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Online Examination System Using Django

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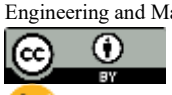

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Abstract--The Online Examination System using Django Framework is a secure and scalable web-based application designed to automate the complete examination lifecycle of an educational institution. The system addresses limitations of conventional examinations such as paper dependency, manual result calculation, delayed evaluation, limited transparency, and high administrative workload.

It provides dedicated interfaces for administrators, teachers, and students, enabling user registration, teacher approval, student approval, question bank management, online examination scheduling, answer submission, automatic evaluation, result processing, and report generation.

The application is implemented using Python and Django on the backend, HTML, CSS, JavaScript, and Bootstrap on the frontend, and SQLite or MySQL as the relational database. Django's Model-View-Template architecture, Object Relational Mapper, authentication middleware, password hashing, CSRF protection, and session handling provide a reliable foundation for secure academic assessment.

The proposed system improves accuracy, reduces operational cost, supports faster result publication, and creates a centralized platform for digital examination management. This report presents the design, methodology, database schema, implementation details, testing strategy, security mechanisms, advantages, future enhancements, and references for the proposed system in IEEE-style format.

Keywords--Online Examination System, Django Framework, Python, SQLite, MySQL, HTML, CSS, JavaScript, Bootstrap, MVT Architecture, Automatic Evaluation, Digital Assessment, Web Application Security.

I. INTRODUCTION

Overview of Online Examination System

An online examination system is a web-based platform that allows educational institutions to conduct examinations through a digital interface. Students can log in, view available exams, answer questions within a specified duration, submit responses, and obtain results after evaluation. Teachers can create questions, organize question papers, schedule examinations, and analyze student performance. Administrators can control users, approve accounts, monitor examinations, and maintain institutional records.

The proposed project, Online Examination System Using Django Framework, follows a modular approach to digital assessment. It provides three major roles: administrator, teacher, and student. The administrator controls system-level operations, the teacher manages academic content and results, and the student attends examinations and views performance. This separation improves security, usability, and maintainability.

The system is suitable for colleges, universities, coaching centers, training institutes, and internal assessment environments. It can be used for unit tests, semester internal examinations, mock tests, placement tests, certification exams, and practice quizzes. The web-based nature of

the platform makes it accessible through common browsers without requiring complex installation on each client device.

In a typical institution, an examination involves multiple stakeholders and several dependent activities. The examination cell defines the schedule, teachers prepare questions, students appear for tests, and administrators publish results. The proposed system converts these activities into controlled digital workflows so that each step is recorded and verified.

The system is not limited to final examinations. It can support class tests, internal assessments, practice examinations, mock interviews, aptitude tests, technical quizzes, and certification-oriented assessments. This flexibility makes the application useful throughout the academic semester rather than only during final evaluation periods.

A key design principle of the proposed project is simplicity for end users and modularity for developers. Students should be able to understand the exam interface without training, while teachers should be able to create questions without technical knowledge. Developers, on the other hand, should be able to maintain separate modules for users, questions, exams, and results.

Need of Digital Examination Platforms

Digital examination platforms have become necessary because academic institutions increasingly require faster, more transparent, and more flexible evaluation processes. Manual examination systems are difficult to scale when the number of students, courses, and internal assessments increases. A digital platform reduces paper usage, minimizes manual coordination, and allows examinations to be conducted with better record management.Online examination systems also support remote and blended learning environments. Students may participate from computer laboratories, classrooms, or controlled

remote environments depending on institutional policy. Digital assessment helps teachers conduct frequent tests and obtain immediate feedback about student understanding.

Another important need is data availability. In a manual system, answer sheets and marks registers are stored physically, and retrieval becomes time-consuming. In a digital system, examination records can be retrieved using student ID, course, date, subject, or exam title. This improves academic decision-making and reporting.

