EXAMGENIX – an AI-powered web-based smart online exams conducting platform

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Abstract: Recently, when the whole world is running online be it any of the case among jobs, education, businesses etc, we understood the need of internet, software and other hardware/software tools to manage and automate our tasks in day to day lives. Focusing on the field of e-Education, we are targeting issues faced in one of the major process involved in it that is online evaluation of exams and assignments. Both the examiners and the students face issues while giving online tests (especially the subjective ones). Students may face problem in uploading answer sheets in case of subjective exams and, in fill in the blanks based online assessments conducted on Google forms, students may face the issues of case sensitivity and also there is a fair possibility that there would be swapping of the pages while scanning and uploading answer sheets which would disturb the sequence and hence making it difficult for the teachers in maintaining the order of those pages. So, we, based on our observations, conclude that, in manual checking, both time and resources are wasted thereby lacking productivity in case of both the examiners as well as the students. And also, there is a higher scope of students in practicing unfair means in higher frequency during online exams. So, in order to avoid this, a smart platform to automatically conduct exams and automate the evaluations to maintain the discipline of honesty, time, resources and accuracy is the need. Our project "Examgenix" is an approach to the addressed problems. Examgenix is a web-based platform which is developed by integrating AI and other smart technologies to help Educational Bodies to conduct and evaluate both the subjective as well as the objective type of exams ensuring automated strictness to avoid false practices such as cheating and plagiarism etc. Some of the major features addressed by us in order to target the mentioned issues faced regularly by teachers and students in online examinations include Automated Evaluation of subjective, MCQ and match the following based questions, Plagiarism Detection and Alert and Remote Proctoring.

IndexTerms – **online examination, online exam portal, automated evaluation, remote proctoring, plagiarism detection, database.**

I. INTRODUCTION

In online semesters and courses, it is very difficult and exhaustive for examiners to check so many answer sheets and also it is a human tendency to commit mistakes. In manual checking, both time and resources are wasted to a greater extent. So, in order to avoid such issues, an automated evaluator is the need. The main and emerging problem with existing online test-conducting softwares are that there is a greater scope of practicing unfair means for the student while giving the tests. Also, the other prominent problem is manual checking, which not only wastes time and resources but also increases the probability of mistakes. So, human error is another problem which is meant to be solved.

Our project "Examgenix" is an alternative to the addressed problems. It has the ability to automatically evaluate both the subjective answers as well as the objective answers and allocate marks to the user after verifying the answers bypassing all our algorithmic checks.

Paper setters or teachers are required to store expected answers along with expected keywords required in the attempted answer corresponding to each question set by them for automated evaluation of subjective questions using machine learning and natural language processing. When a student (user) takes the test, he/she is provided with an area to type his/her answers in case of subjective questions or radio buttons to mark their answers in case of MCQs and match the following based questions. Once the users enter their answers, the system then compares these answers to the original answers stored in the database and allocates the marks accordingly.

Hence, the web application reduces the workload by automating the manual checking process accurately followed by remote proctoring and gives unbiased and sure results.

Another emerging issue on existing test-taking portals is Plagiarism. Plagiarism is an act of stealing someone's work such as, copying words from a book or some website, also stealing the ideas, images, videos and music and using them without permission and providing a proper citation. PLAGIARISM has become a serious concern nowadays due to the availability of vast resources such as previous year papers, brief content available on Quora, Wikipedia and Google, all of them are easily available on the web, which makes developing plagiarism detection feature a useful and challenging task due to the scalability issues. Our project is implementing a plagiarism detection feature to test the answers entered by the students(user) and emphasize the parts of the answers that are plagiarized hereby, preventing the student from cheating i.e., copying and pasting the answers from the web.

Another main feature of the project is remote proctoring which targets the following factors:

- Face Detection: Throughout the test, the face of the student(user) will be detected, recognized and verified.
- Screen and keyboard Lock: Once the student(user) start the test, automatically a screen lock will be applied, which will disallow the student from switching the windows and exiting the full screen while taking the test. And also the mouse gestures and keyboard shortcuts correspond to the cut, copy and paste features will be disabled throughout the test.

II. TECHNOLOGIES USED

- Frontend Development -: HTML, CSS, Bootstrap, Javascript, JQuery, AJAX.
- Backend Development -: Django, Python, Natural Language Processing, Machine Learning

III. MODULES AND METHODS

1. Login/Signup-: New users(either teachers or students) can signup with their valuable details including the official email id provided by their respective organisation and in case of registered users, they can simply log in to the portal with the username and password allotted to them. As soon as a new user signs up, he/she is signed up as a student user with limited rights by default. Then they are allotted faculty rights or other special rights as a student by the organizational admin by changing the user type.

2. Dashboard-: This project includes 2 different dashboards for teachers and students.

2.1 <u>Student Dashboard</u>: The student dashboard consists of following functionalities as mentioned below-:

- Examinations-: Here, the students can view all the upcoming exams made available to them by their respective teachers. And, from the list of upcoming exams, the students can register for any of the exams and wait for their respective approval from the teacher without which, they cannot attempt the exam. After the approval from teachers, students can attempt that particular exam.
- Progress-: Here, the students can check their performances in all their previously attempted exams evaluated that are verified by the faculty members along with their corresponding answer keys.
- Visualizations-: This section consists of certain visualizations projecting the students' progress in previously attempted exams and their respective monthly attempts.
- User Profile-: Here, the students can verify or update their respective profile details.

2.2 <u>Faculty Dashboard</u>: The student dashboard consists of following functionalities as mentioned below-:

- Courses-: In this section, the teachers can create or add new courses/Subjects, view existing courses/subjects and even modify or edit existing courses/subjects.
- Topics-: In this section, the teachers can create or add new units/topics corresponding to a particular course, view existing units/topics and even modify or edit existing units/topics.
- Subtopics-: In this section, the teachers can create or add new subtopics corresponding to a particular topic, view existing subtopics and even modify or edit existing subtopics.
- Examinations-: Here, the faculty members can create new exams based on courses, topics and subtopics, view previously conducted or created examinations, or modify the details of already created examinations.
- Questions-: In this section, the faculty members can create or add new questions in a particular examination, view existing questions and even modify or update existing questions.
- Management-: This section consists of 3 processes which are meant to be managed by the teachers. These processes are user registrations, examination approvals and exam evaluations.
  - User Registrations-: In this section, the teachers can modify the details and permissions of already registered students.
  - Examination Approvals-: In this section, all the examination registration requests made by the users are available. And, the teachers can approve the suitable requests thereby giving them the permissions to attempt the respective exams.
  - Exam Evaluations-: Here, the teachers can view the results of all the students in a particular test, and also in case of any doubts in the automated evaluation of any particular test, they can manually evaluate those answers and give marks accordingly. And on verifying the results, those results are made available to the respective students on their dashboards.
- Visualizations-: In this section, certain visualizations projecting the students registered per exam and users registered per month.
- User Profile-: Here, the faculty members can verify or update their respective profile details.

3. Remote Proctoring-: As the student start an exam, their respective webcam will be activated and student's face will be detected and recognized using image processing and deep learning continuously and in case of any anomalies, they will be given an alert along with an increment in their respective cheat count in the database. As soon as someone's cheat count is updated to 5, their tests will be cancelled. And also, cut, copy, paste, switching of tabs and cancellation of full-screen mode based gestures will be blocked while attempting the exam.

4. Plagiarism Detection-: As soon as the student submits the test, their subjective answers will be checked for being plagiarized or not using web scraping and cosine text similarity.

5. Automatic Evaluation-: All the answers will be automatically evaluated as soon as the students submit their ongoing test. This evaluation is based on the answers already stored in the database by directly matching them with students' respective submissions in the case of MCQ and match the following based questions. And in case of subjective answers, the evaluation will be the average of text similarity score between the students' submission and the teachers' expected answer stored in the database and the inclusion of expected keywords stored in the database in the students' submissions.

