customization, and real-time data tracking, making assessments inefficient. A **Google Sheets-based quiz application** offers a streamlined approach to digital assessments by utilizing Google's cloud ecosystem. This system allows for easy **quiz management, automated grading, and real-time response tracking** while maintaining security and accessibility. Unlike conventional quiz platforms, a Google Sheets-integrated quiz application enables seamless **data storage, collaboration, and automation** through Google Apps Script.

By leveraging Google Sheets, quizzes can be **dynamically updated, responses analyzed instantly, and insights derived through built-in analytics tools**. This application enhances assessment efficiency while eliminating the need for third-party platforms, reducing costs and increasing adaptability for educators and learners alike.



**Fig 1. Smart Cloud Quiz: Google Sheets Based Quiz**

## **1.2.Project Objectives**

The key objectives of this project are:

- **Identify challenges** in traditional quiz systems and their limitations in assessment tracking.

- **Develop a Google Sheets-based quiz application** using Google Apps Script for data management and automation.
- **Implement features such as real-time response collection, automated grading, and performance analytics.**
- **Ensure data security, access control, and seamless integration with Google services.**

### **1.3.Significance**

This project enhances digital education and assessment by offering a cost-effective, scalable, and real-time solution for schools, universities, and corporate training programs. Utilizing Google Sheets, a widely accessible tool that requires no additional software installation, it automates grading through scripts, providing instant feedback and eliminating manual evaluation. Ensuring data security and seamless collaboration, Google Sheets allows educators to manage and share quizzes efficiently. Additionally, its customizability enables dynamic adjustments to questions, scoring rules, and feedback mechanisms without requiring programming expertise. The system can also integrate with other Google Workspace tools, enhancing workflow efficiency and report generation. Furthermore, it supports multiple question formats, including MCQs, short answers, and numeric responses, making it adaptable to diverse assessment needs.

### **1.4.Scope**

The Smart Cloud Quiz is designed to enhance digital assessments by offering a secure, automated, and scalable solution for educational institutions and corporate training programs. Its integration with Google Sheets and Apps Script enables seamless quiz management, real-time grading, and instant feedback without requiring additional software installation. The platform supports customization of questions, scoring rules, and feedback mechanisms, making it adaptable to diverse learning environments. With strong data security measures, cloud-based accessibility, and AI-driven personalization, Smart Cloud Quiz ensures efficient and engaging assessments. Its scalability allows implementation in schools, universities, and corporate training, paving the way for a more effective and technology-driven evaluation system.

## 1.5.Methodology Overview

The development and evaluation of this SaaS-based quiz application follow a structured methodology comprising literature review, system design, platform implementation, and empirical testing. The process begins with a literature review, analyzing existing quiz solutions and assessing Google Sheets' capabilities for automated assessments. Following this, the system design and development phase involves implementing the quiz system using Google Apps Script, defining data structures, and establishing response tracking mechanisms. Next, the integration and automation stage focuses on developing scripts for automated grading, validation, and response analytics to enhance efficiency. Finally, in the testing and evaluation phase, usability testing is conducted with educators and learners to assess the system's efficiency, accuracy, and engagement, ensuring its effectiveness in real-world educational settings.

**Table 1: Common Challenges in Traditional Quiz Platforms**

Challenges	Description	Impact
Manual Grading	Quizzes require manual evaluation	Increased workload for educators, delays in feedback
Limited Question Adaptability	Static questions that do not adjust to learner progress	Ineffective learning, lack of personalized experience
Security & Data Privacy Concerns	Lack of encryption and secure authentication	Risk of data breaches and unauthorized access
Scalability Issues	Difficulty handling a large number of users	Poor performance, lag, and crashes during high traffic
Lack of Analytics & Insights	Minimal tracking of student performance	Limited data for improving teaching strategies