The demand for digital examination platforms increased with the growth of online learning, remote education, and hybrid classroom models. Institutions require tools that can operate beyond physical classrooms while still maintaining control over academic records. A browser-based examination system provides this flexibility.

Digital platforms also support quick academic intervention. When results are available immediately, teachers can identify weak topics and arrange remedial classes. Students can also understand their progress earlier instead of waiting for manually checked answer sheets.

The platform can improve institutional documentation. Instead of maintaining separate paper registers for attendance, question papers, marks, and evaluation records, the database can store all examination data in a structured and searchable form. This is useful during audits, accreditation work, and academic reviews.

Existing Problems in Traditional Exams

Traditional examinations depend on printed question papers, physical answer sheets, manual invigilation, manual collection, manual evaluation, marks entry, and result publication. These activities require considerable time and manpower. Errors can occur during marks calculation, roll number entry, paper distribution, and answer sheet handling.

Students may face delays in result publication and difficulty obtaining detailed feedback. Teachers may spend excessive time checking objective questions that could be evaluated automatically. Administrators must coordinate seating arrangements, question paper printing, storage, and record maintenance. These issues make the conventional process slow and resource-intensive.

Another problem in paper-based examinations is dependency on physical logistics. Question papers must be printed securely, transported safely, stored before the exam, and distributed at the correct time. Any leakage or misplacement can compromise the fairness of the examination.

Manual answer checking is also difficult when the number of students is large. Even objective questions require teachers to compare each answer manually and calculate marks. This creates fatigue and increases the probability of mistakes.

Traditional methods also lack fine-grained data. A teacher may know a student's total marks but may not easily obtain topic-wise accuracy, question-wise difficulty, or average performance across a group. Digital records make such analysis possible.

Benefits of Automation

Automation improves examination efficiency by reducing repetitive manual tasks. Objective answers can be evaluated immediately using stored answer keys. Results can be calculated consistently, stored securely, and displayed quickly. Teachers can reuse question banks and schedule examinations without repeatedly preparing paper-based test material.

Automation also improves transparency. Every examination attempt can be stored with timestamps, selected answers, marks, and result status. This information helps in verification, audit, and academic analysis. Administrators can monitor active examinations and generate reports from a centralized interface.

II. CHALLENGES IN ONLINE EXAMINATION SYSTEM

User Authentication

User authentication is one of the most important challenges in an online examination system. The platform must confirm that the person accessing the examination is an authorized student, teacher, or administrator. Unauthorized access may lead to data leakage, unfair examination attempts, or manipulation of results. The proposed system uses Django's authentication framework, password hashing, login sessions, role validation, and protected views to restrict system access.

The system may support account approval by administrators before students and teachers can use the platform. This prevents unknown users from immediately participating in institutional examinations. Additional verification such as email confirmation, roll number validation, or institutional ID checking can be added during deployment.

Authentication is more than a login screen. It includes account creation, approval, password storage, session validation, logout handling, and protection against direct URL access. If any of these areas is weak, a user may access data that does not belong to their role.

For a college deployment, administrators may verify students using roll number, course, semester, and institutional email. Teachers may be approved using department information and employee ID. These checks improve trust in the user database.

Question Bank Management

Question bank management involves creating, updating, storing, and organizing questions for different courses, subjects, marks, and difficulty levels. Teachers require a structured interface to add multiple-choice questions, define correct answers, and assign marks. Without proper question bank management, question papers may become repetitive, unbalanced, or difficult to maintain.

The proposed system stores question details in a relational database. Each question is linked with a course or exam and contains options, correct answer, marks, and teacher ownership. This makes retrieval and reuse easier and supports future features such as random question selection and topic-wise classification.

Question bank quality directly affects assessment quality. Questions should be accurate, clear, relevant to the syllabus,

and mapped to proper marks. The system should allow teachers to review questions before publishing an exam.

Duplicate questions and incorrect answer keys are common risks. A future enhancement can include question validation, peer review, tagging, difficulty classification, and import from spreadsheet files.