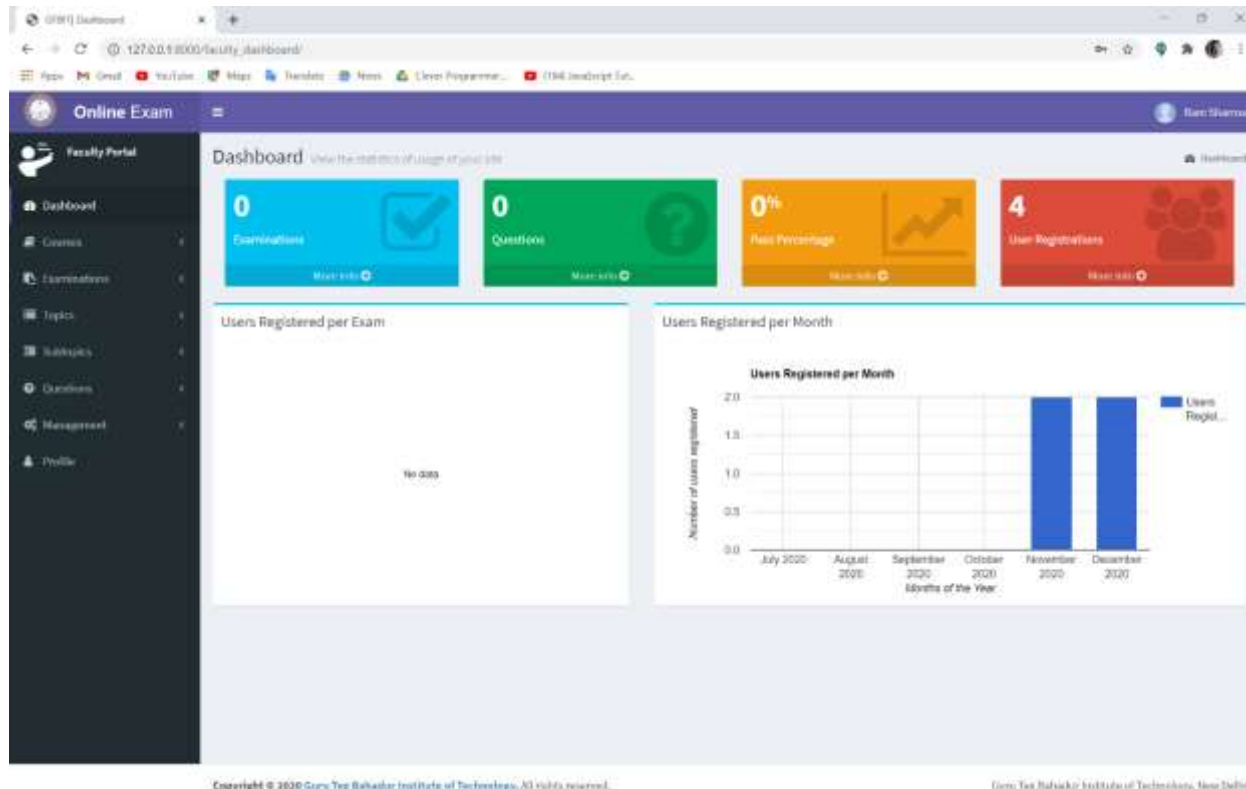## IV. EXPERIMENTAL RESULTS

Teacher's Dashboard

Figure 1

The procedure of creating an exam by teacher:
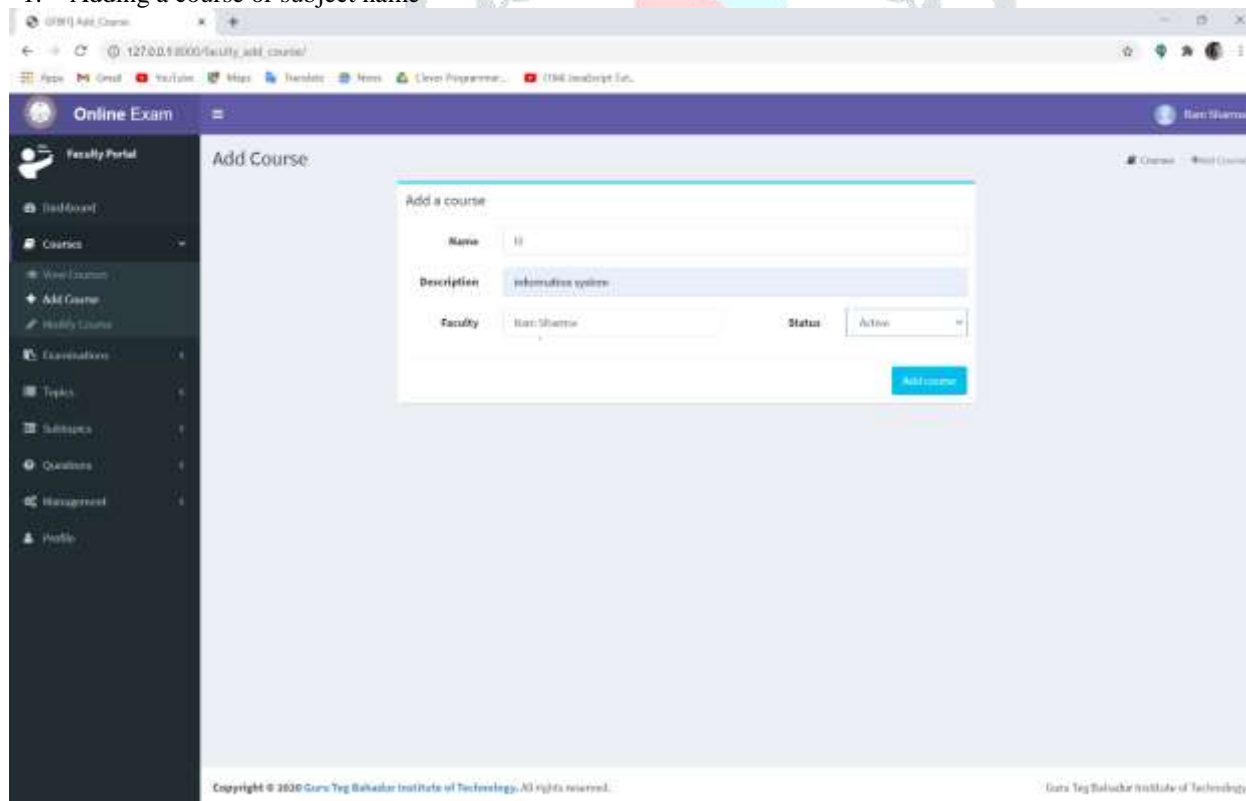
1. Adding a course or subject name