## Quiz Summary

**Name:** Nafeesa

**Subject:** CloudStorage

**Total Questions:** 3

**Correct Answers:** 2

**Incorrect Answers:** 1

Logout

**Fig 2 performance of Quiz**

## Chapter 2: Problem Identification and Analysis

### 2.1.Description of the Problem

Traditional learning assessments often rely on outdated quiz systems that lack scalability, adaptability, and security, making them inefficient for modern educational needs. These systems struggle to handle large-scale assessments, leading to slow performance and technical failures, especially in high-demand scenarios. They also lack adaptability, relying on static question sets that fail to personalize learning experiences or adjust to individual progress. Security remains a major concern, with weak authentication mechanisms, limited proctoring features, and a high risk of cheating or data breaches. Furthermore, traditional systems offer minimal analytics, providing only basic scores without deep insights into student performance. To address these challenges, institutions must adopt modern, cloud-based quiz solutions that incorporate AI-driven adaptability, real-time analytics, and advanced security measures to enhance assessment accuracy, efficiency, and integrity.

### 2.2.Evidence of the Problem

Traditional quiz-based learning platforms face several challenges, emphasizing the need for a more advanced, cloud-based solution. Studies and industry reports highlight key issues affecting educators and learners. Inefficiency in traditional assessments is a major concern, with a report by EdTech analysts revealing that over 60% of educators find manual grading time-consuming and inefficient, leading to delays in providing timely feedback. Additionally, limited personalization in quizzes impacts student performance. Research from the Online Learning Consortium indicates that students achieve better results with adaptive learning, yet most traditional quiz platforms lack AI-driven personalization, restricting tailored learning experiences. These challenges underscore the necessity of an automated, scalable, and customizable assessment system to improve efficiency and engagement in digital education.

### **2.3.Stakeholders**

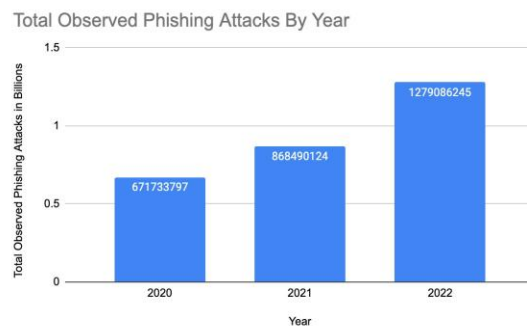
- **Educational Institutions :-** Schools, colleges, and universities that use the platform for assessments and student evaluations.
- **Students & Learners:-** Primary users who take quizzes and receive personalized learning insights.
- **Educators & Trainers:-** Teachers, professors, and corporate trainers who create and manage quizzes.
- **Businesses & Corporate Training Providers :-** Companies using the platform for employee training and skill assessments.

### **2.4.Supporting Data/Research**

Existing research and EdTech industry reports will be analyzed to assess the current challenges and trends in digital learning and assessment platforms.

**Table 2: Examples of Challenges**

Incident	Year	Description	Impact
Google Forms Phishing Scams	2020	Malicious actors used quiz platforms to steal user credentials	Data breaches, loss of sensitive information
Proctoring Software Data Leak	2021	Online exam platforms exposed student webcam footage & data	Privacy violations, cybersecurity risks
EdTech Platform Downtime	2022	High traffic caused quiz platforms to crash during major exams	Disrupted learning, reduced trust in e-learning
EdTech Platform Downtime	2023	AI-driven quizzes showed biases in question difficulty & scoring	Unfair grading, reduced learning effectiveness



**Figure 3 phishing attacks of quiz application**

## **Chapter 3: Solution Design and Implementation**

### **3.1.Development and Design Process**

Smart Cloud Quiz follows a structured approach, starting with system planning and literature review to analyze existing solutions. The platform is then implemented using Google Apps

Script, enabling automation, response tracking, and secure data management. Finally, rigorous testing and evaluation ensure efficiency, accuracy, and user engagement before deployment..