Exam Scheduling

Exam scheduling ensures that students can access an examination only within the permitted time window. The system must store exam date, start time, end time, duration, course, and assigned question set. Incorrect scheduling can result in unauthorized early access, missed examinations, or overlapping tests.A Django-based scheduling module can validate active exams using server time. Students should see only examinations available to their account and course. Teachers and administrators should be able to create, update, start, pause, or stop examinations according to academic rules.

Scheduling must also consider exam duration and grace time. If the internet connection is unstable or a student's browser refreshes, the system should still calculate the remaining time based on server-side timestamps rather than trusting only the client-side timer.

The start and stop controls are useful when an institution conducts examinations in computer labs. Administrators may open an exam when students are seated and stop it after completion. This gives operational control similar to a physical examination hall.

Result Processing

Result processing must be accurate, fast, and transparent. Objective questions are evaluated by comparing submitted answers with stored answer keys. Marks are added based on correct responses, and final scores are stored in the Result table. For descriptive answers, manual review can be supported in future versions.

The system must prevent duplicate submissions and must store the final submitted response safely. Result generation should be deterministic so that the same set of answers always produces the same marks. This improves fairness and reduces disputes.

Result processing should preserve historical data. If a question is edited after an examination, old results should not become inconsistent. Therefore, systems often lock question papers after an exam starts or store a snapshot of attempted questions.

The result module may also calculate grade, percentage, rank, pass status, and course-wise summary. These values can be displayed on dashboards and exported for institutional reporting.

Security and Anti-Cheating

Online examinations face risks such as unauthorized login, impersonation, answer sharing, browser switching, multiple attempts, direct URL manipulation, and data tampering. The proposed system handles basic security using authentication, authorization, CSRF protection, session management, and database-level validation. Anti-cheating can be strengthened with random question ordering, time limits, attempt restrictions, activity logging, and future AI-based proctoring.

Security must be balanced with usability. A strict system that frequently logs out students or loses answers can create stress during examinations. Therefore, secure session handling, clear instructions, and periodic answer saving are important design considerations.

Anti-cheating mechanisms can be divided into preventive, detective, and corrective controls. Preventive controls include login validation, time limits, and attempt restrictions. Detective controls include activity logs, IP tracking, and proctoring. Corrective controls include exam cancellation, retest scheduling, and manual review.

The proposed version focuses on application-level security and leaves advanced proctoring as a future enhancement. This is appropriate for an MCA/B.Tech project because it demonstrates a strong foundation while allowing scope for research extension.

Scalability and Performance

Scalability becomes important when many students log in and submit answers at the same time. The backend must process requests quickly, and the database must handle concurrent read and write operations. Query optimization, indexing, caching, and appropriate deployment architecture can improve performance.

For small institutions, SQLite may be sufficient during development or laboratory deployment. For larger institutions, MySQL is more suitable because it supports stronger concurrency and production-level database administration. The system design should allow database migration without changing major business logic.

During an active exam, the system must handle repeated answer-saving requests and final submissions. If every student submits at the same time, the database may receive many write operations in a short interval. Proper indexing and efficient query design are therefore important.

Django applications can be scaled using production servers such as Gunicorn or uWSGI, reverse proxies such as Nginx, and relational database servers such as MySQL or PostgreSQL. Static files can be served separately to reduce load on the application server.

III. RELATED WORK

Existing Online Examination Systems

Existing online examination systems commonly provide registration, question display, answer submission, and result generation. Some platforms are integrated into learning management systems, while others are standalone applications developed for specific institutional

needs. Commercial platforms may include proctoring, analytics, and cloud hosting, but they can be expensive or difficult to customize.

Open-source and academic systems often focus on basic test delivery. They may not provide strong role-based dashboards, teacher approval, student approval, detailed reporting, or customizable database structures. Institutions with local evaluation rules may require a customized solution that matches their academic workflow.