Figure 2

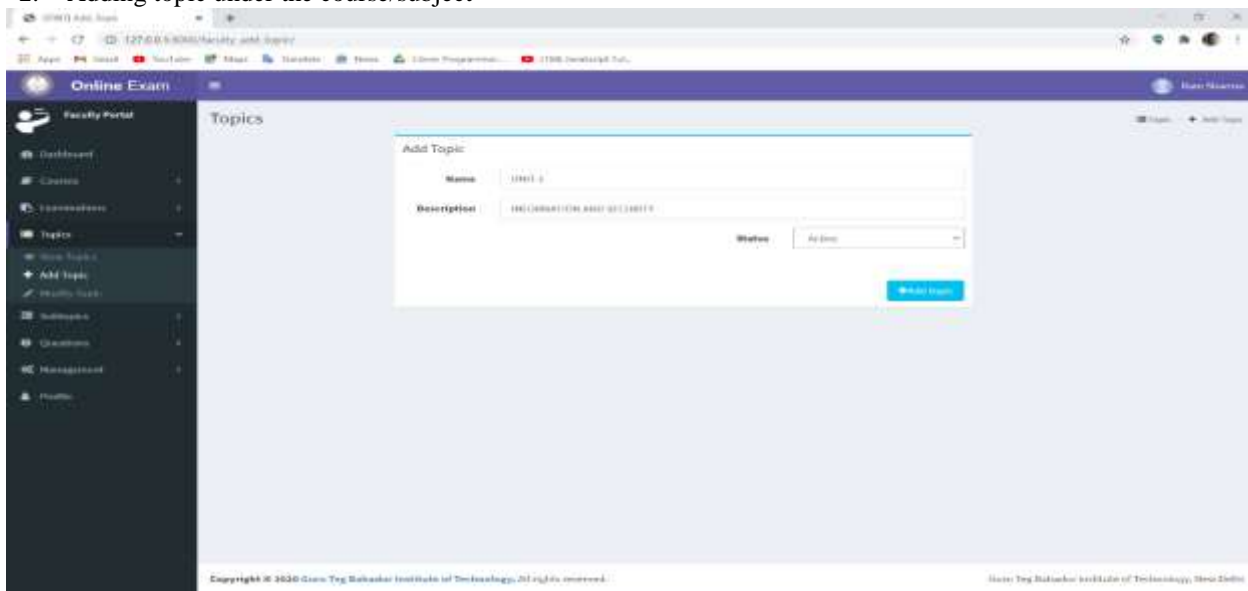2. Adding topic under the course/subject

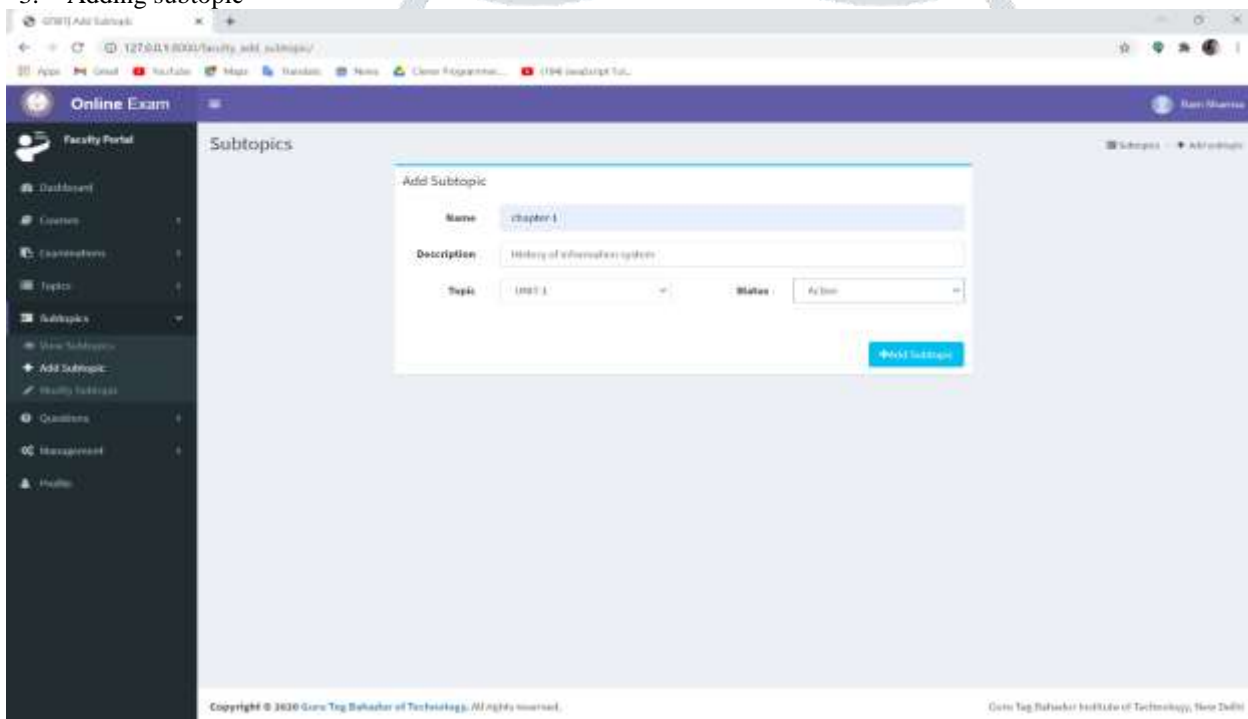**Figure 3**

3. Adding subtopic

Figure 4

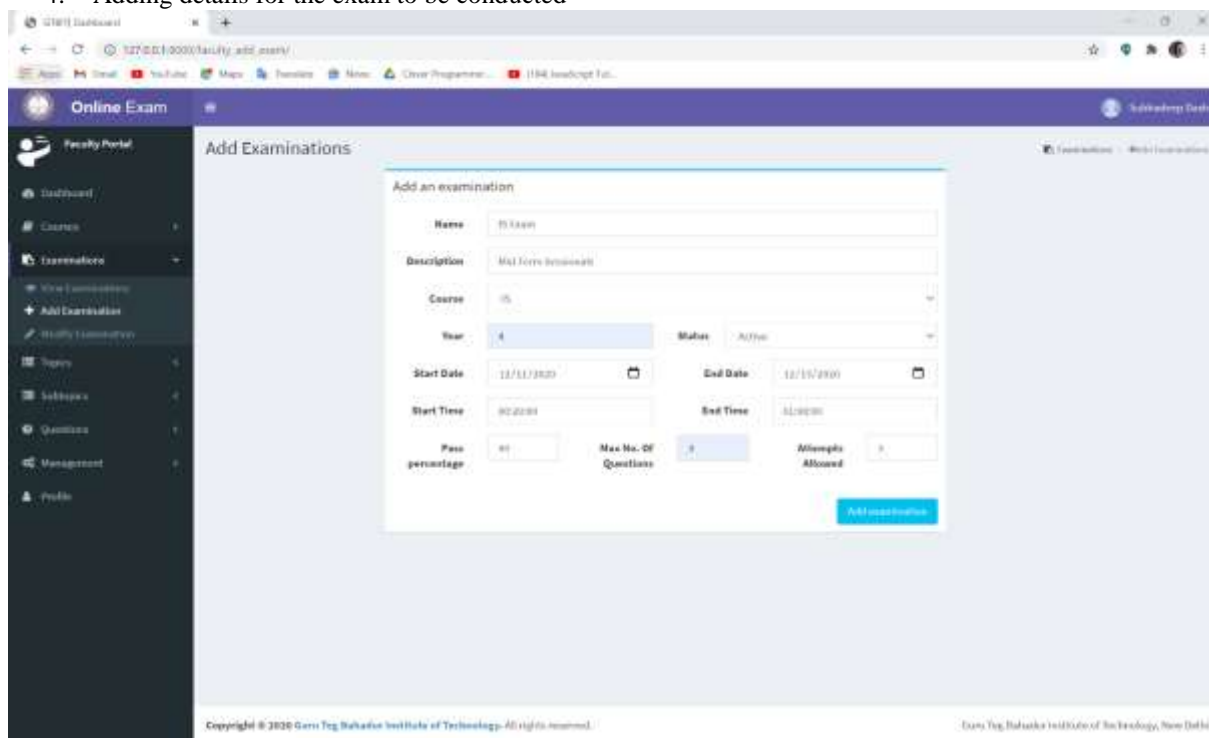4. Adding details for the exam to be conducted

Figure 5

5. Adding questions
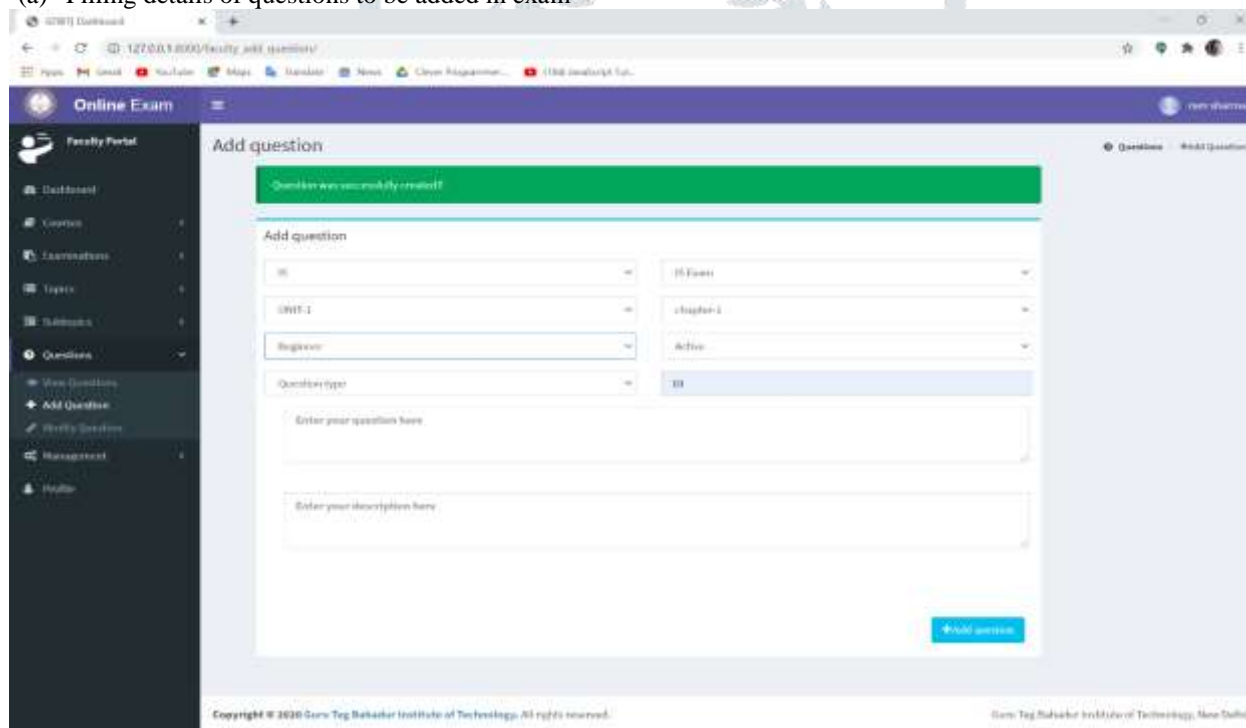
    (a) Filling details of questions to be added in exam
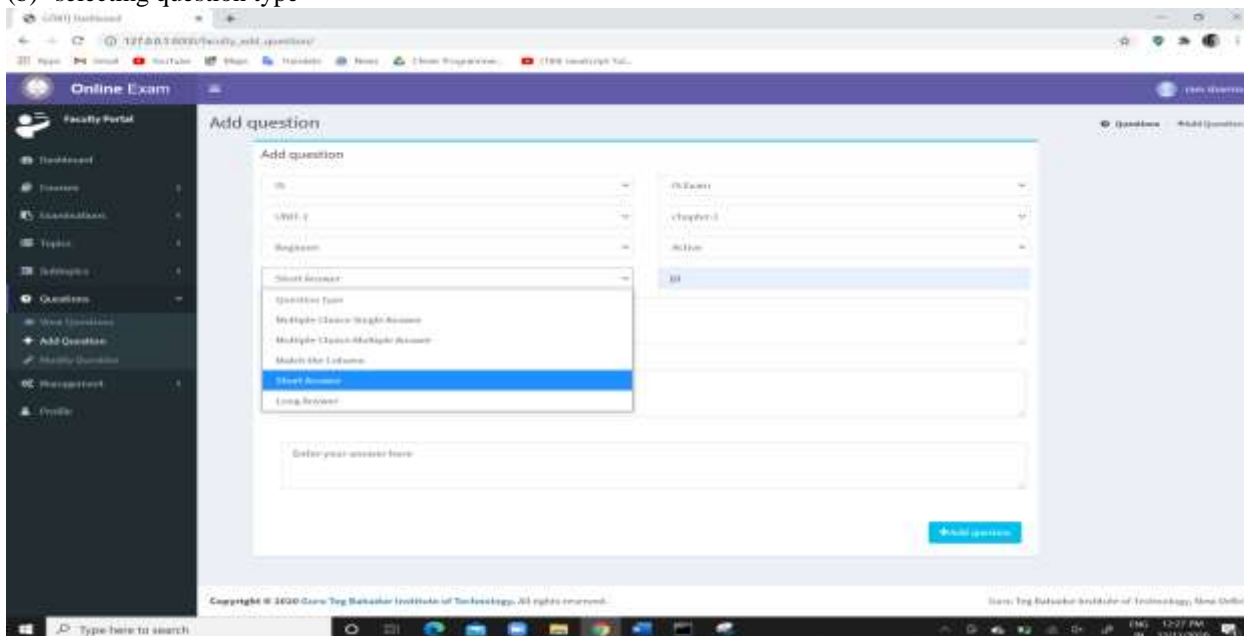

