



Online Examination Using Blockchain

Anjana M S

MES20MCA-2009

Product owner : Nowshad C V



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Online Examination Using Blockchain

- ❖ We are living in the era where office work is becoming work from home and examinations are becoming online examinations. In online examinations there is a lot of chance of impersonation. This paper proposes a method to overcome the downside of online examinations which is impersonation.
- ❖ This approach aims in increasing the credibility of online exams and eliminate the need for an examiner so that the exams can be taken from any convenient location. In recent days, the candidate appearing for an online examination is authenticated by carrying out manual verification of the candidate's credentials by the examiner. Conducting an automated face authentication at the beginning of the examination will check the identity of the user.
- ❖ For this type of authentication, we use facial recognition system which uses the OpenCv with HOG.
- ❖ Also propose an anti-forgery mechanism to cut the counterfeiting of certificates. Blockchain provides greater security, improved traceability, better security, and encrypted data features. By using blockchain, a forged or duplicated certificate can be detected.

METHODOLOGY

MODULES

➤ ADMIN

- ❖ Login
- ❖ Add and Manage Course
- ❖ Add and Manage Staff
- ❖ Add and Manage Subject
- ❖ Subject Allocation
- ❖ View Students
- ❖ Add and Manage Timetable

➤ STAFF

- ❖ Login
- ❖ Add and Manage Students
- ❖ Upload videos
- ❖ Upload Study Materials
- ❖ Manage Exam
- ❖ View Question Paper
- ❖ Chat
- ❖ View Attendance
- ❖ View Timetable
- ❖ View Allocated Subjects
- ❖ View Answer
- ❖ View Students Performance

➤ STUDENT

- ❖ Login
- ❖ View Subjects
- ❖ View Videos
- ❖ View Timetable
- ❖ View Study Materials
- ❖ Face verification and Attend Exam
- ❖ View Result and E-certificate
- ❖ Chat
- ❖ Online Exam Monitoring

Functional Modules

The project is been executed to accomplish the results by three modules namely:

- ❖ Face authentication
- ❖ Online examination portal
- ❖ Certificate generation, and Certificate verification
- ❖ Student performance Analysis

1. Face Authentication

The system first requires registration of the candidate before the examination. On the beginning of the examination, the system takes candidate's face and validates it and on verification, the candidate will be taken to the examination portal. Dlib and openCV packages is used for the face recognition algorithm and for image processing. After identifying the face next step is feature extraction. HOG features are extracted from the image and then start comparing with the image in the database to identify whether he/she is a valid user or not. If it matches up to 60% to 70% he/she is a registered user. If it is not satisfying the threshold value he/she is an invalid user.

2. Online Examination Portal

After face authentication, the candidate is provided with the examination portal which is built using Python where they can write their exam in objective type questions. The candidate's face is verified dynamically to check identity, throughout the examination. The candidate's face will be captured dynamically at regular intervals to check the identity of the candidate. On completion of the examination and the score report will be generated as an e-certificate for each candidate.

3.Certificate Generation and Verification

E-Certificate will be generated for each candidate as a pdf format. It is also downloadable. The hash value of the pdf is calculated and stored in the blockchain. The verification portal again calculates the hash value of the file and check if it matches with the hash value of the pdf in the blockchain. By using blockchain, only authorized people can access the documents stored using their private keys .

4.Student's Performance Analysis

Using Decision tree, the student's performance will be evaluated. The dataset will have features of students Such as score, attendance, First series mark, Second series Mark etc. Using these features student's range will be predicted like below average, average or outstanding. So that their teachers can understand who is falling back and can take actions to improve his/her grades. Also students and staff can interact with each other in the chat section.

Face Recognition

1. Face Detection

- ❖ Face detection is generally the first step towards many face-related applications like face recognition or face verification.
- ❖ Various face detection algorithms are there but the *HOG* is the oldest method that is also used today and also it is used here.
- ❖ The first task that is to perform detecting faces in the image(photograph) or video stream . After face detection we know that the exact coordinates/location of the face, so we extract this face for further processing.