Many learning management systems provide quiz modules, but they may include extra course-management complexity that is unnecessary for institutions wanting a dedicated exam portal. Standalone examination systems can be simpler and easier to customize.

Commercial systems offer high-end features such as live proctoring and cloud analytics, but licensing cost and data privacy concerns may be barriers. A locally developed Django solution gives institutions control over source code, database, and deployment.

Research Analysis

Research in educational technology highlights that online assessment improves speed, record management, and accessibility. However, studies also show that examination security, fairness, usability, and network reliability remain key concerns. A good system should combine technical security with simple user experience.

Django is a suitable framework for such systems because it provides reusable components for authentication, database operations, routing, form validation, middleware, and administrative control. Python's readability also makes the codebase easier for students and academic developers to understand.

Published work on e-assessment emphasizes that online examinations must be valid, reliable, secure, and usable. Validity means the exam measures intended learning outcomes. Reliability means the system produces consistent results. Security means user identity and data integrity are protected. Usability means students can complete exams without interface confusion.

Research also indicates that immediate feedback can improve learning. When students quickly receive results, they can identify errors and revise concepts. Therefore, automatic result generation is not only an administrative benefit but also an academic benefit.

Limitations of Existing Systems

Many existing systems lack flexible question bank management, detailed result analysis, multi-role approval workflow, and modular architecture. Some systems are difficult to maintain because business logic, user interface, and database queries are not properly separated. Others are not responsive and therefore create difficulties on mobile or tablet screens.

The proposed system addresses these limitations by using Django's MVT pattern, Bootstrap-based responsive templates, role-wise dashboards, relational database design, and structured modules for admin, teacher, and student activities.

Some existing systems store questions and results but do not provide approval workflows. Without approval, fake accounts can register and access examination pages. The proposed system includes admin approval as an important control.

Another limitation is poor reporting. A system that only displays individual marks may not help teachers understand class performance. The proposed result structure can be extended to generate course-wise and exam-wise analysis.

IV. PROBLEM STATEMENT

Issues in Manual Examination Process

Manual examination systems require question paper printing, invigilation planning, answer sheet distribution, collection, checking, marks entry, moderation, and result publication. These tasks are time-consuming and prone to human error. Physical records can be misplaced or damaged, and result preparation may be delayed.

Manual processes also increase cost through paper, printing, storage, and administrative effort. Repeated internal tests become burdensome when every assessment requires physical preparation and manual evaluation.

Manual systems are also difficult to audit. If marks are changed, it may be hard to determine when and why the change happened. A digital system can maintain timestamps and user references for important operations.

The problem becomes more complex when institutions conduct frequent internal assessments. Repeated printing and checking reduces teaching time and increases administrative burden. Automation helps institutions conduct assessments more regularly.

Student Difficulties

Students may face uncertainty about exam schedules, result publication dates, and evaluation transparency. In traditional systems, students often receive only final marks without immediate feedback. If answer sheets are not available for review, students cannot easily understand where they made mistakes.

In distance learning or blended learning environments, physical attendance for every small assessment may be inconvenient. A digital platform provides more flexibility and improves access to academic evaluation.

Students may also face difficulty when results are delayed because they cannot plan improvement strategies in time. Immediate or faster result publication helps them understand performance before the next assessment.

In manual settings, students may not have access to a consolidated history of attempted tests. A student dashboard can maintain previous scores and help students track their own learning progress.

Teacher Difficulties

Teachers spend considerable time preparing question papers, checking objective answers, calculating marks, and entering results. Reusing previous questions is difficult when records are paper-based. Maintaining balanced question papers across topics and difficulty levels also becomes challenging.

Teachers also need performance data to identify weak areas among students. Manual systems provide limited analytics and make it difficult to compare results across tests.

Teachers often need to prepare multiple versions of question papers to prevent copying. This is difficult manually but can be simplified by randomization in a digital platform.