Figure 6

(b) selecting question type

Figure 7

Student's Dashboard showing one examination previously added by the teacher
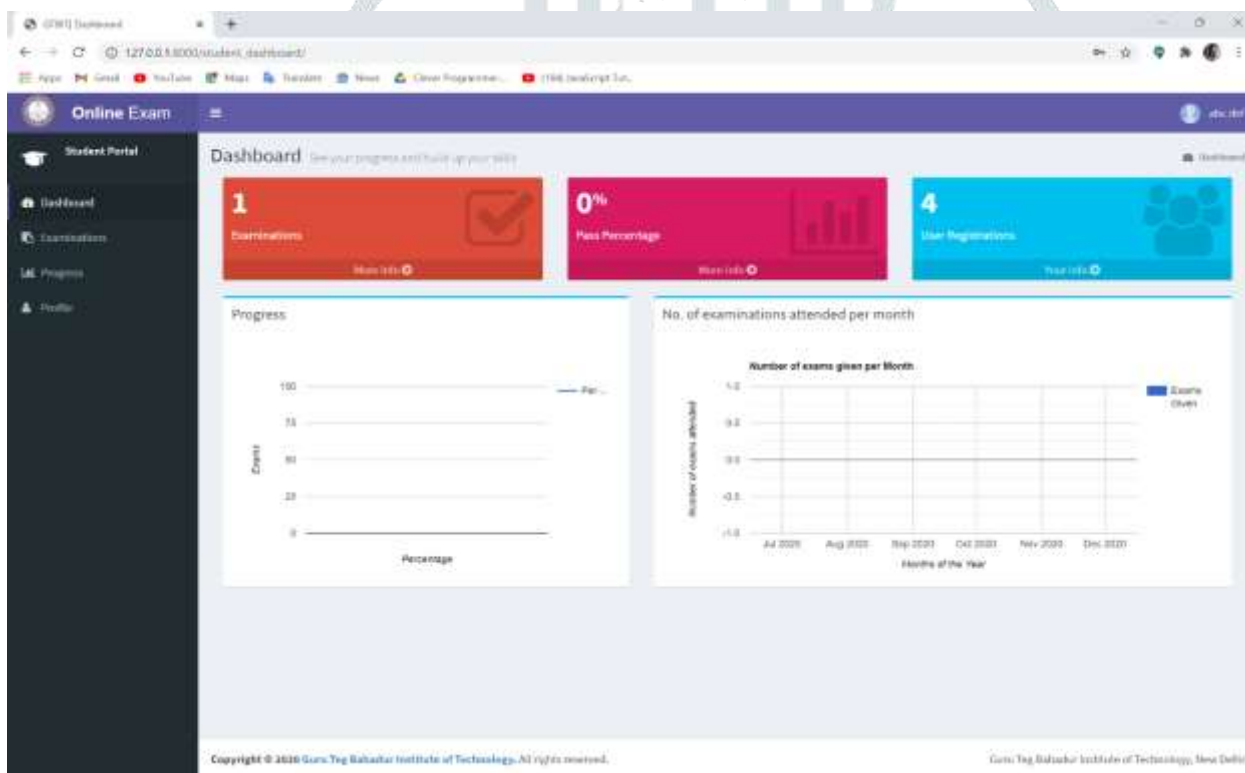
Figure 8

(to give the exam, the student has to firstly login and then register for the exam to get permission from the teacher)
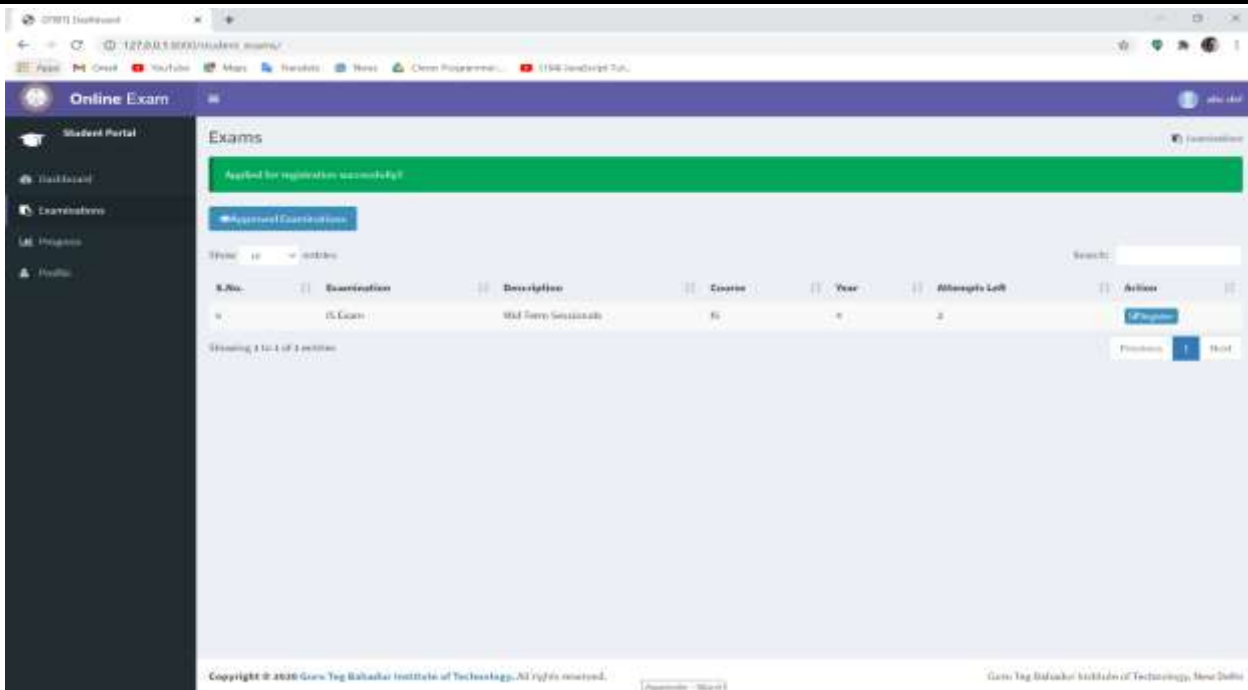
Figure 9

