ECC 3116: ENGINEERING ALGORITHM

PROJECT: PE-QA.EXE EDUCATIONAL APPLICATION

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LECTURER: ASSOC. PROF. DR. SYAMSIAH BINTI MASHOHOR

GROUP MEMBERS:

NAME	MATRIC NUMBER
AIDIL HARITH ANWAR BIN AZMI	202788
EISYATUL HANNIE BINTI MOHAMMAD RUSHDAN	202785
NURUL AIDA BINTI ZAIROL AKMAR	203732
NIK MUHAMMAD FARHAN BIN OWI SIONG KIAT @ RUSTAM AL	203733
AHMAD QAYYUM FIKRI BIN AHMAD JAZIMIN	200359

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1.0 ABSTRACT

Nowadays, the world has been infected by a virus called as COVID-19. The outbreak started at Wuhan, China and it was rapidly spreading through and outside of Wuhan including Malaysia [1]. Therefore, lockdown is activated and students in Malaysia need to change their education into online learning or e-learning [2]. Because of that, students need an easy path to learn using e-learning in a more effective way to achieve good CGPA in their courses. After investigating all the websites that provide studying programs, a project has been created to increase the productivity of all students to be able to practice while learning their courses during this lockdown. This project is about developing an educational application called PE-QA.EXE by using engineering algorithms concepts. This project has narrowed the scope of course in computer engineering which is algorithms. The proposed PE-QA.EXE consists of chapter, tutorial and practice in algorithms. The expected outcome is that PE-QA.EXE will be able to give the students in universities to learn education in a simple way yet able to give them a powerful accomplishment which is extensive knowledge. Moreover, this project also expects to be cost free for students all around the world [3].

2.0 INTRODUCTION

As the COVID-19 outbreak in 2020 across the world, a lot of the people have been affected by the pandemic. Workers have been asked to work at home, businessmen lost a lot of profits and students need to follow a new system for their education such as e-learning. There is a report by online learning platform Udemy revealed that people are relying on e-learning to up skill and pass time [4]. So people now are needed to use their internet a lot for their work. So applications that have multi-purpose functions such as Grab, Boost and Touch n Go are very famous among people in Malaysia.

All universities start to activate online learning especially in Malaysia which is like students in Universiti Putra Malaysia (UPM) are busy studying, completing assignments, working with final year projects (FYP) and everything else [5]. However, all students completed their work from home which required internet research, referring to online notes, online exams etc. Therefore, we as students from Bachelor of Computer and Communication Systems Engineering are willing to create a program by the name, PE-QA.EXE. PE-QA.EXE serves as a platform for all students who need a website where they can refer as a reference and practice on what they understand. Here is the summary steps on how to use PE-QA.EXE:

1. Study mode: where we can learn array, queue and stacks, sorting, linked list, searching, hashing, graphical analysis.
2. Simulation mode: where we can see examples on how the code is running.
3. Create your first code: where we can create our first code with the guidance from PE-QA.EXE.

Furthermore, this project is to help these students easily to refer for their studies and assignments. That is why this software is created. PE-QA.EXE supports students which are like this quote “Be a lifelong student, the more you learn, the more you earn and the more self-confidence you will have”.

3.0 PROBLEM STATEMENT

Among the problems that arise from this pandemic are internet connections that are needed for all people that are affected. Based on the survey done on ICT usage and access by the Department of Statistics (DOSM), computer usage in the rural areas appeared to be left behind at only 54 per cent compared with 77.3 per cent for Malaysians who live in urban areas. Thus, these data show the need to address this issue [6]. This will be a burden for the people that need internet access to complete their task. For example, students now need to follow their lecture through online conferences or online notes. So the students that can't afford an expensive and faster internet will lag behind from the peers in learning.

Apart from that, majorities of students are having final exams online. Thus, they need a platform where they can learn and practice their coding. As a result, PE-QA.EXE created this website as a main platform for all students who take engineering courses to help them finish their assignment and score high in their online test.