Teachers also need reliable attendance and attempt information. The online system can show which students attempted an exam, who missed it, and when each submission was made.

Administrative Problems

Administrators must coordinate users, courses, exam schedules, question papers, invigilation, and result records. Manual record keeping becomes complicated as the number of students and exams increases. Centralized monitoring is difficult without a digital dashboard.

The proposed system solves these problems by providing digital account control, examination scheduling, result storage, and report viewing from a unified platform.

Administrative staff must also handle corrections such as wrong roll numbers, missing answer sheets, absent entries, and result rechecking requests. Digital validation reduces these issues because required data is checked before submission.

Centralized administration provides a single source of truth for examination data. This avoids inconsistencies between teacher records, student records, and administrative registers.

V. OBJECTIVES OF THE PROPOSED SYSTEM

Student Management

The system manages student registration, login, profile details, exam eligibility, exam attempts, and result viewing. Student records are stored in the database and can be approved or managed by administrators.

Teacher Management

Teacher management includes teacher registration, approval, course assignment, question creation, exam preparation, and result review. The teacher dashboard provides academic control without exposing administrative settings.

Admin Control

The administrator controls users, courses, exams, approvals, and reports. Admin control ensures that only verified teachers and students participate in official examinations.

Online Exam Conduct

The system conducts exams through a browser-based interface. Students can view questions, select answers, monitor remaining time, and submit responses digitally.

Automatic Evaluation Automatic evaluation reduces manual checking for objective questions. Submitted answers are compared with correct answers, marks are calculated, and result records are created.

Result Generation

The result module generates scores, percentage, pass/fail status, and performance records. Results can be displayed to students and reviewed by teachers and administrators.

VI. SYSTEM METHODOLOGY

Frontend: HTML, CSS, Bootstrap, and JavaScript

The frontend layer provides the user interface through which students, teachers, and administrators interact with the system. HTML is used to structure pages such as login forms, dashboards, question screens, result pages, and reports. CSS is used for visual styling, spacing, typography, and layout consistency. Bootstrap provides responsive grid systems, buttons, forms, alerts, tables, navigation bars, and cards that improve usability across devices.

JavaScript is used for interactive behavior such as countdown timer display, form confirmation, answer selection behavior, validation assistance, and user feedback. The timer is particularly important because it informs students about remaining time and can trigger automatic submission in an enhanced implementation.

The frontend design should prioritize readability. Examination questions must be displayed with adequate spacing, clear option labels, and visible marks. The submit button should be clearly separated from ordinary navigation controls to avoid accidental submission.

Bootstrap helps create responsive dashboards with cards, tables, alerts, and forms. Admin, teacher, and student dashboards can share a common layout while displaying different menu options based on user role.

Backend: Python and Django Framework

The backend is implemented using Python and Django. Python provides readable syntax and strong support for web development. Django provides URL routing, views, templates, models, middleware, authentication, ORM, session handling, and form processing. These features reduce development time and improve reliability.

Django views process HTTP requests, validate user roles, communicate with models, and return rendered templates. The ORM maps Python classes to database tables, allowing developers to perform database operations without writing raw SQL for most functions.

Django's form handling can validate required fields, choice values, and numeric marks before saving data. This reduces invalid database records. Django messages can provide success or error feedback after form submission.

Middleware and decorators are useful for authentication and authorization. For example, a teacher-required decorator can check whether the logged-in user has teacher privileges before allowing access to question creation pages.

Database: SQLite/MySQL

SQLite can be used during development because it is lightweight and requires minimal configuration. MySQL can be used in production because it provides better concurrency, administration tools, and scalability. The database stores users, students, teachers, courses, exams, questions, submissions, and results.

SQLite is file-based and simple to configure, which makes it suitable for development, demonstrations, and small laboratory use. MySQL is server-based and better suited for multi-user production environments where concurrent access and backup management are important.

The database layer should enforce relationships using foreign keys. For example, a question should belong to an exam, and a result should belong to a student and an exam. These relationships protect data consistency.