(now the teacher has to give permission from his/her end to allow the student to give exam)
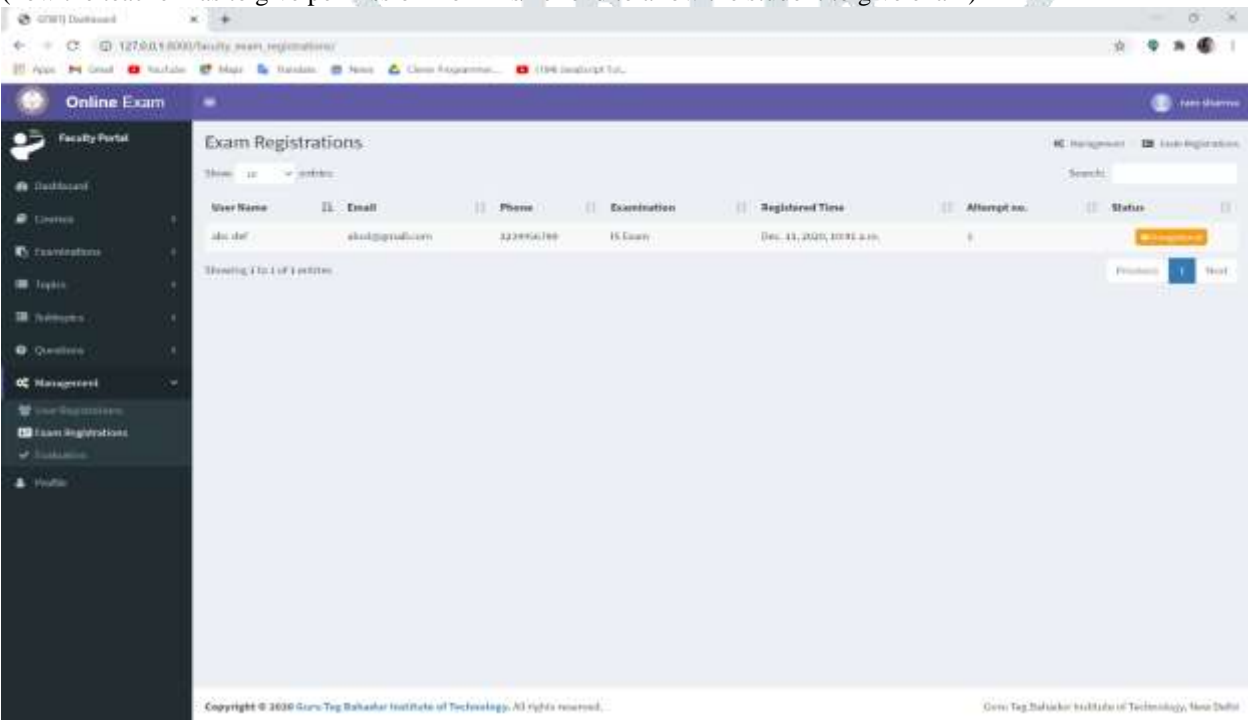
Figure 10

(teacher has given permission)
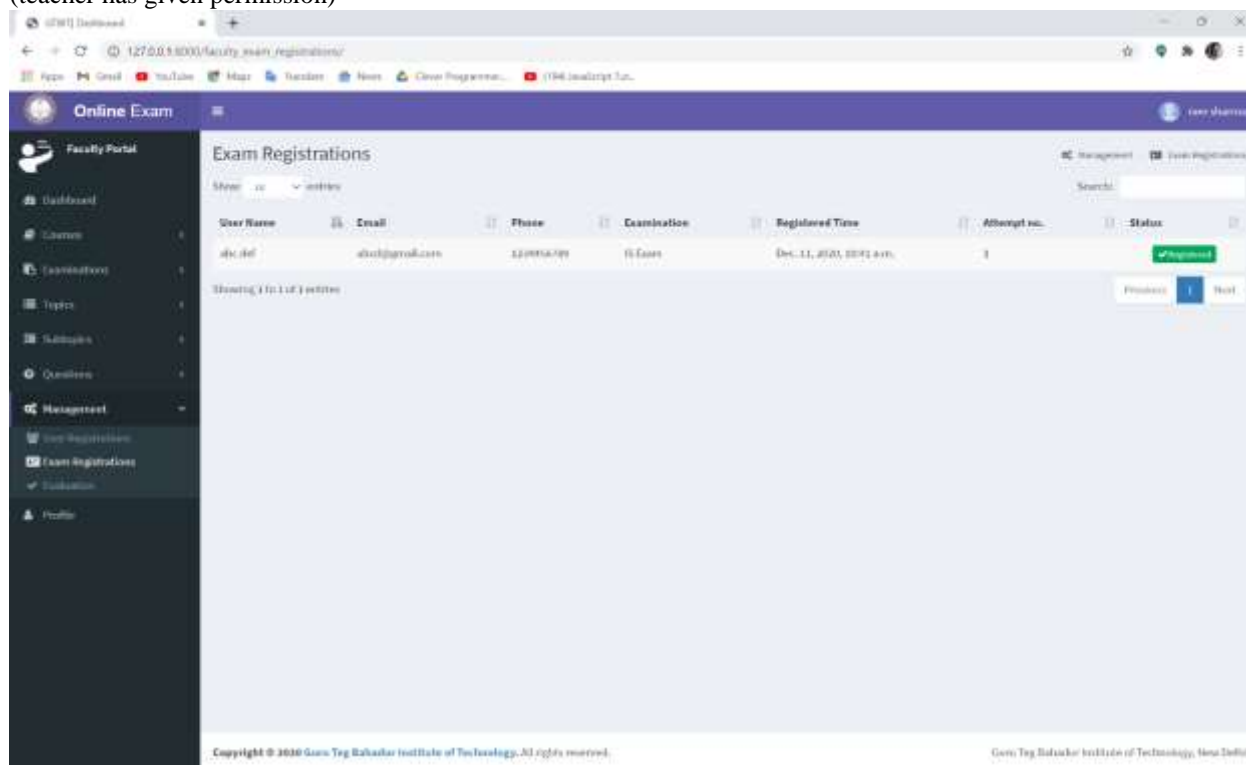
Figure 11

(now student have to go in approved examinations to give the exam)
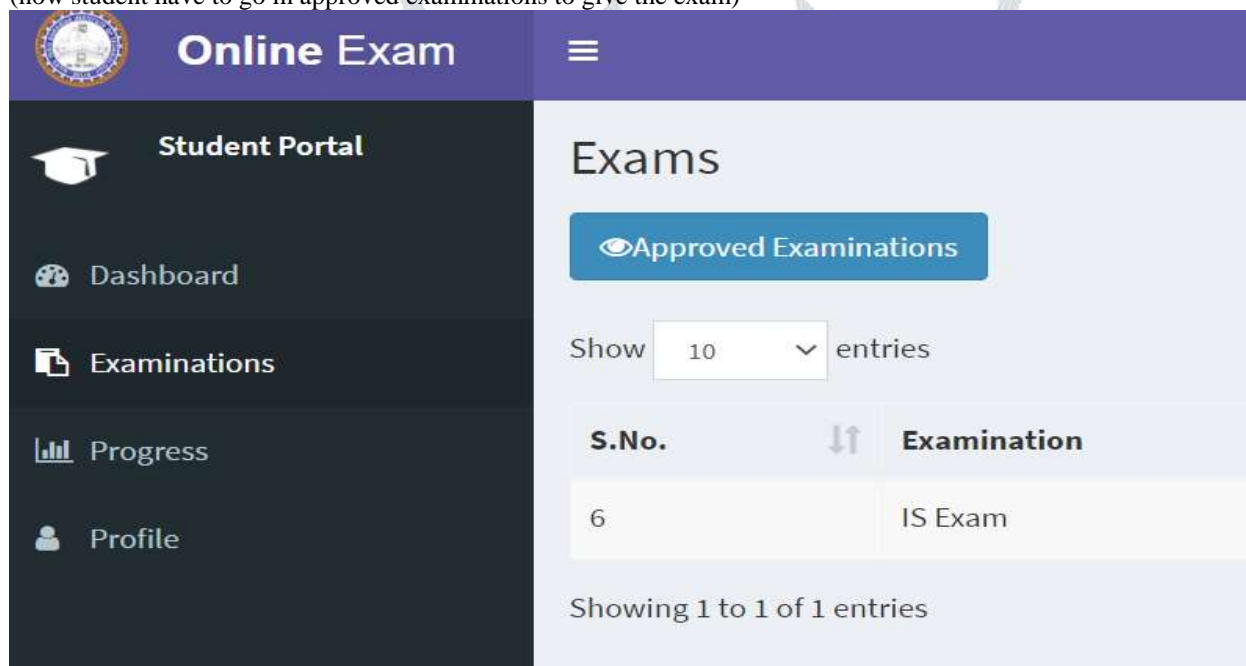
Figure 12