2. Feature Extraction

- ❖ Now see we have cropped out the face from the image, so we extract specific features from it. face embeddings is used to extract these features of the face.

- ❖ A neural network takes an image of the face of the person as input and outputs a vector that represents the most important features of a face. In machine learning, this vector is called embedding and hence we call this *vector face embedding*.
- ❖ When we train the neural network, the network learns to output similar vectors for faces that look similar . Consider an example, if we have multiple images of faces within different timelapse, it's obvious that some features may change but not too much. So in this problem, the vectors associated with the faces are similar or we can say they are very close in the vector space.
- ❖ Here we pass all the images in our data to this pre-trained network to get the respective embeddings and save these embeddings in a file for the next step

3.Comparing faces

- ❖ The face embeddings for each face in the data saved in a file, the next step is to recognize a new image that is not in data.
- ❖ Hence the first step is to compute the face embedding for the image using the same network we used earlier and then compare this embedding with the rest of the embeddings that we have.
- ❖ We recognize the face if the generated embedding is closer or similar to any other embedding.

To implement face recognition using OpenCV and Python three libraries need to install.

1. OpenCV
2. Dlib
3. Face_recognition

- ❖ OpenCV is a video and image processing library and it is used for image and video analysis, like facial detection, license plate reading, photo editing, advanced robotic vision, and many more.
- ❖ The dlib library contains our implementation of ‘deep metric learning’ which is used to construct our face embeddings used for the actual recognition process.
- ❖ The face_recognition wraps around dlib’s facial recognition functionality, making it easier to work with.. First, remember to install dlib library before you install face_recognition.

OpenCV

Open CV is the open source computer vision library by Intel. It has several implemented and optimized algorithms of image processing usage. **One of the most popular algorithms HOG(Histogram Of Oriented Gradients) which is capable of detecting face and objects.**

How does the Face Detection work?

Face Detection is the ability to locate the faces in a photograph. You create a two steps pipeline for face detection.

Step 1: Build a Face Detection Model

You create a machine learning model that detects faces in a photograph and tell that it has a face or not.

Here Hog is used to detect the face.

How does the Histogram of Oriented Gradients (HOG) works?

Step 1: Converts the input image to black and white.

HOG only considers the changes between the light and dark areas in the image. It ignores the color information. That's why it converts colored image into the black and white image.

Step 2: Looks for the gradient

Now after the step 1, it looks for the gradient in each pixel. A gradient is a direction from the lighter area to the darker area. It repeats the process for the entire pixels of a black and white image and draws the gradient image of it.

The trained datasets are available like dlib, face recognition that is free to use. These libraries contain all the HOG represented images and built a machine learning model.

Step 2: Use the Sliding Window Classifier.

After building the model in the step 1, Sliding Window Classifier will slides in the photograph until it finds the face. If it finds then, locations of the face are noted.

Block Chain

- ❖ All the student information is stored in blockchain. Blockchain is a **record-keeping technology designed to make it impossible to hack the system or forge the data stored on it**, thereby making it **secure and immutable**. It is a type of distributed ledger technology (DLT), a digital system for recording transactions and related data in multiple places at the same time.
- ❖ Once the information stored in blockchain it is not possible to manipulate the stored information .
- ❖ It consists of an expanding list of transactions or records stored in the blocks and uses peer to peer networks. The blocks in the blockchain are connected as a chain with the use of hashing algorithms.
- ❖ Blocks are stored in a decentralized network where all the blocks are present in multiple nodes. As data is decentralized the chances of data tampering and data loss is less which makes blockchain more secure and transparent.

- ❖ Each block of the blockchain consist of the previous block's hash value, nonce, a timestamp, the records of the block and the hash of the current block.
- ❖ The main advantages of using blockchain are decentralization, security , transparency, and immutability.
- ❖ There are 3 types of blockchain such as

1. Public

The data in the public blockchain can be viewed by all and anyone can access the blockchain.

2. private

Private blockchain is used within an organization to store the financial organization of the organization.

