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Automation of Seating Plan for Examinations using Round-Robin Policy

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Abstract: ***This paper introduces a Python-based Graphical User Interface (GUI) application designed to automate the seating arrangement process for examinations, specifically catering to the needs of examination departments. Leveraging the openpyxl and pandas libraries for Excel file manipulation and creating Dataframes the application aims to replace the laborious manual process traditionally employed by colleges. The main objective is to reduce the time and effort invested by examination departments in seating arrangement tasks. The user-friendly GUI simplifies data input, while the application's algorithm automates seating assignments, ensuring that no two students writing same exam can't sit in same bench in optimal manner using excel and python . Results demonstrate a significant reduction in time spent on seating arrangement, with outputs including detailed room-wise seating sheets and comprehensive summaries listing roll numbers by regulation and branch. This innovative approach not only streamlines examination management but also enhances accuracy and efficiency.From this GUI we can add, edit and delete the halls in which the exams are being conducted.Further we input the excel sheet in which the roll numbers of students were there as per their branch and regulation as input and genrates formatted excel sheets that generate seating arrangement .Formatting the font and size of rows and columns and wrapping the columns when required are done automatically.***

Keywords:Examination Seating Arrangement, Openpyxl, Pandas, Tkinter, Round-Robin.

I. INTRODUCTION

Seating arrangement play a pivotal role in maintaining order and fairness, especially during examinations, but the manual process of arranging seats can be cumbersome and prone to errors. This research paper delves into the development of an automated seating arrangement system using Python and the openpyxl library, aiming to streamline the process and reduce the workload for examination departments.The traditional manual approach to seating arrangement involves time-consuming tasks, such as posting detailed sheets near examination rooms, which can be replaced by an automated system. Leveraging a user-friendly Graphical User Interface (GUI), the application allows efficient way of inputing data to excel sheets for room no,rows and columns from user and check if the given rooms capacity is sufficient to allocate these students and further generate the seating arrangement by considering the primary goal of significantly reducing the time and effort expended by examination departments.

The automated system utilizes a round-robin seating algorithm to ensure a fair distribution of students and prevent individuals from the same group or regulation from sitting adjacent to each other. By taking roll number of student populations, the system can adapt to diverse regulations and academic years seamlessly.The generated outputs include detailed summary sheets for each examination room, visually representing the seating arrangement, and a comprehensive summary sheet categorizing students by roll numbers, groups, and regulations and room number. These outputs help students to check their room numbers and positions as well as Examination cell to make fast decisions during paper distribution. The introduction of an automated seating arrangement system marks a significant improvement in examination management. By harnessing the capabilities of Python and automation, this system not only enhances efficiency but also contributes to the creation of a fair, secure, and streamlined examination environment. The research and development of such systems hold immense potential for revolutionizing administrative processes in educational institutions.

II. LITERATURE SURVEY

Seating arrangement is on of the primary concerns in the colleges during the hectic examination schedules.Its a time taking manual process that makes the Examination cell much fussy.In order to reduce this various methods have been proposed previously.However these systems used various algorithms like using random allocation or taking alphabetical order.Later some researchers proposed to use genetic algorithm and graph theories.

Random allocation and alphabetical order seating methods, as used in prior studies, may not ensure equitable student allocation. These approaches lack consideration of factors such as student preferences and specific constraints. They can result in uneven distribution and potentially suboptimal arrangements, potentially disadvantaging students. More sophisticated algorithms are needed to address fairness and efficiency in seating arrangements.A genetic algorithm for seating arrangements assigns students to seats by evolving solutions over generations. It optimizes seating based on defined constraints and objectives. However, the algorithm can be complex to set up and fine-tune due to factors like encoding, fitness function design, and parameter choices. Additionally, it may require significant computational resources for large-scale seating arrangements.Later graph theories were used for seating arrangement using Hungarian algorithm. The Hungarian algorithm assigns students to seats optimally, minimizing conflicts, but its complexity can be high. It involves creating a cost matrix, applying the Hungarian algorithm, and backtracking to find the optimal arrangement, making it computationally demanding for large datasets.Further machine learning classification and clustering algorithms are being used which introduces complexity through data preprocessing, model selection, training, and evaluation. Data quality and feature design are critical, and the computational resources needed can be substantial, especially with large datasets. Balancing model complexity and interpretability is essential to ensure practical, effective seating solutions.