(student now can give the exam)
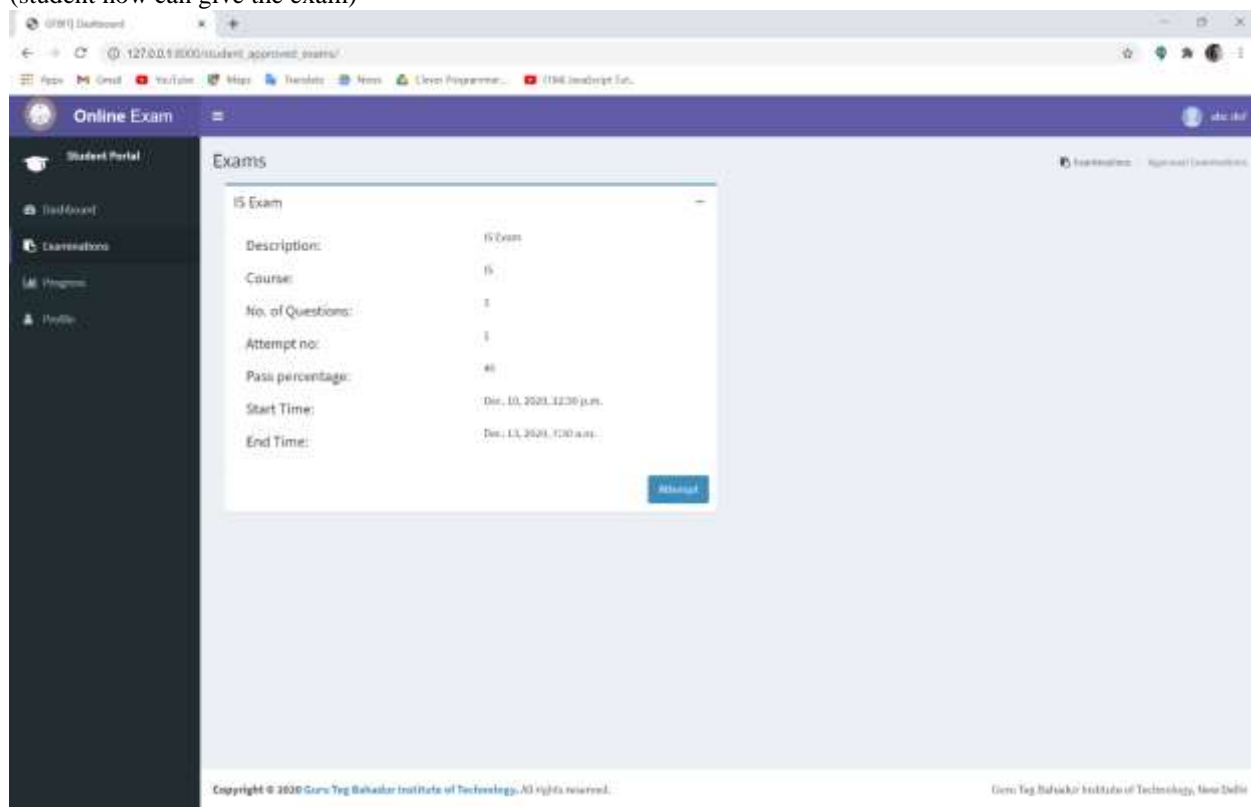
Figure 13
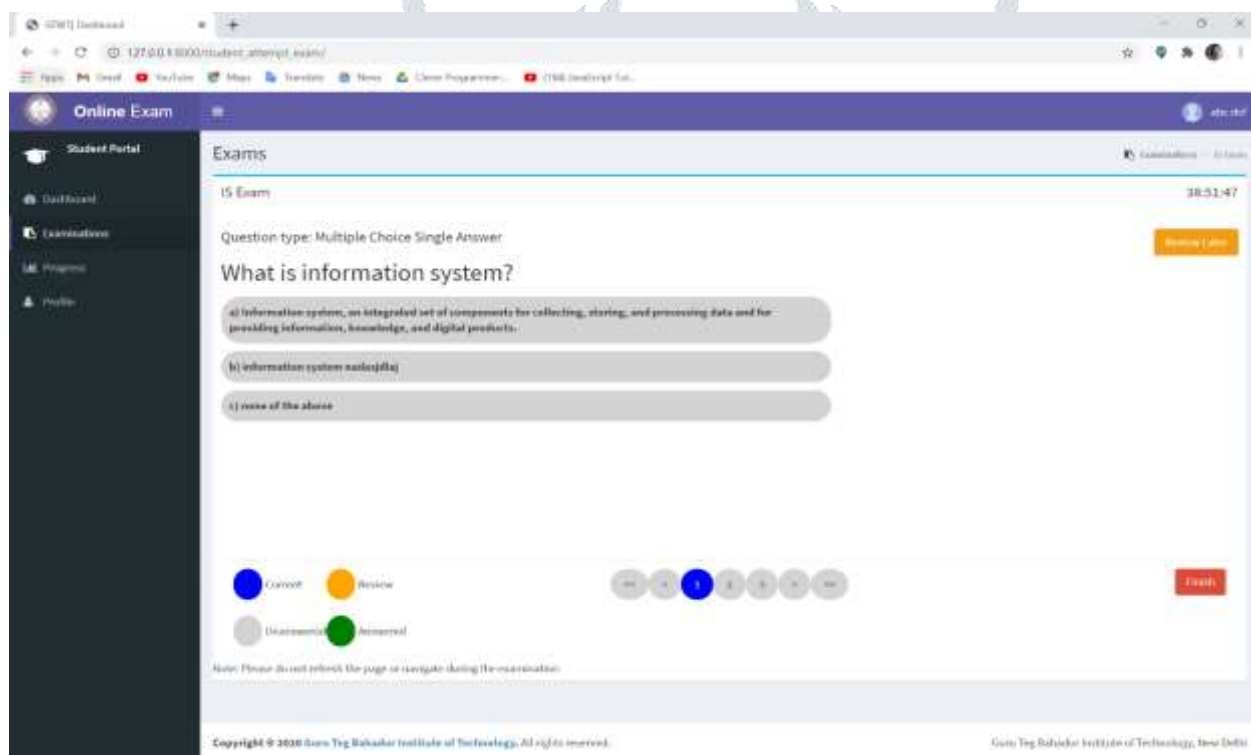
Figure 14