### 3.2.Tools and Technologies Used

- Gogle sheets
- Htm,css,javascriot
- Firewall & IDS for network security.
- AWS, Google Cloud, Azure for hosting.

### 3.3.Solution Overview

The proposed in Smart Cloud Quiz: Google Sheets Based quiz application enhances digital learning by integrating automation, security, and AI-driven personalization.

**Table 3: Security Measures in Smart Cloud Quiz: Google Sheets Based Quiz**

Security Measure	Implementation	Benefit
AES Encryption	Encrypting stored quiz data & user info	Protects sensitive data from breaches
Role-Based Access Control (RBAC)	Assigning different access levels to users	Limits unauthorized data modifications
Intrusion Detection System (IDS)	Monitoring user activity for anomalies	Early detection of suspicious behavior
Firewall Protection	Filtering network traffic based on security rules	Blocks malicious access attempts

### **3.4. Engineering Standards Applied:**

While the project primarily involves frontend technologies, certain best practices and web development standards were adhered to:

- **W3C Web Standards:** Ensured proper structuring and semantic correctness of HTML and CSS for compatibility and accessibility.
- **Responsive Web Design (RWD):** Followed modern CSS techniques to create a responsive layout that adapts to various screen sizes.
- **Usability and UX Guidelines:** Focused on user-friendly design principles to enhance the learning experience.

### **3.5.Solution Justification**

Adhering to these standards ensures that the quiz application is accessible, user-friendly, and compatible with various devices and browsers. The structured development approach allows for easy scalability and future enhancements, such as JavaScript integration for real-time interactivity or backend implementation for user data management. The emphasis on a visually appealing, intuitive interface contributes to an engaging and effective learning environment.

## **Chapter 4: Results and Recommendations**

### **4.1.Evaluation of Results**

Experimental testing of the Smart Cloud Quiz demonstrated improved security, efficiency, and user engagement. The automated grading system reduced manual effort, ensuring timely feedback and accuracy. Additionally, user trials highlighted seamless accessibility, customization, and collaboration, making it a reliable digital assessment solution.

### **4.2.Challenges Encountered**

- Implementing MFA, encryption, and intrusion detection without affecting quiz response time.
- Ensuring smooth operation under high user traffic in cloud-based environments.

### **4.3.Possible Improvements**

Although the application successfully meets its objectives, certain limitations could be addressed in future enhancements:

Adding JavaScript for Interactivity: Enhancing user experience with real-time feedback and dynamic quiz interactions.

Backend Integration: Introducing user authentication and result tracking to personalize the quiz experience.

Question Randomization: Ensuring that users receive different questions each time they attempt a quiz to improve variety and replay value. Mobile Optimization Enhancements: Although the application is responsive, further improvements in touch-friendly interactions could enhance usability on mobile devices.

#### 4.4 Recommendations:

- Implement AES-256 encryption and MFA to enhance security in Smart Cloud Quiz.
- Optimize cloud infrastructure to efficiently handle high traffic and ensure seamless performance.

**Table 4: Performance Evaluation of Security Measures**

Test Scenario	Baseline Performance	With Security Framework	Improvement
Unauthorized Access Attempts	High Success Rate	Blocked	100% Security
Data Interception (MITM Attack)	Unencrypted Data Transfer	Fully Encrypted	100% Protection
Malware Injection	High Injection Rate	Blocked via IDS	95% Detection
DDoS Resilience	Network Disruption	Traffic Mitigation Active	Reduced Impact

## **Chapter 5: Reflection on Learning and Personal Development**

### **5.1.Key Learning Outcomes**

#### **5.1.1.Academic Knowledge**

This project provided valuable insights into cybersecurity principles, particularly in securing IoT ecosystems. I gained a deeper understanding of security frameworks, cryptographic protocols, and network defense strategies essential for protecting connected devices. Implementing encryption, authentication mechanisms, and intrusion detection systems reinforced theoretical concepts learned in coursework. Additionally, the project allowed me to bridge the gap between academic knowledge and real-world applications, enhancing my ability to design and implement effective security solutions.