III. SYSTEM ANALYSIS

A. *Existing System*

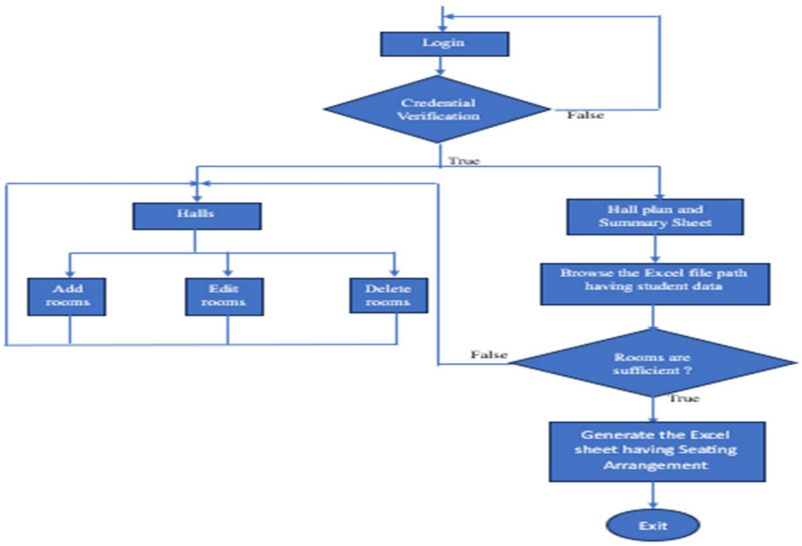
Existing systems are usually working with databases but its not convinient all the times to import the data into databases.Its very important to consider that some times that students might belong to different regulation and different branch.Existing systems usually are following manual or semi-automated process of seating arrangement.Most of the algorithms used in previous papers like genetic algorithm and hungarian algorithm are trying to improve optimality leaving behind the time and space complexity.Machine learning algorithms require much data to train the models which may not be be efficient method in all the cases.Fairness and efficiency is decreasing in the case of random allocation and alphabetical order allocation.Considering these parameters in mind a new system was proposed as shown below.

B. *Proposed System*

The proposed system considers the roll numbers of students from different colleges that are stored in excel workbook in multiple pages.It uses round robin fashion by taking quanta value to be the number of rows in order to arrange the students to sit in their respective positions.It generate four output sheets mainly.

1) Sheet with room numbers, rows and columns
2) Sheet with the summary of each regulation ,branch and number of students writing exam on that day
3) Workbook containing multiple sheets named with room number and seating arrangemnet of each room.
4) Summary sheet of the workbookof seating arrangement

IV. SYSTEM ARCHITECTURE



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V. MODULE DESCRIPTION

A. Login Module

It allows the examination department to enter the user name and password and if the username and password are correct then it enters to new window having Halls button and Halls and summary sheet button as shown in Figure 1. It provides security to application by not allow the unauthorized users to use this application.