3. consortium blockchain

Consortium blockchain is semi-private and it is used within a specified circle and group. Here use consortium blockchain where the data is shared between the candidate and the vendors who are verifying the certificate.

Configuration of blockchain

Truffle

- ❖ Truffle is the most popular development tooling for Ethereum programmers. Easily deploy smart contracts and communicate with their underlying state without heavy client side programming. An especially useful library for the testing and iteration of Ethereum smart contracts.
- ❖ It is used to create configuration files and compile blockchain.
- ❖ First install node to create files for blockchain automatically. Through this create contract that contain sol files. Sol files contain the information that we want to pass into the blockchain. This concept is called *smart contracting*.

Ganache

- ❖ Ganache is a high-end development tool used to run your own local blockchain for both Ethereum and Corda dApp development. It act as a server to see the info that pass to the blockchain.

Decision Tree

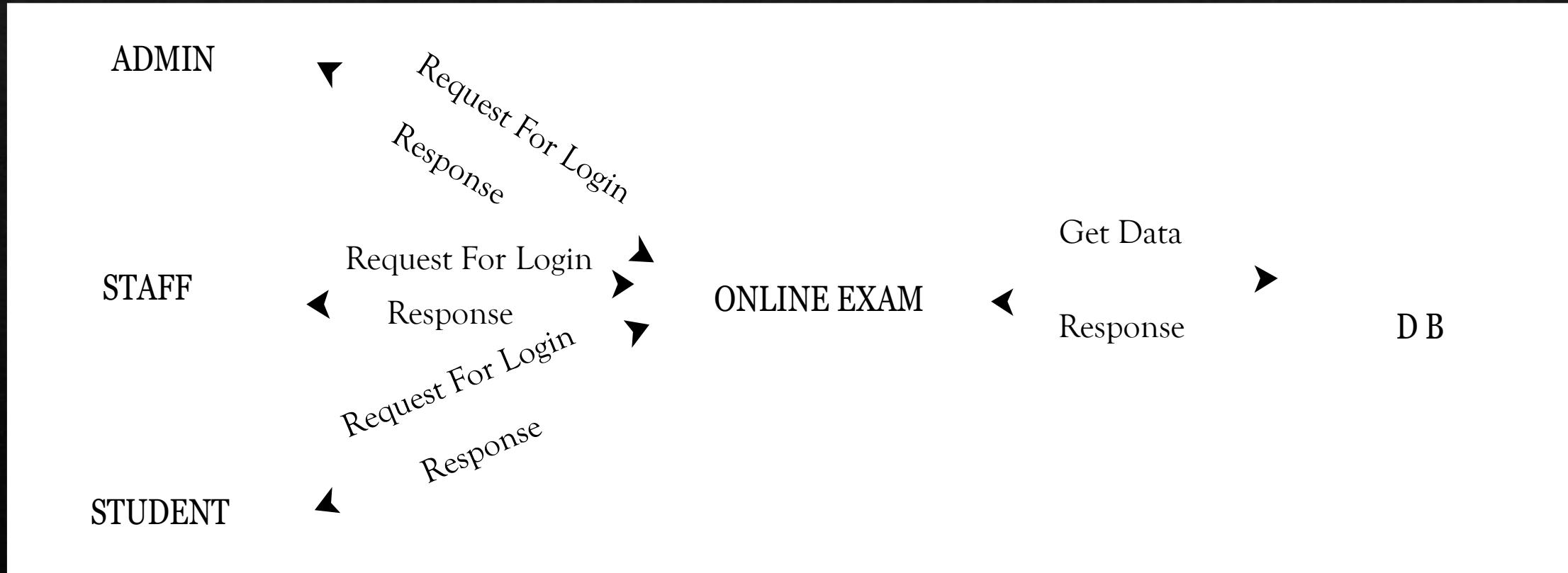
- ❖ Decision tree is used for student performance analysis. One of the most popular predictive modelling techniques is the decision tree, which is used for predicting and categorizing a given data object based on a previously generated model.
- ❖ A decision tree produces sequences of rules that help for decision-making. The rules can be generated from the visualized decision trees for a better understanding of the most impactful attribute and also of the final outcome.
- ❖ The dataset will have features of students Such as score, attendance, First series mark, Second series Mark etc. The dataset is downloaded from Kaggle.com
- ❖ After that the student's current marks and attendance will be compared with the dataset to predict the performance.
- ❖ Using these features student's range will be predicted like below average, average or outstanding. So that their teachers can understand who is falling back and can take actions to improve his/her grades. Also students and staff can interact with each other in the chat section.