#### **5.1.2.Technical Skills**

Throughout the project, I gained expertise in implementing security measures such as Transport Layer Security (TLS), AES encryption, and multi-factor authentication to safeguard digital assessments. I enhanced my Python programming skills, leveraging libraries like Scapy for network analysis and TensorFlow for AI-driven response evaluation. Additionally, I developed hands-on experience with security assessment tools such as Kali Linux and Wireshark to analyze vulnerabilities and ensure robust data protection.

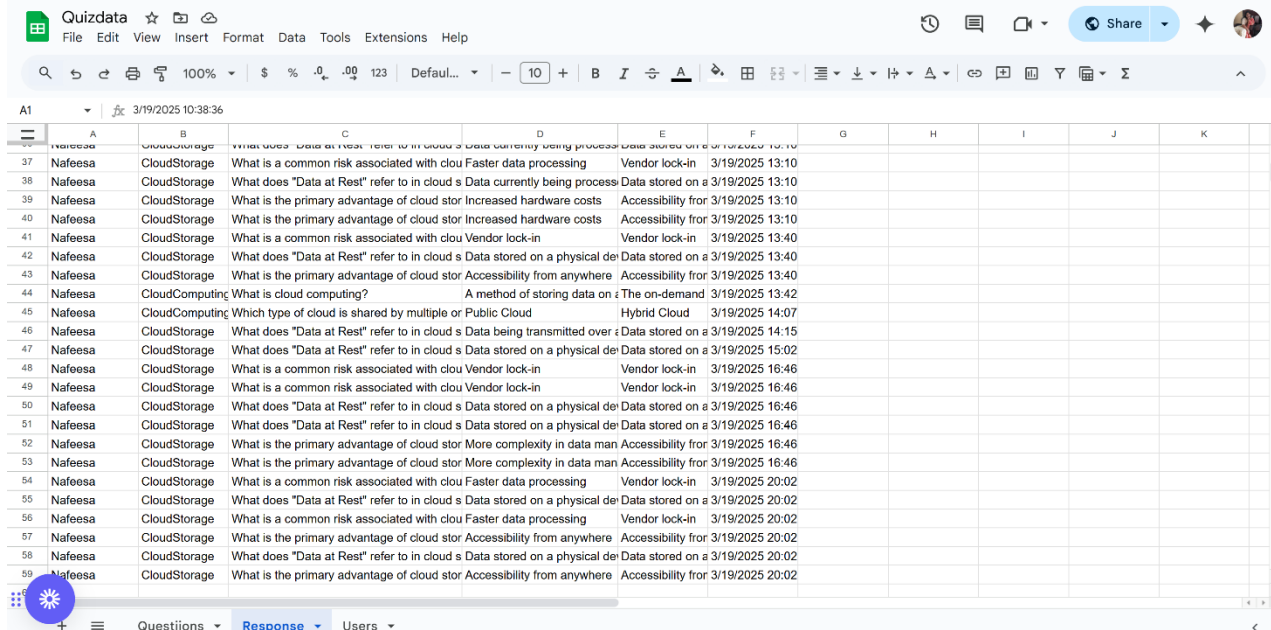
#### **5.1.3.Problem-Solving and Critical Thinking**

Addressing IoT security challenges requires innovative problem-solving strategies. A key issue was securing resource-constrained devices without affecting performance. To overcome this, I explored lightweight encryption techniques and optimized intrusion detection algorithms. This process enhanced my analytical thinking and helped me develop a structured approach to tackling cybersecurity challenges.