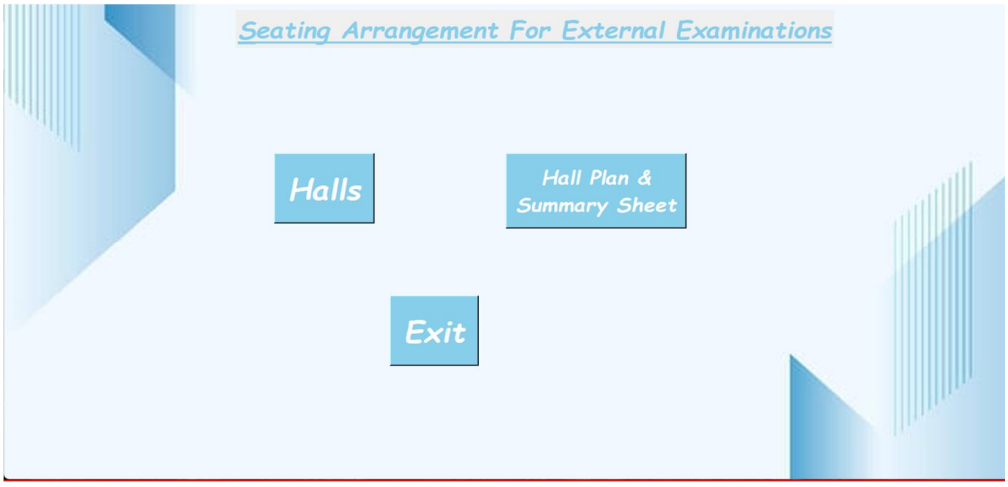

Figure 1-Home Page

B. Halls Module

It allows users to add new rooms and edit the room capacity if required and delete the rooms.This module helps in creating rooms.xlsx file that contains room number ,rows and columns if it doesnot exist and further add the rooms data as shown in figure 2.

C. Halls and Summary Sheet Module

It takes the excel workbook with student roll numbers in multiple sheets as input from the local system as shown in figure 3 anf figure 4 and generates three main files of seating arrangement mentioned as 2,3,4 in proposed system.The generated files are automatically saved and stored in local PC.