DEVELOPING ENVIRONMENT

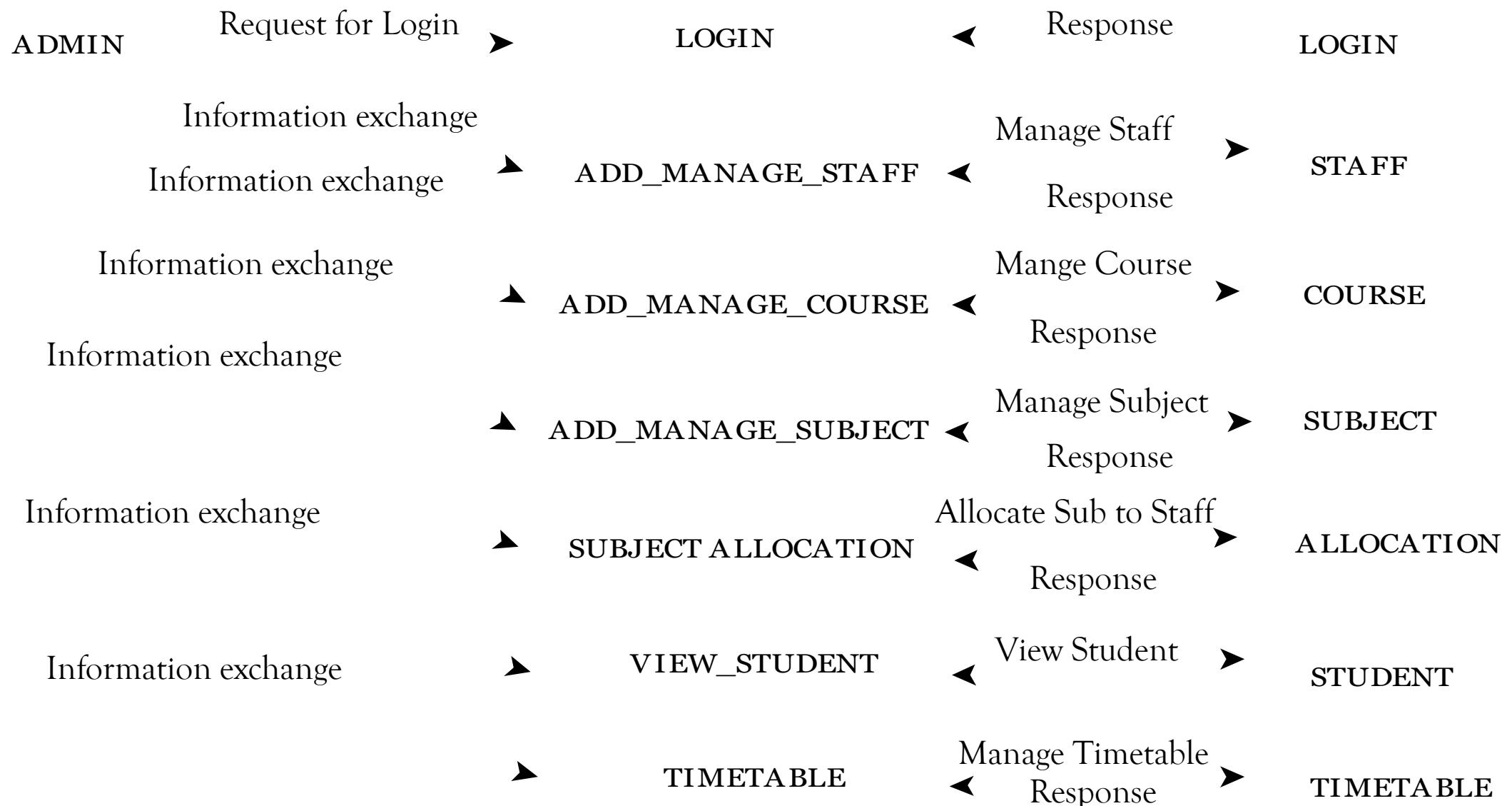
- ❖ OPERATING SYSTEM: WINDOWS 10 AND ABOVE
- ❖ FRONT END: HTML, CSS, JAVASCRIPT
- ❖ BACK END: Mysql
- ❖ SOFTWARES USED: Jetbrains Pycharm, Android Studio ,SQLyog
- ❖ TECHNOLOGY USED: PYTHON, JAVA
- ❖ FRAME WORK USED : Flask