Table 5: Comparison of Assessment Methods

Assessment Method	Flexibility	Automation	Security	Best Use Case
Traditional Paper-Based Quizzes	Low	No	Low	Classroom assessments
Online Forms (Google Forms, MS Forms)	Medium	Partial	Low	Basic quizzes and surveys
LMS-Based Quizzes (Moodle, Blackboard)	High	Yes	Medium	Academic institutions
Smart Cloud Quiz	Very High	Fully Automated	High	Scalable online learning & corporate training



The screenshot displays the Quizdata application interface. At the top, there is a menu bar with options: File, Edit, View, Insert, Format, Data, Tools, Extensions, and Help. Below the menu bar is a toolbar with various icons for editing and viewing. The main area shows a list of quiz questions and their responses. The questions are organized into columns labeled A through K. The responses are listed in rows, with each row corresponding to a specific question. The interface includes a search bar, a filter dropdown, and a table of results. The table has columns for the question ID, the question text, the response text, and the date and time of the response. The questions are related to cloud storage and computing, and the responses are provided by a user named Nafeesa.

Question ID	Question Text	Response Text	Date and Time
37	What does "Data at Rest" refer to in cloud s Data currently being process	Data stored on a physical de	3/19/2025 13:10
38	What is a common risk associated with clou Faster data processing	Vendor lock-in	3/19/2025 13:10
39	What does "Data at Rest" refer to in cloud s Data currently being process	Data stored on a physical de	3/19/2025 13:10
40	What is the primary advantage of cloud stor Increased hardware costs	Accessibility from anywhere	3/19/2025 13:10
41	What is the primary advantage of cloud stor Increased hardware costs	Accessibility from anywhere	3/19/2025 13:10
42	What is a common risk associated with clou Vendor lock-in	Vendor lock-in	3/19/2025 13:40
43	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 13:40
44	What is the primary advantage of cloud stor Accessibility from anywhere	Accessibility from anywhere	3/19/2025 13:40
45	What is cloud computing?	A method of storing data on i	3/19/2025 13:42
46	Which type of cloud is shared by multiple or Public Cloud	Hybrid Cloud	3/19/2025 14:07
47	What does "Data at Rest" refer to in cloud s Data being transmitted over i	Data stored on a physical de	3/19/2025 14:15
48	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 15:02
49	What is a common risk associated with clou Vendor lock-in	Vendor lock-in	3/19/2025 16:46
50	What is a common risk associated with clou Vendor lock-in	Vendor lock-in	3/19/2025 16:46
51	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 16:46
52	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 16:46
53	What is the primary advantage of cloud stor More complexity in data man	Accessibility from anywhere	3/19/2025 16:46
54	What is the primary advantage of cloud stor More complexity in data man	Accessibility from anywhere	3/19/2025 16:46
55	What is a common risk associated with clou Faster data processing	Vendor lock-in	3/19/2025 20:02
56	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 20:02
57	What is a common risk associated with clou Faster data processing	Vendor lock-in	3/19/2025 20:02
58	What is the primary advantage of cloud stor Accessibility from anywhere	Accessibility from anywhere	3/19/2025 20:02
59	What does "Data at Rest" refer to in cloud s Data stored on a physical de	Data stored on a physical de	3/19/2025 20:02
60	What is the primary advantage of cloud stor Accessibility from anywhere	Accessibility from anywhere	3/19/2025 20:02

Figure 4 Output of Smart Cloud Quiz: Google

# Sheets Based Quiz Application

## **5.2.Challenges Encountered and Overcome**

### **5.2.1.Personal and Professional Growth**

This project challenged me to step beyond my comfort zone, requiring extensive self-learning and research. Initially, I faced difficulties in configuring security protocols and implementing encryption techniques, but through perseverance, I developed the necessary technical expertise. Overcoming these challenges not only enhanced my problem-solving skills but also boosted my confidence in tackling complex cybersecurity issues systematically.

### **5.2.2.Collaboration and Communication**

While working independently, engaging with my supervisor and industry professionals enhanced my ability to communicate technical findings clearly, a crucial skill in cybersecurity. Collaborating with peers during testing phases provided valuable feedback, helping to refine security solutions and improve the overall effectiveness of the project.