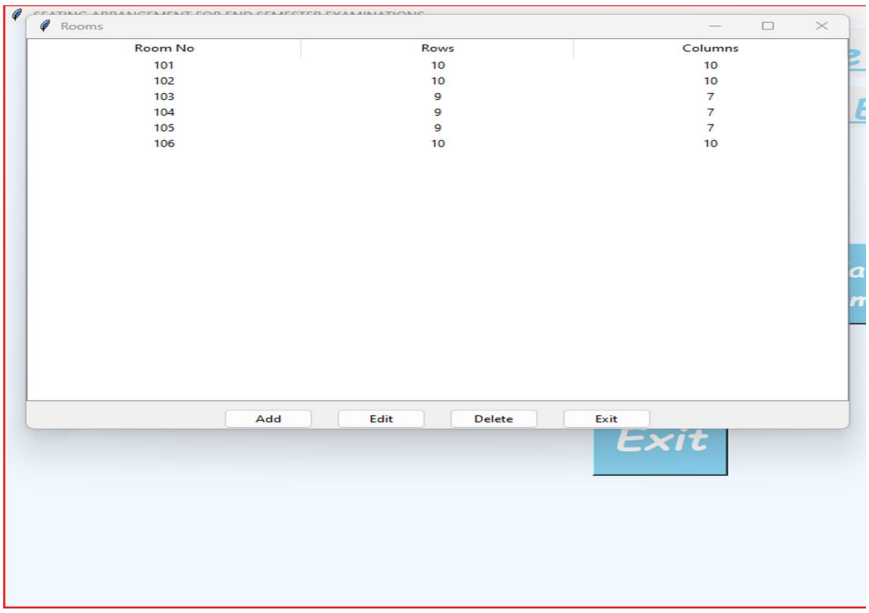

Figure 2-Seating Hall Management

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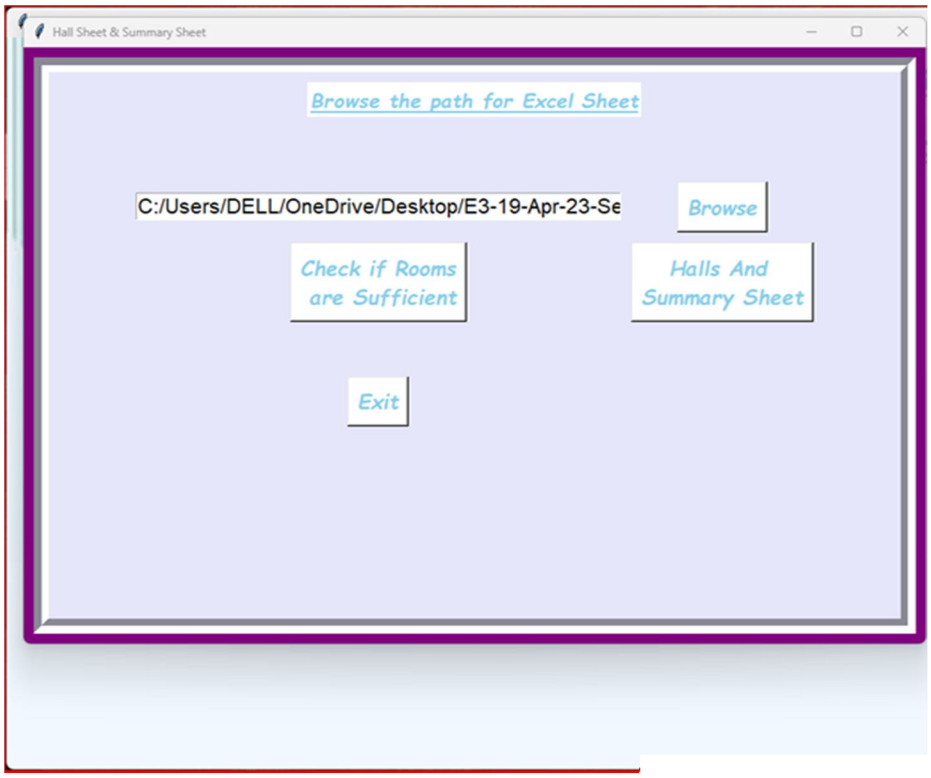

Figure 3 Candidate Browse Page

VI. METHODOLOGY

This project uses Python libraries like pandas and OpenPyxl as they are user friendly to format and manipulate the excel sheets. Pandas library is used to create dataframes and students roll numbers are filled in it in Round robin fashion once after checking if they don't belong to same branch.The GUI is created using Tkinter.The following python code is being used in this project.

A. Pseudocode

For each room in the list of rooms:
Extract room number, number of rows, and number of columns
If there are multiple unique branch names in the student list:
Create an empty dataframe with the specified number of rows and columns
Divide the columns into odd and even columns
Calculate the number of odd and even columns
Initialize counters 'i' and 'j' to 0
For each odd column and row:

Assign students from the odd list to the odd positions in dataframe if available, else set to None
Increment 'i'

For each even column and row:
Assign students from the even_list to the even positions in dataframe if available, else set to None
Increment 'j'

The provided pseudo code implements a round-robin seating arrangement for multiple rooms. It iterates through each room, creating a seating grid with rows and columns. Students are assigned seats in an alternating manner, first in odd-numbered columns and then in even-numbered columns, ensuring that different branches are seated together. If there are more students than available seats, the remaining seats are marked as "None."

Libraries that are used in this project are as follows:

1) *Pandas:* Pandas is a versatile Python library commonly used for data manipulation and analysis. It offers data structures and functions to efficiently work with structured data, making it an essential tool for tasks like data cleaning, transformation, and analysis.
2) *Openpyxl:* Openpyxl is a Python library that specializes in reading and writing Excel files. It provides the capability to handle Excel workbooks, worksheets, and cell data, making it valuable for tasks involving data import and export from and to Excel spreadsheets.
3) *Tkinter:* Tkinter is the standard GUI (Graphical User Interface) library for Python. It enables developers to create interactive desktop applications with user-friendly interfaces. With Tkinter, you can design and build windows, buttons, menus, and other graphical elements to create visually appealing and functional applications.