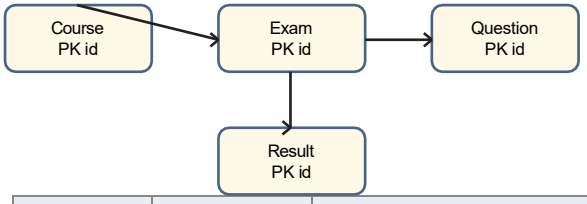
Architecture: MVT Architecture

Django follows the Model-View-Template architecture. The Model defines database structure and business entities. The View handles request processing and application logic. The Template controls presentation and renders HTML responses. This separation improves maintainability and allows developers to update one layer without heavily affecting others.

In the proposed architecture, the browser sends HTTP requests to Django URL patterns. The mapped view checks permissions, reads or writes model data, and returns a template response. The template generates HTML that is displayed in the user's browser.

The MVT pattern improves maintainability because database definitions, application logic, and page presentation are not mixed together. It also supports teamwork, where one developer may work on models while another works on templates

Technology Stack.



Layer	Technology	Purpose
Frontend	HTML, CSS, Bootstrap	Page structure, styling, responsive layout
Frontend Logic	JavaScript	Timer, confirmation, client-side interaction
Backend	Python, Django	Request handling, business logic, authentication
Database	SQLite / MySQL	Persistent storage for users, exams, questions, results
Architecture	MVT	Separation of model, view, and template responsibilities

Table I. Technology stack used in the proposed system.

Fig. 1. Proposed Django MVT-based architecture for the Online Examination System.

VII. SYSTEM DESIGN

Admin Module

The admin module provides centralized control over the application. The administrator can approve teachers, approve students, create and manage courses, monitor examinations, view reports, and start or stop exams according to institutional requirements. The admin module is also responsible for maintaining system discipline and verifying registered users.

Admin control prevents unauthorized users from joining official examinations. The administrator can remove inactive accounts, correct user data, and monitor result records. In a production system, the admin dashboard can also include activity logs and exportable reports.

Teacher Module

The teacher module enables faculty members to create questions, create question papers, schedule examinations, and view results. Teachers can add multiple-choice questions with options, correct answers, marks, and course mapping. They can analyze student performance and identify topics that require revision.

The teacher module should restrict each teacher to authorized courses or exams. This maintains academic accountability and prevents accidental modification of another teacher's examination data.

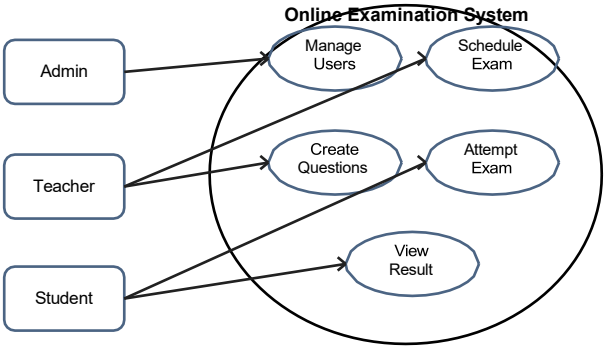
Student Module

The student module allows students to register, log in, attend exams, submit answers, and view results. Students can see available examinations assigned to their course and can attempt only active exams. The interface should be simple and distraction-free so that students can focus on answering questions.

After submission, students can view marks based on institutional policy. Immediate results may be shown for objective exams, while delayed results may be used when manual review is required.