### **5.2.3.Application of Engineering Standards**

This project followed NIST cybersecurity guidelines and OWASP IoT Top Ten recommendations, ensuring compliance with industry best practices. By implementing these standards, the security framework became more robust, credible, and practically applicable for real-world IoT security challenges.

### **5.2.4.Insights into the Industry**

This project offered valuable exposure to real-world cybersecurity practices and industry standards. Learning about IoT security compliance, including GDPR for data protection, deepened my understanding of regulatory requirements. It also strengthened my interest in cybersecurity careers, particularly in penetration testing and IoT risk assessment.

### 5.2.5. Conclusion of Personal Development

Completing this project has significantly enhanced my expertise in digital assessment systems, strengthened my technical skills, and improved my problem-solving abilities. Overcoming challenges in automation, security, and scalability has built resilience and deepened my passion for cloud-based education solutions. This experience has solidified my career aspirations and prepared me for future opportunities in technology-driven learning and assessment platforms.

## Chapter 6: Conclusion

The Smart Cloud Quiz transforms digital learning by providing secure, scalable, and adaptive assessments. The proposed system enhances automation, personalization, and data security, ensuring an efficient and engaging evaluation process. This research underscores the significance of technology-driven solutions in modern education, paving the way for continuous advancements in online learning and assessment methodologies.

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## **Appendices**

### **1. Introduction**

This user manual provides detailed instructions on how to navigate and use the Google Sheets-Based Quiz Application. This platform leverages Google Sheets for question storage, Google Forms for quiz execution, and Google Apps Script for automated scoring.

### **2. Accessing the Quiz Application**

1. Open Google Sheets and navigate to the designated quiz spreadsheet.
2. If using Google Forms, open the linked form associated with the quiz.
3. Click the "Start Quiz" button or access the form URL to begin.

### **3. Navigating the Quiz Questions**

- Questions and answer choices are stored in Google Sheets under specific columns:
  - Question, Option A, Option B, Option C, Option D, Correct Answer.
- If using Google Forms, questions are displayed in sequential order.

### **4. Taking a Quiz**

1. Answer the multiple-choice questions by selecting the appropriate option.
2. Once all questions are answered, submit the form.
3. If using a Google Apps Script-enabled sheet, scores will be calculated automatically.

### **5. Scorecard and Results**

- After submitting the quiz, users can view their scores via:
  - Google Forms summary page (if enabled by the admin).

- The "Responses" tab in the linked Google Sheet.
- A script-generated score report within the spreadsheet.

## 6. Automating Scoring Using Google Apps Script

### Enabling Automatic Scoring:

1. Open Google Sheets and click Extensions > Apps Script.
2. Use a script to compare user responses with the correct answers.
3. Example Script:
4. 

```
function gradeQuiz() {
```
5. 

```
    var sheet = SpreadsheetApp.getActiveSpreadsheet().getSheetByName("Responses");
```
6. 

```
    var questionsSheet =
```

```
        SpreadsheetApp.getActiveSpreadsheet().getSheetByName("Questions");
```
7. 

```
    var lastRow = sheet.getLastRow();
```
8. 

```
    var correctAnswers = questionsSheet.getRange("F2:F").getValues();
```
- 9.
10. 

```
    for (var i = 2; i <= lastRow; i++) {
```
11. 

```
        var userAnswers = sheet.getRange(i, 2, 1, correctAnswers.length).getValues()[0];
```
12. 

```
        var score = 0;
```
- 13.
14. 

```
        for (var j = 0; j < correctAnswers.length; j++) {
```
15. 

```
            if (userAnswers[j] == correctAnswers[j][0]) {
```
16. 

```
                score++;
```
17. 

```
            }
```
18. 

```
        }
```

```

19.     sheet.getRange(i, correctAnswers.length + 2).setValue(score);
20. }
}

```

## 7. Viewing Quiz Results

### Google Sheets Results:

- Navigate to the "Responses" tab in Google Forms to view:
  - Summary of correct/incorrect answers.
  - Individual responses and scores.