VII. RESULTS

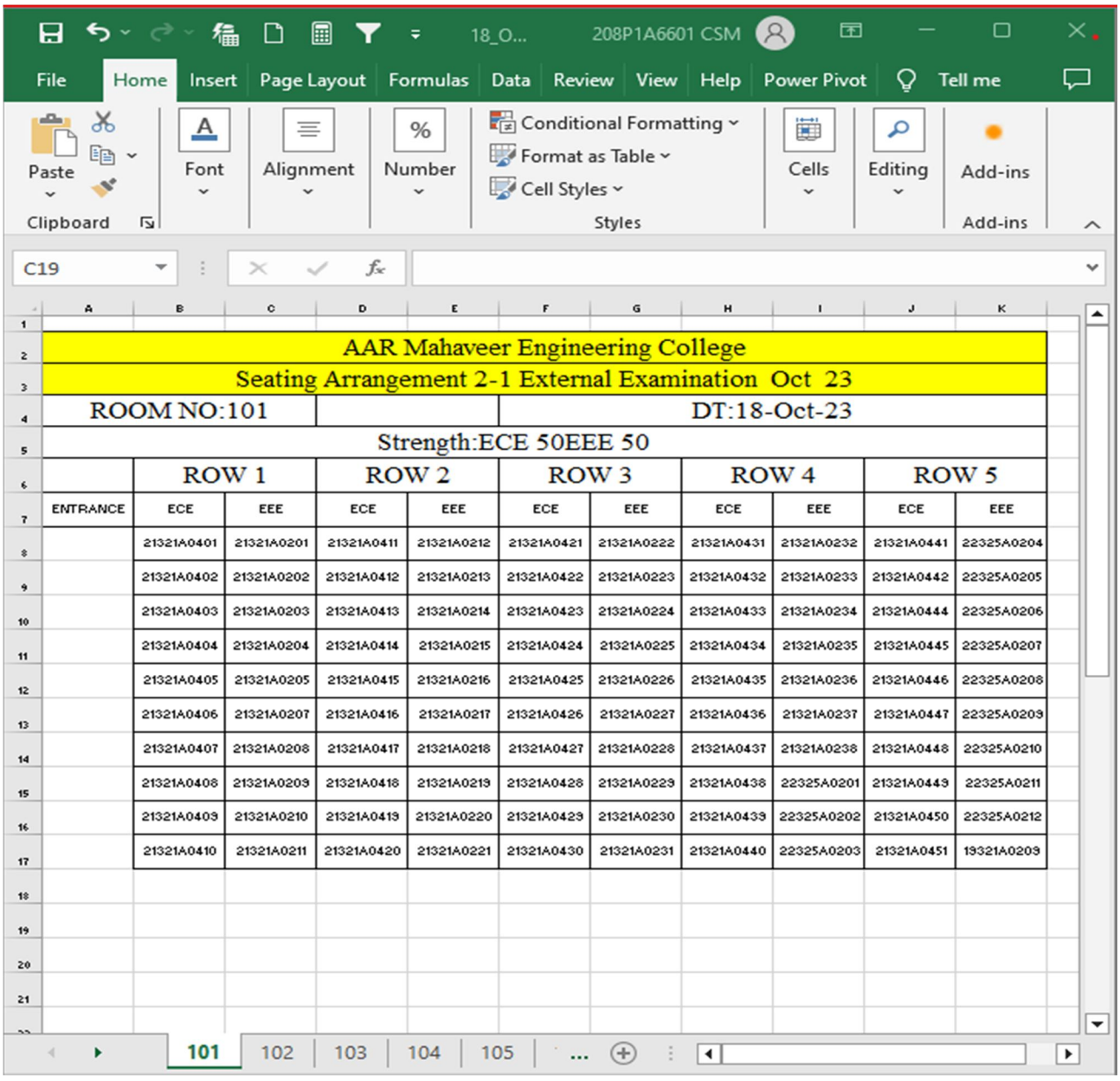

Figure 4 Hall Plan

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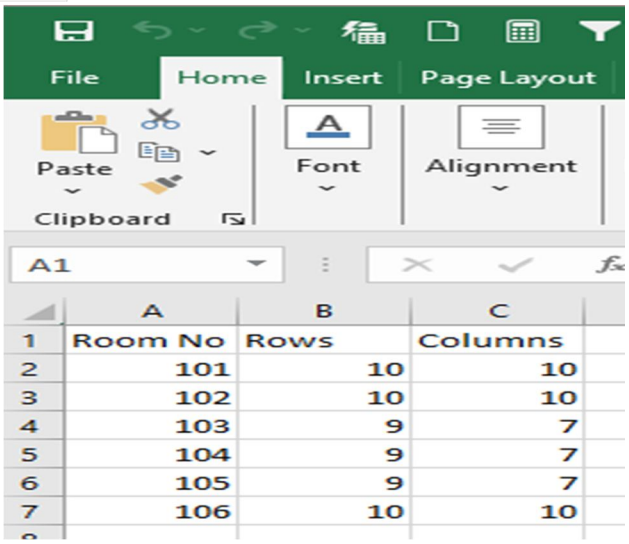