The teacher can now evaluate the exam given by the student

Figure 15
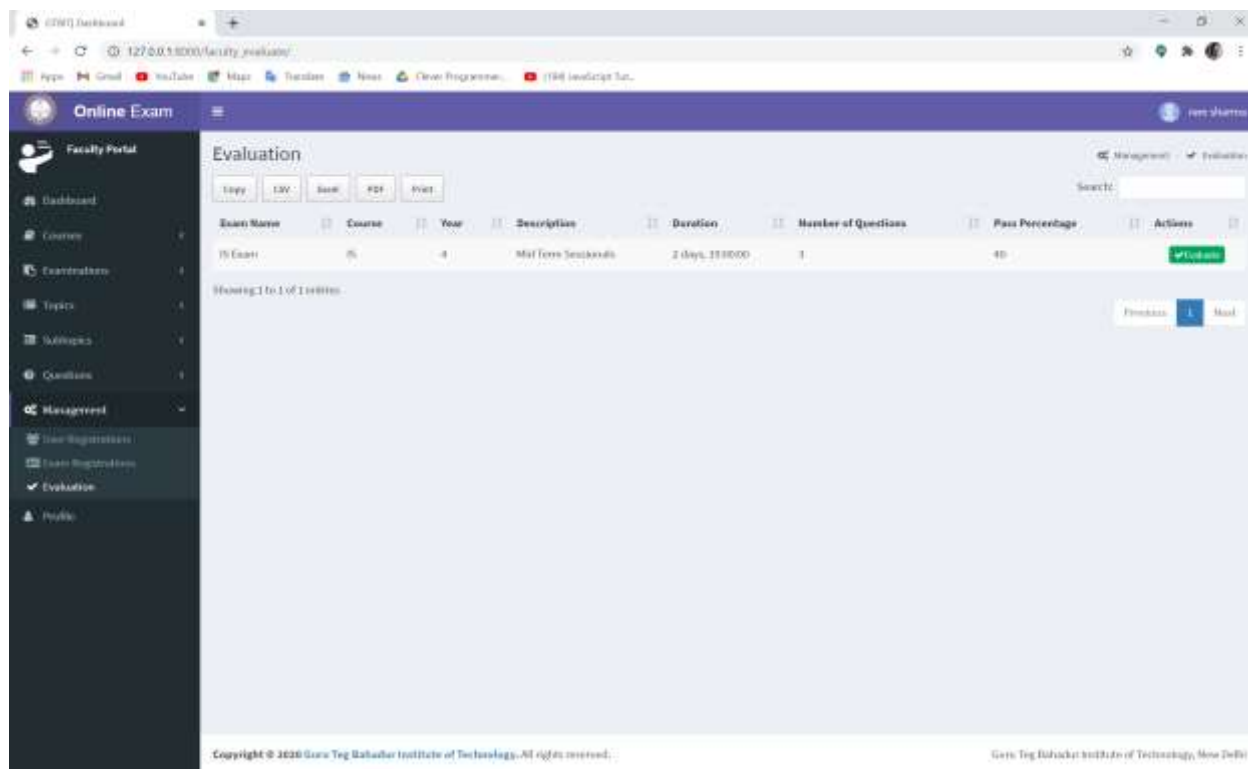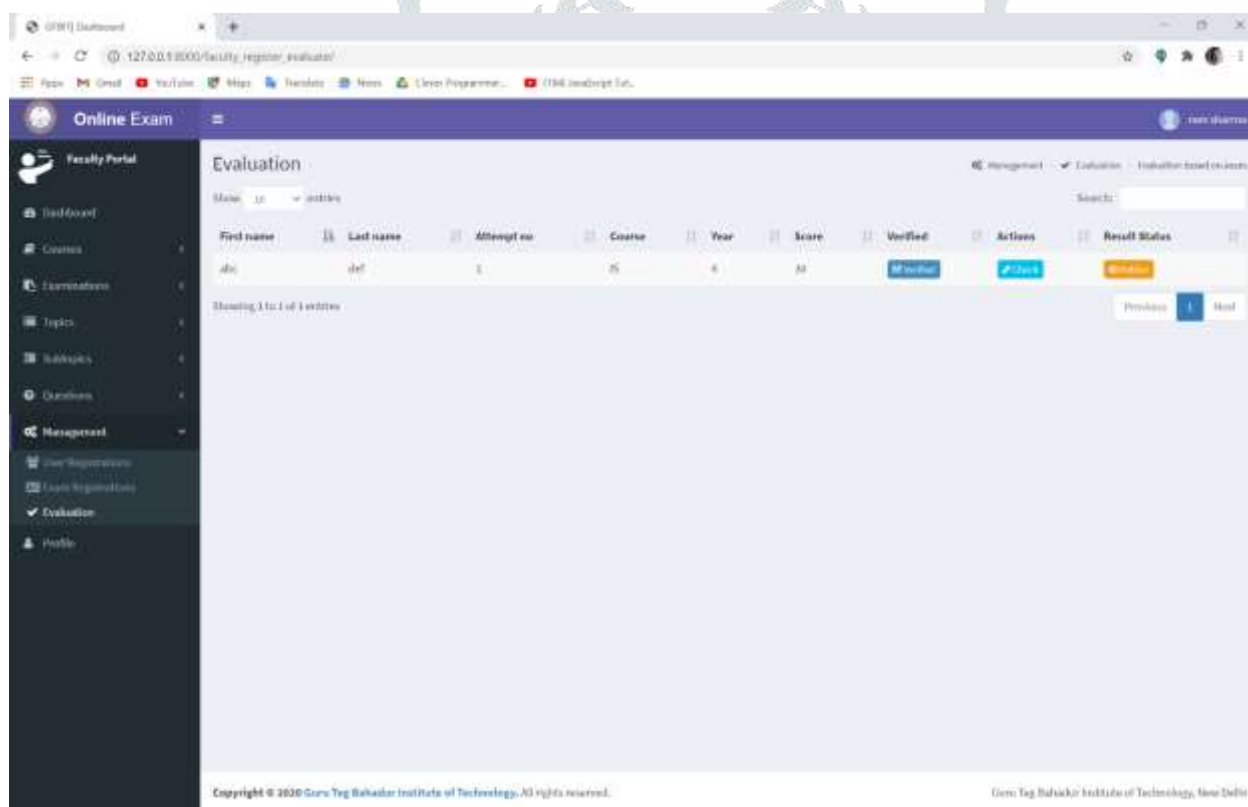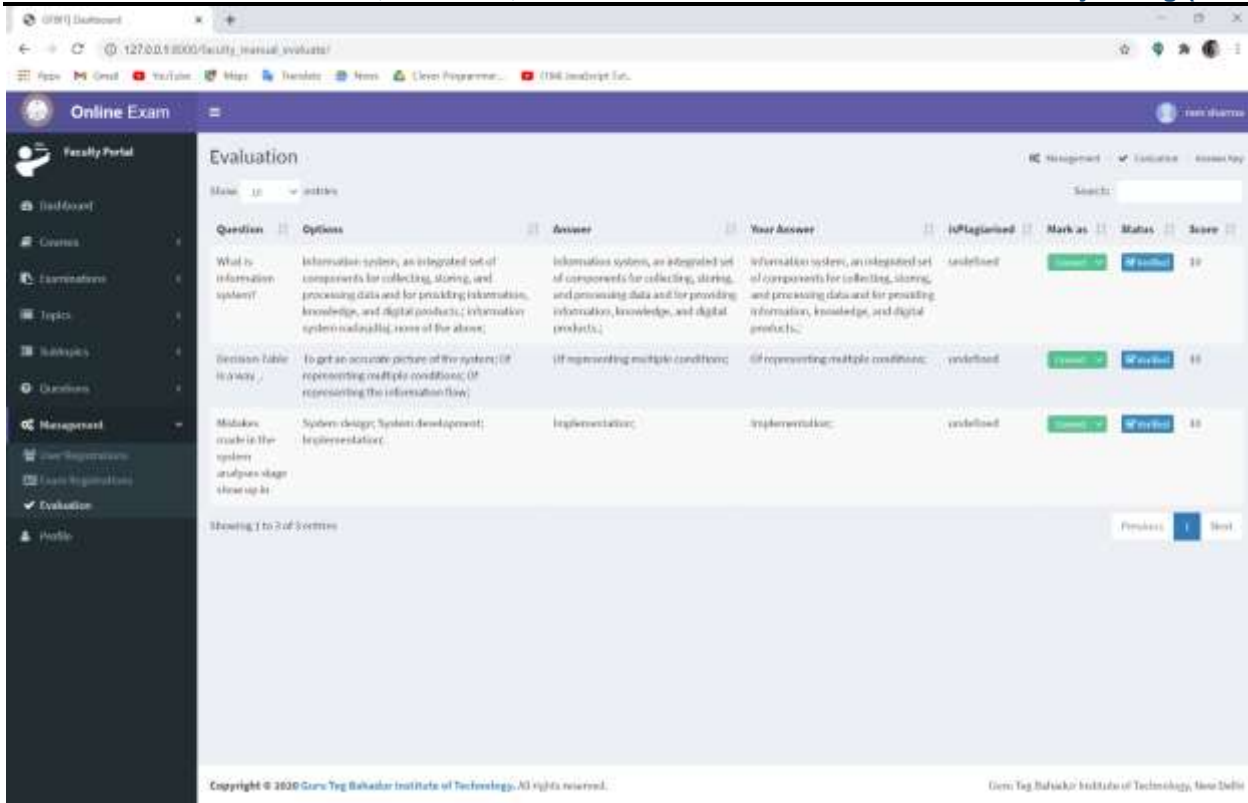