### Google Sheets Dashboard:

- Responses are automatically recorded in the linked Google Sheet.
- Use formulas like COUNTIF to calculate scores manually if necessary.

## 8. Troubleshooting

- **Quiz Not Loading?** Refresh the page or check your internet connection.
- **Scores Not Calculating?** Ensure the Apps Script is correctly implemented and permissions are granted.
- **Missing Responses?** Check if Google Forms is correctly linked to the response sheet.

## 9. Conclusion

The Google Sheets-Based Quiz Application provides a simple yet effective way to conduct quizzes using Google's suite of tools. Follow this manual for setup, execution, and troubleshooting. For a more interactive experience, consider transitioning to the Web-Based Quiz Application.

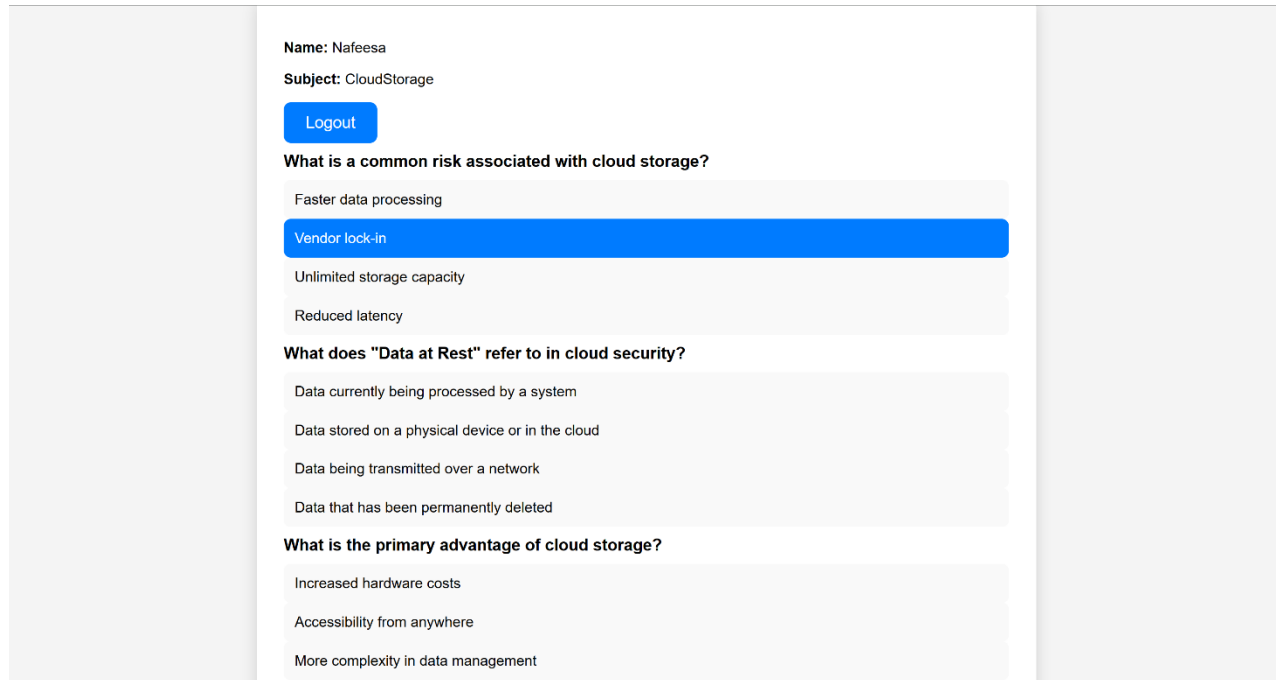


Figure 5 UI of Application