DATA FLOW DIAGRAM

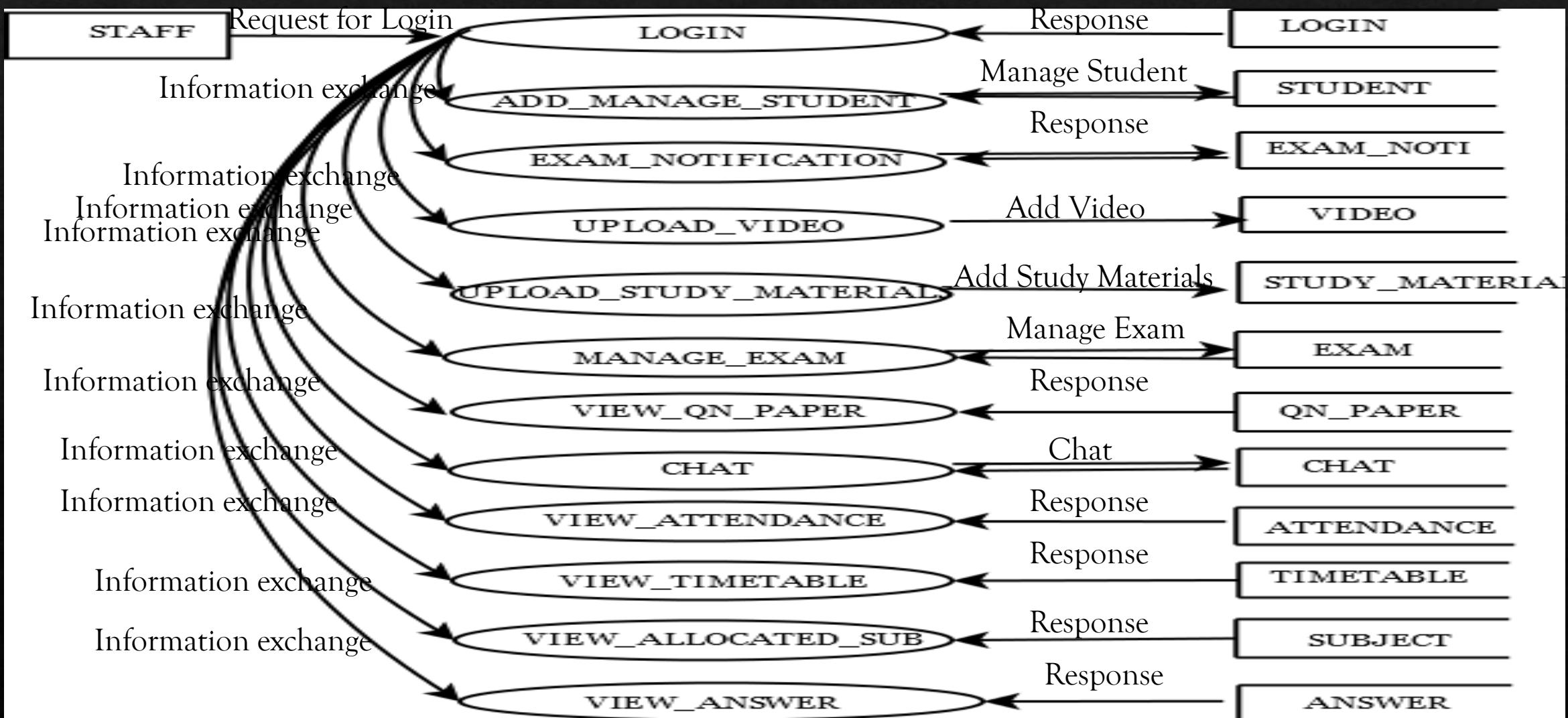
LEVEL 0



LEVEL 1.1



LEVEL 1.2



LEVEL 1.2

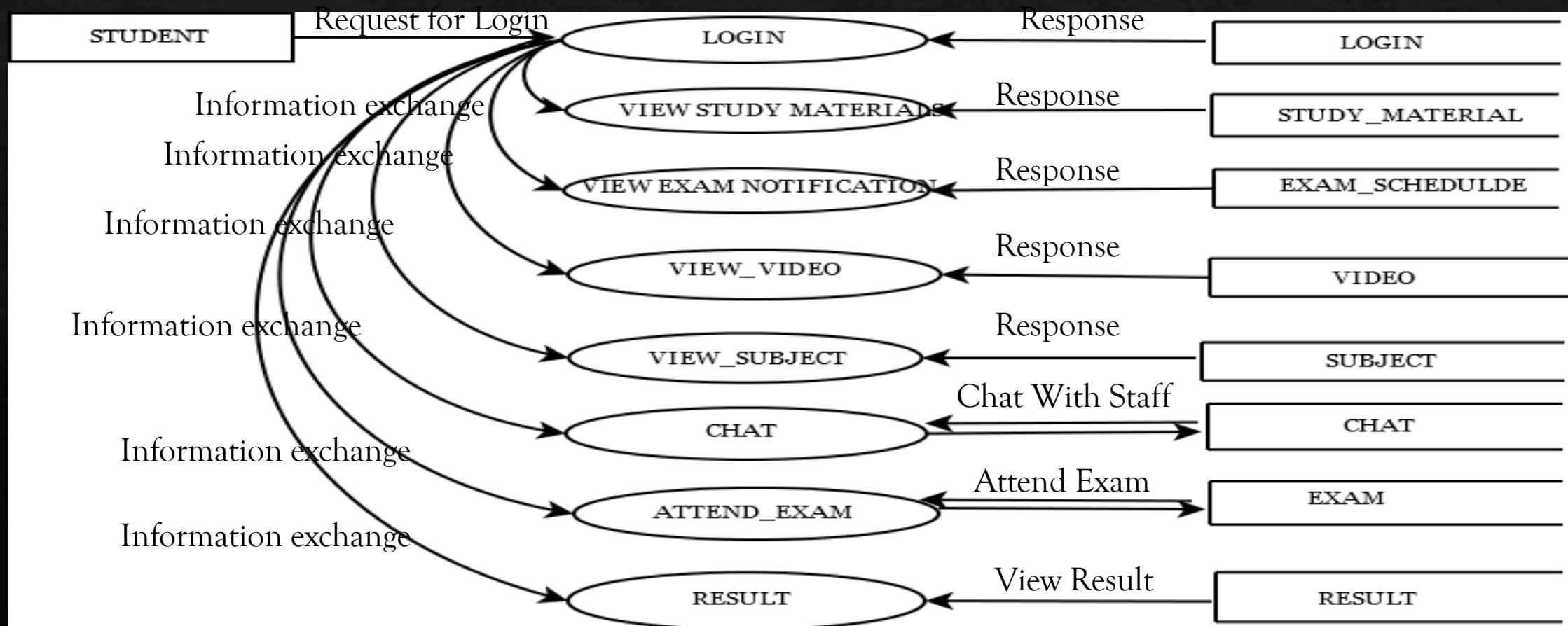


TABLE DESIGN

Login

Student

USER STORIES

User Story ID	As a type of User	I want to <perform some task>	So that I can <Achieve Some Goal>
1	Admin	login	login successful with correct username and password
2	Admin	add and manage staff	add staff, manage staff
3	Admin	add and manage subject	mange subjects
4	Admin	allocate subject to staff	manage staff
	Admin	add and manage timetable	manage staff and students
5	Staff	login	login successfully with correct username and password
6	Staff	add and manage student	manage students
7	Staff	chat	communicate with the students
8	Staff	add study materials and video	take attendance of students
9	Staff	view allocated subjects	add study materials and video to students
10	Staff	add exam notification	manage exam
11	Staff	view answer	issue score card for students