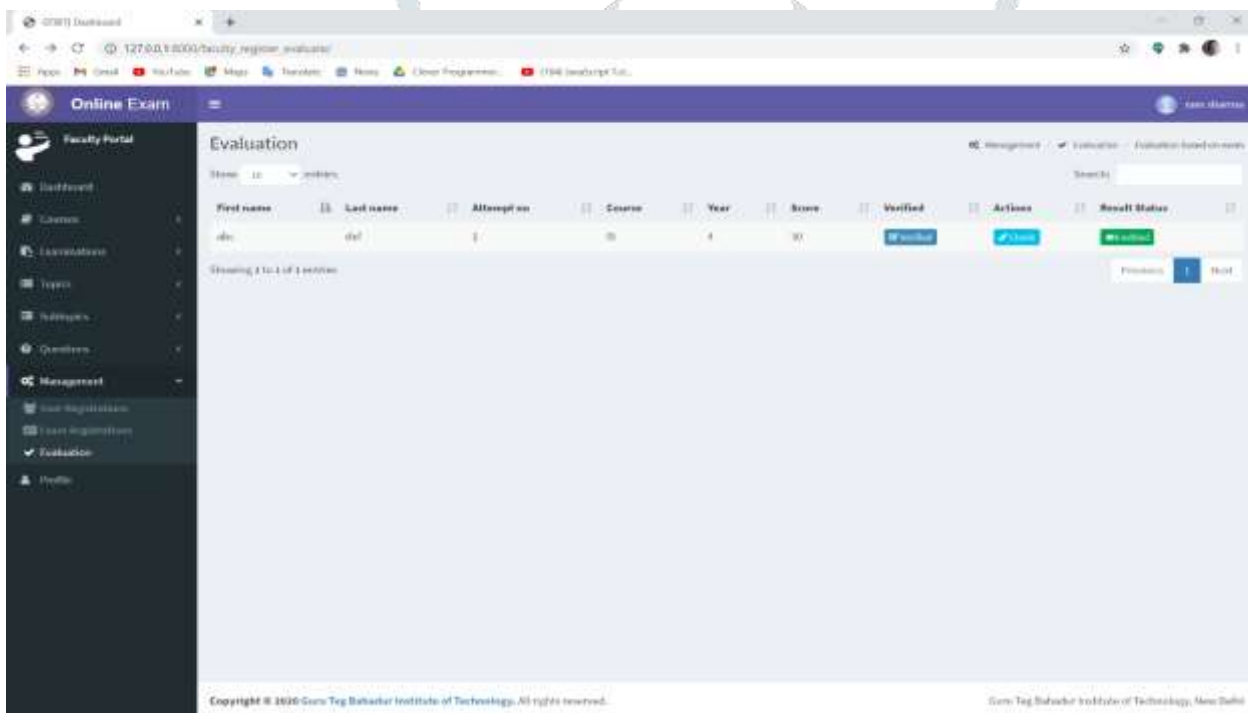**Figure 16**

Figure 17

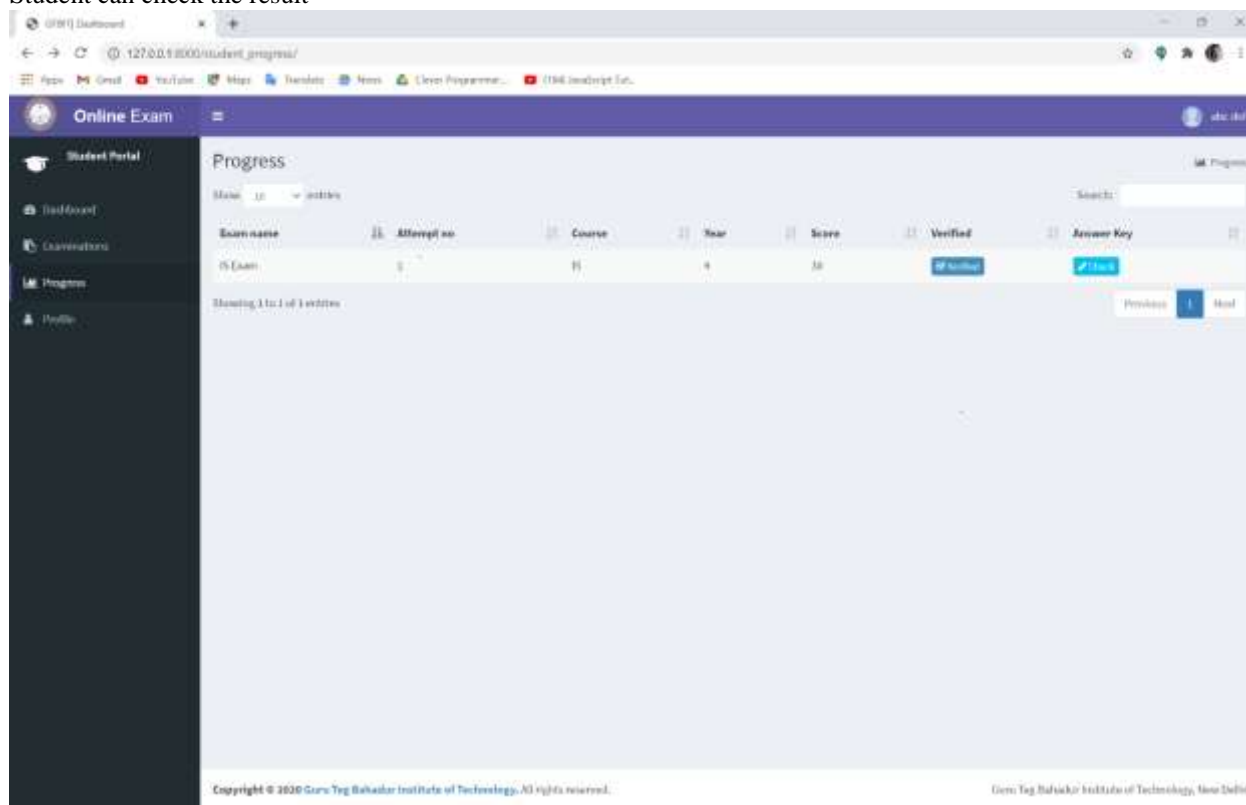**Figure 18**

Student can check the result

Figure 19

Student and respective teacher, both are informed in case of cancellation of a particular student's examination due to unfair attempts even after 5 warnings.
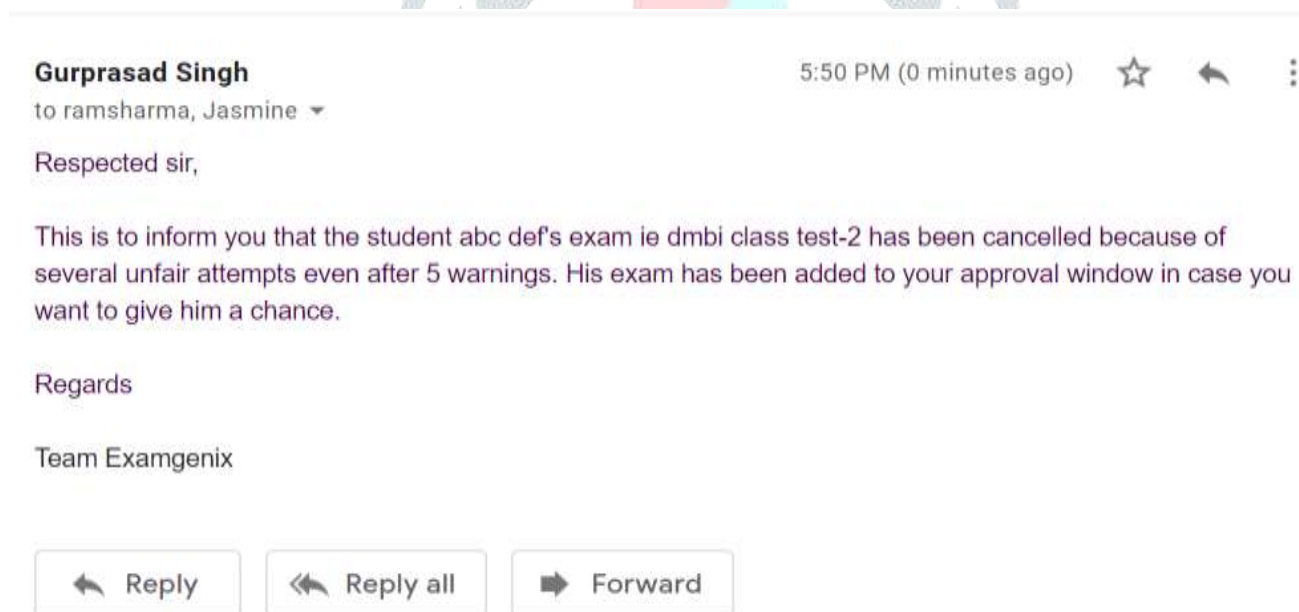

Figure 20

V. CONCLUSION

This AI-powered web application provides the access to all of its users to conduct online examinations worldwide. The proposed Examgenix can be easily adopted by universities and institutions in order to make the exam more secure and more flexible. It is scalable enough that more than 500 students can give an exam at a time. It is divided into 3 main subsystems namely student, teacher and administrator. Thus, the proposed system is flexible and easily integrable for further development and maintenance because each subsystem is designed efficient enough that they can be handled separately without influence on any other system.

VI. REFERENCES

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