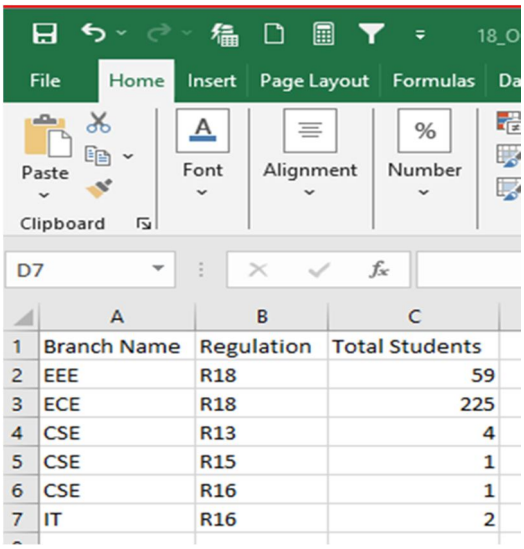


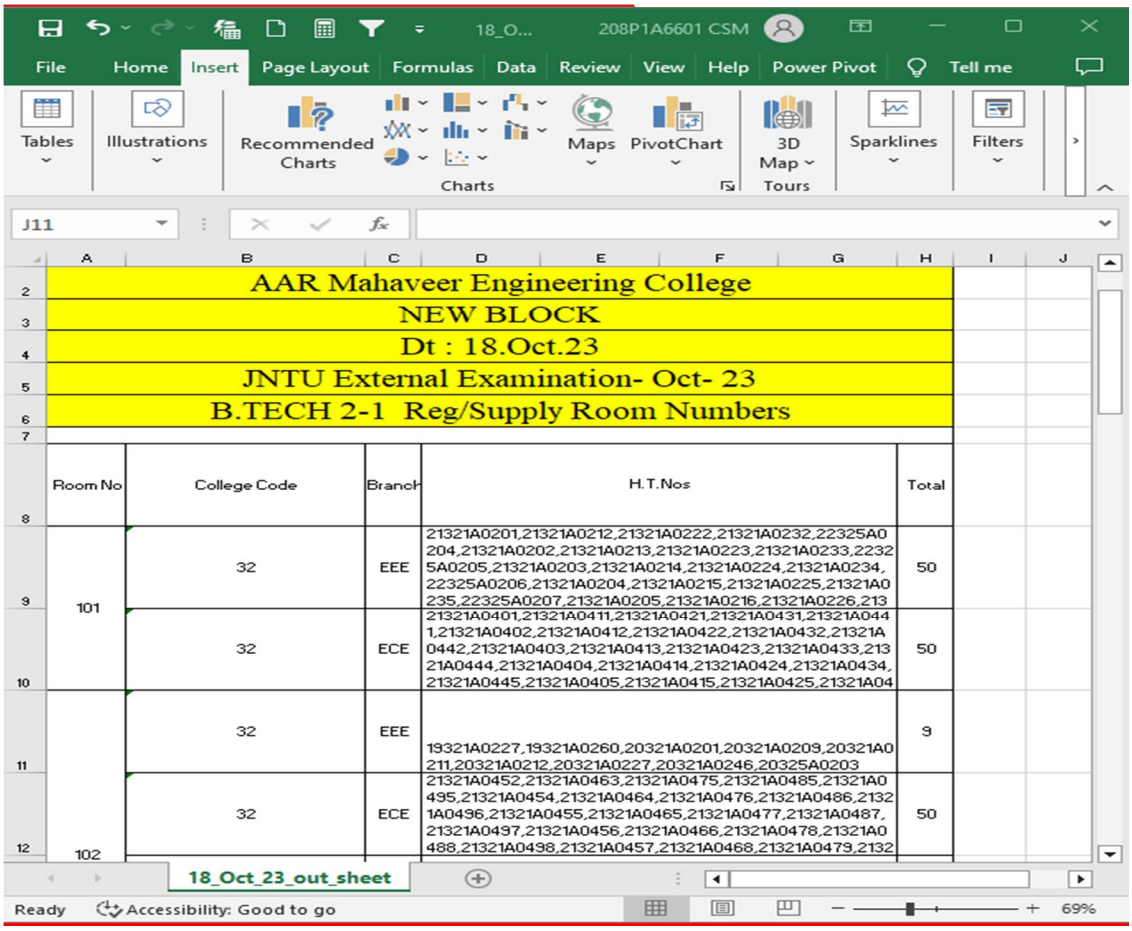
	A	B	C
1	Room No	Rows	Columns
2	101	10	10
3	102	10	10
4	103	9	7
5	104	9	7
6	105	9	7
7	106	10	10