User Story ID	As a type of User	I want to <perform some task>	So that I can < Achieve Some Goal>
12	Student	download video	View video
13	Student	download study materials	View study materials
14	Student	download attendance	View attendance
15	Student	verify face	Attend my exams
16	Student	download score card	View my result
17	Student	chat with teacher	For clearing doubts

PRODUCT BACKLOG

User story ID	Priority <High/Medium/Low>	Size (Hours)	Sprint <#>	Status <Planned/In progress/Completed>	Release Date	Release Goal
1	Medium	8	1	Completed	1/05/2022	Staff form designing
2	High	10		Completed	15/05/2022	Coding for staff
4	High	6	2	Completed	28/05/2022	Block chain management , create block chain , truffle management
5	Medium	5		Completed	1/06/2022	Contract creation , blockchain implementation.
6	High	5	3	Completed	5/06/2022	Add & manage blocks to blockchain , create block ,node module , add to block
8	High		4	In progress		Examination portal, face capture and verification.
9	High		5	Planned		Student performance analysis, dataset creation , preprocessing.
10	High		5	Planned		Feature extraction , training ,

PROJECT PLAN

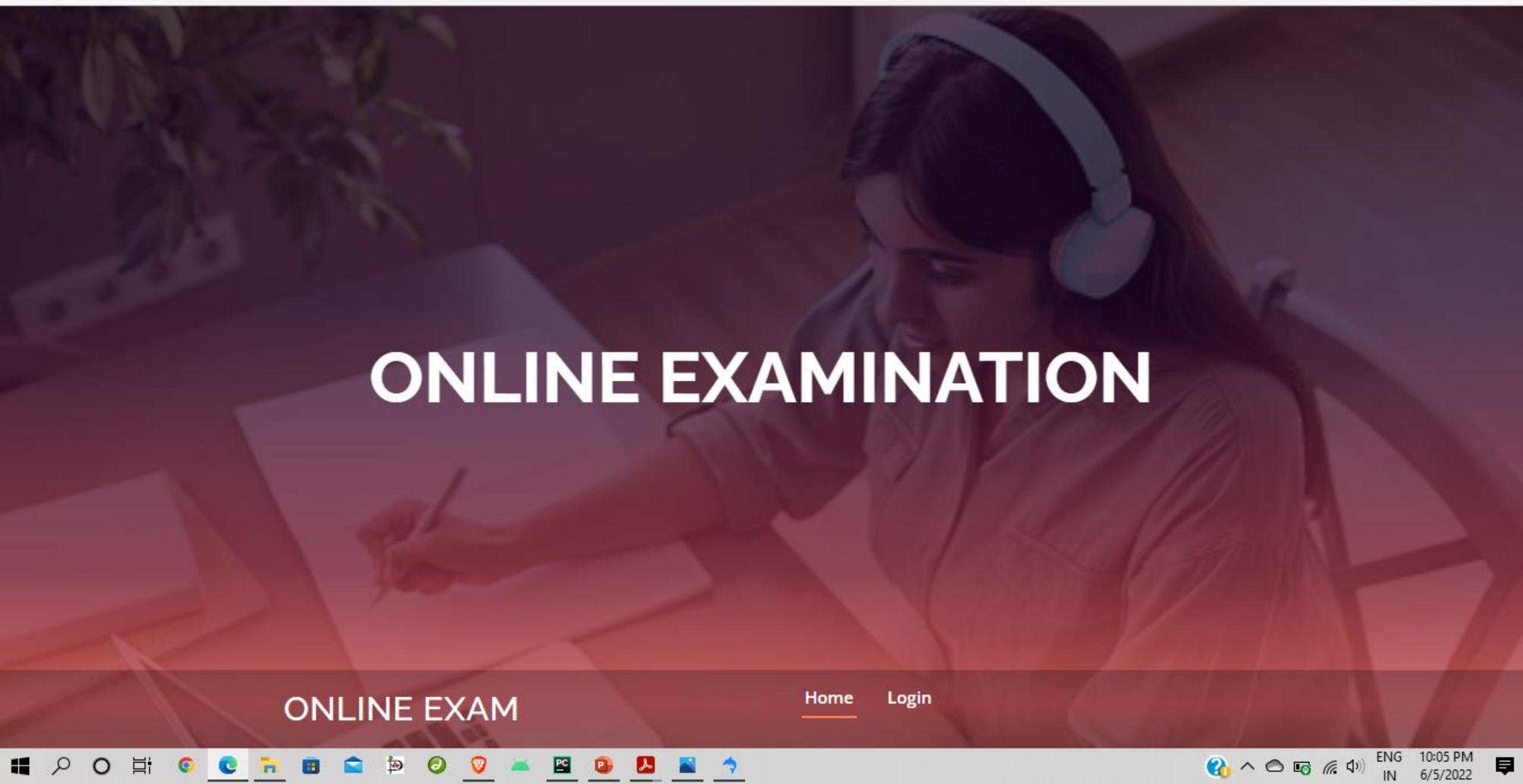
User Story ID	Task Name	Start Date	End Date	Hours	Status
1	Sprint 1	20/04/2022	1/05/2022	18	Completed
2		4/05/2022	15/05/2022		Completed
4	Sprint 2	17/05/2022	28/05/2022	11	Completed
5		29/05/2022	1/06/2022		Completed
6	Sprint 3	2/06/2022	5/06/2022	5	Completed
8	Sprint 4	6/06/2022			In progress
9	Sprint 5				Planned
10					Planned