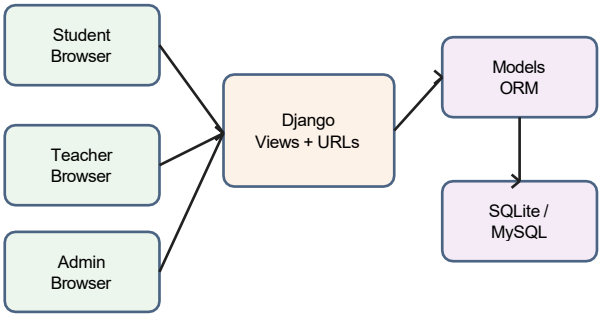
Table	Important Fields	Primary Key	Foreign Keys
User	id, username, email, password, role, is_active	id	-
Student	id, user_id, roll_no, course_id, phone, status	id	user_id, course_id
Teacher	id, user_id, department, phone, approval_status	id	user_id
Course	id, course_name, course_code, semester	id	-
Exam	id, title, course_id, teacher_id, duration, start_time, end_time, status	id	course_id, teacher_id
Question	id, exam_id, question_text, option1, option2, option3, option4, answer, marks	id	exam_id
Result	id, student_id, exam_id, score, percentage, grade, submitted_at	id	student_id, exam_id

Fig. 2. Use case diagram showing admin, teacher, and student interactions

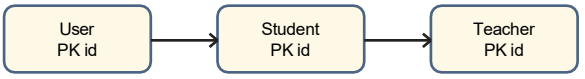


VIII. DATABASE DESIGN

The database design follows relational principles. Each major entity is represented as a table with primary keys and foreign keys.



Relationships maintain consistency among users, students, teachers, courses, questions, exams, and results. Django models define these tables and the ORM manages database operations. The schema can be deployed on SQLite during development or MySQL in production.



IX. IMPLEMENTATION

Folder Structure

```
onlineexam/
|
+-- exam/
|       +-- models.py
|       +-- views.py
|       +-- urls.py
|       +-- forms.py
+-- teacher/
|       +-- views.py
|       +-- urls.py
+-- student/
|       +-- views.py
|       +-- urls.py
+-- templates/
|       +-- admin/
|       +-- teacher/
|       +-- student/
+-- static/
|       +-- css/
|       +-- js/
|       +-- images/
+-- onlineexam/
|       +-- settings.py
|       +-- urls.py
+-- manage.py
```

The project is divided into reusable Django applications. The exam app stores shared models and common examination logic. The teacher app handles teacher-specific dashboards and question creation. The student app handles student registration, exam attendance, and result display. Templates are separated by role, and static files store CSS, JavaScript, images, and Bootstrap assets.

Models, Views, URLs, Templates, and Authentication

Models define database entities such as Course, Exam, Question, and Result. Views process incoming requests and apply business logic. URLs map browser routes to view functions. Templates render HTML pages using data passed by views. Authentication is implemented using Django's built-in user model and login decorators. Role checks are applied to ensure that admin, teacher, and student users access only permitted pages.

Input	Validation Rule	Reason
Email	Must be unique and properly formatted	Prevents duplicate accounts
Marks	Must be positive numeric value	Avoids invalid score calculation
Exam Duration	Must be greater than zero	Prevents impossible exams
Correct Answer	Must match one option	Ensures automatic evaluation works
Exam Submission	Allowed only once per student per exam	Prevents duplicate attempts

X. CONCLUSION

The Online Examination System Using Django Framework provides a secure, efficient, and scalable solution for digital assessment in educational institutions. It automates major examination activities such as user registration, teacher approval, student approval, question creation, exam scheduling, online test conduct, answer submission, automatic evaluation, result generation, and reporting.

The system uses Python and Django for backend development, HTML, CSS, Bootstrap, and JavaScript for frontend design, and SQLite or MySQL for database storage. Django's MVT architecture improves separation of concerns and maintainability. Its authentication, ORM, session, and CSRF features provide a strong base for secure web application development.

The proposed system reduces manual workload, improves result accuracy, enhances transparency, and supports better academic record management. It is suitable for MCA, B.Tech, college internal assessment, training institute evaluation, and online certification scenarios. With future enhancements such as AI proctoring, face recognition, mobile application support, cloud deployment, and analytics dashboards, the system can become a comprehensive digital examination platform.

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