Figure 5 Hall Capacity



	A	B	C
1	Branch Name	Regulation	Total Students
2	EEE	R18	59
3	ECE	R18	225
4	CSE	R13	4
5	CSE	R15	1
6	CSE	R16	1
7	IT	R16	2

Figure 6 Candidate Strength



Room No	College Code	Branch	H.T.Nos	Total
101	32	EEE	21321A0201,21321A0212,21321A0222,21321A0232,22325A0204,21321A0202,21321A0213,21321A0223,21321A0233,22325A0205,21321A0203,21321A0214,21321A0224,21321A0234,22325A0206,21321A0204,21321A0215,21321A0225,21321A0235,22325A0207,21321A0205,21321A0216,21321A0226,213	50
	32	ECE	21321A0401,21321A0411,21321A0421,21321A0431,21321A0441,21321A0402,21321A0412,21321A0422,21321A0432,21321A0442,21321A0403,21321A0413,21321A0423,21321A0433,21321A0444,21321A0404,21321A0414,21321A0424,21321A0434,21321A0445,21321A0405,21321A0415,21321A0425,21321A04	50
102	32	EEE	19321A0227,19321A0260,20321A0201,20321A0209,20321A0211,20321A0212,20321A0227,20321A0246,20325A0203	9
	32	ECE	21321A0452,21321A0463,21321A0475,21321A0485,21321A0495,21321A0454,21321A0464,21321A0476,21321A0486,21321A0496,21321A0455,21321A0465,21321A0477,21321A0487,21321A0497,21321A0456,21321A0466,21321A0478,21321A0488,21321A0498,21321A0457,21321A0468,21321A0479,2132	50

Figure 7 Hall-wise Summary report of Candidates

VIII. FUTURE ENHANCEMENTS

This work can be further enhanced in such a way that the system should prepare hall plan in accordance with schedule given by institution so that the work will be fully automated. Further it should make sure that the different branch students writing same exam should not sit beside each other.

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IX. CONCLUSION

This work is currently being used by our institution to generate the seating arrangement in our college during the external examinations .The output files are generated and saved in such a way that they are not even required do the formatting.The complete process of using excel formulas in manual way is converted to automated process. It helps in saving time, conduct exams in fair manner and without any malpractices.