SPRINT BACKLOG PLAN

Backlog Item	Status And Completion Date	Original Estimation in Hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
UserStory#1,#2,#3			hrs	hrs	hrs	hrs	hrs									
Form Designing	1/05/2022	8	1	1	1	2	0	1	1	0	1	0	0	0	0	0
Coding	15/05/2022	10	1	3	0	1	1	0	1	0	0	3	0	0	0	0
UserStory#4, #5																
Block chain management	28/05/2022	6	1	1	0	1	1	2	0	0	0	0	0	0	0	0
Blockchain implementation	1/06/2022	5	0	4	1	0	0	0	0	0	0	0	0	0	0	0
UserStory#6,#7																
Add &manage blocks	5/06/2022	3	0	0	0	0	1	1	1	0	0	0	0	0	0	0
Examination portal, face verification	In progress															
UserStory#8,#9																
Student performance analysis	planned															
Prediction	planned															
		32	3	9	3	4	3	4	3	0	1	3	0	0	0	0

SPRINT ACTUAL

Backlog Item	Status And Completion Date	Original Estimation in Hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
UserStory#1,#2,#3			hrs	hrs	hrs	hrs	hrs									
Form Designing	1/05/2022	9	1	1	1	2	0	1	1	0	2	0	0	0	0	0
Coding	15/05/2022	10	1	3	0	1	1	0	1	0	0	3	0	0	0	0
UserStory#4, #5																
Block chain management	28/05/2022	6	1	1	0	1	1	2	0	0	0	0	0	0	0	0
Blockchain implementation	1/06/2022	6	0	4	2	0	0	0	0	0	0	0	0	0	0	0
UserStory#6,#7																
Add &manage blocks	5/06/2022	4	0	0	0	0	2	1	1	0	0	0	0	0	0	0
Examination portal, face verification	planned															
UserStory#8,#9																
Student performance analysis	planned															
Prediction	planned															
Total		34	3	9	3	4	4	4	3	0	2	3	0	0	0	0



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THANK YOU