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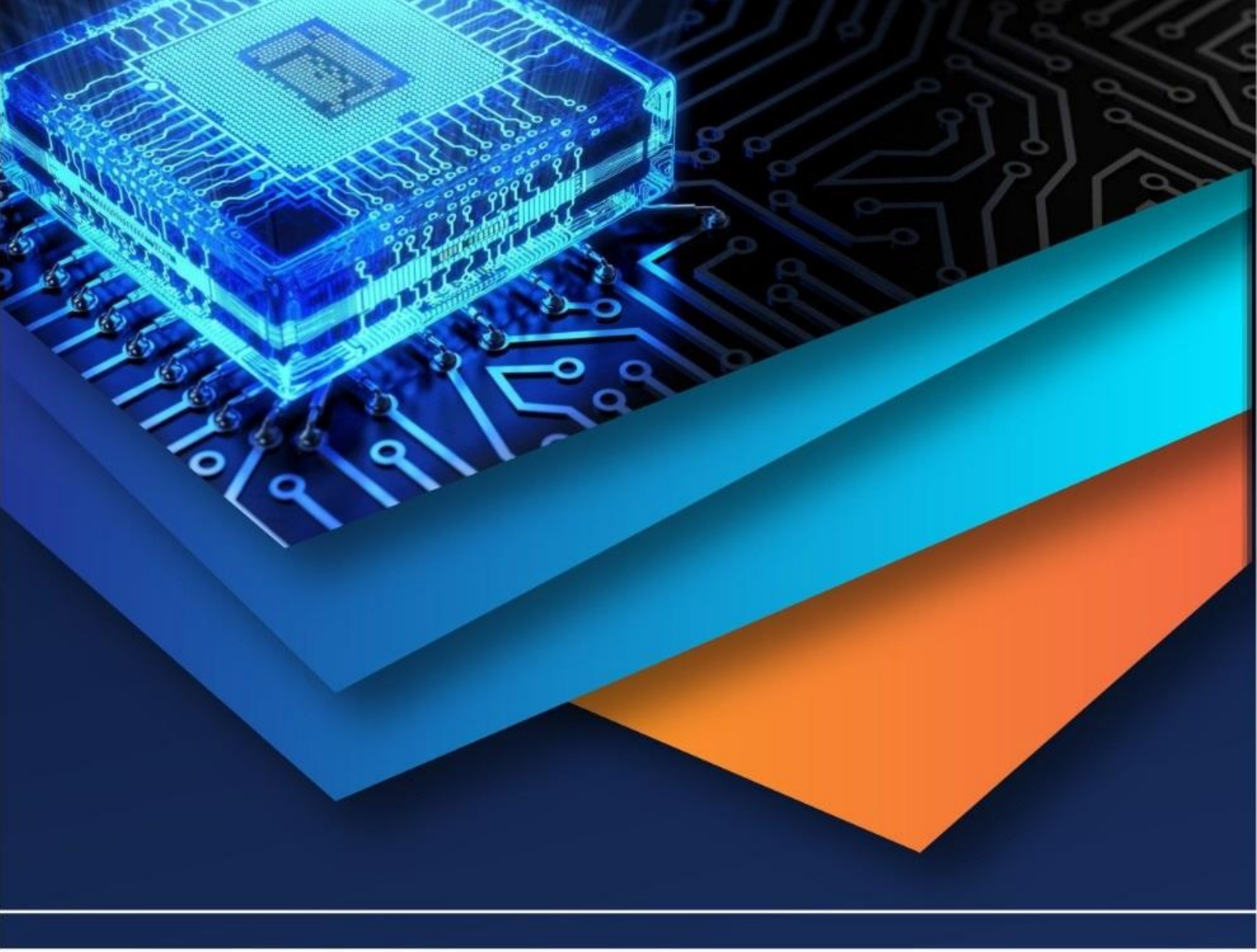

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