Other than that, people surf the internet and buy some things from the online shops. There will be some leakage of private information such as your account id and password as the user needs to agree to share the information needed for them to process the buying. This will increase the risk of leaking the information which could lead to voice phishing, frauds or even identity theft. Some of the apps that have been provided can't provide a 100% sureness for stored information are not leaked anywhere.

PE-QA.EXE is an Offline Malaysian Algorithm application during COVID-19 outbreak that focuses on helping the people by giving them a guide or easier way to finish their tasks. The application provides an ATM system, admin-customer database (shopping), hash the password and also a binary tree system for the users. The coding for simulation will also be provided in the application. Other than that it also gave some entertainment options for the user by generating a tic tac toe game as they are using the application. This application also focuses on giving the people especially students that want to learn algorithm and data structure by giving them the basic understanding for topics such as queue, stacks, array, sorting, linked list, searching, hashing and graphs that are covered in a single application. After learning all the basics, the project also gave an option for the users to try code for themselves. As a quote goes "You never know what you can do until you try, and very few try unless they have to." – CS Lewis. This shows that PE-QA.EXE is a multi-purpose application that can be used by all people in Malaysia.

4.0 OBJECTIVES

1. To design an application that is easy and cost free for people to use during the quarantine.

2. To give students more information about algorithms and data structure at the same time they can learn through the application.

3. To provide some entertainment options for the user especially during quarantine.

5.0 LITERATURE REVIEW

According to the Chinese researchers, online education is a network-based approach to teach which offers rapid learning through the application with more resources, more autonomy, unlimited time and unlimited space. Shi Yong Zheng, Su-Ping Jiang, Xiao-Guang Yue, Ruihui Pu, and Bi-Qing Li stated that online education is convenience and efficient as the characteristics of the mobile internet era are described as SoLoMo (Social/Location/mobility). Based on Shi Yong Zheng, she has proved that students prefer to have high favor in online learning rather than using online courses in order to obtain credits within the prescribed courses. She stated that an improved online education learning system can enhance the sense of on-site teaching, improve the systemicity of learning, improve the completion rate of the curriculum, optimize the quality of education, reduce the pressure on teachers, optimize the certification system, and change the educational concept [8].

Based on the research, six critical success factors in online education are ease of access and navigation, interface, interaction, attitudes towards students, instructor technical competence and classroom interaction. Most states need to expand access to education in order to meet the education and training needs of state residents and companies and to educate under-served populations. According to Weill and Broadbent, some are hoping to leverage the scalability of online education to avoid overwhelming their bricks-and-mortar capacities by alleviating capacity constraints. Whitty et al indicates that any higher education institutions are being challenged to adapt rapidly to a decrease in public funding and to an increasingly competitive environment. Whitty et al also stated that online learning acts as a catalyst for institutional transformation as many higher education institutions are being challenged to adapt rapidly to a decrease in public funding and to an increasingly competitive environment. As being said by Thierry Volery and Deborah Lord, online education capitalizes on emerging market opportunities. The key factors in effective online delivery is effectiveness in terms of student involvement and participation, cognitive engagement, technology self-efficacy (i.e. the belief that one has the capability to interact with a given technology), perceived usefulness of the technology employed, and the relative advantage or disadvantage of online delivery. According to studies, three main variables affecting the effectiveness of online delivery are technology, instructor characteristics and student characteristics [6].

E-learning is defined as part of the new dynamic that characterizes educational systems at the start of the 21st century. Like society, the concept of e-learning is subject to constant change. World Asia stated that to take control of the situations, the Government of India issued the guidelines on social distancing and has been communicating to the entire population through different channels successfully. Besides, Hindustan Times pull out the fact that 82 districts all over the country have been locked down to get control over the situation. In addition to that, Times of India said the teaching community is trying to question back how they are safe from the pandemic disease if not the students and on the other hand few educational institutes are mulling to terminate a few teachers for saving the money [9].

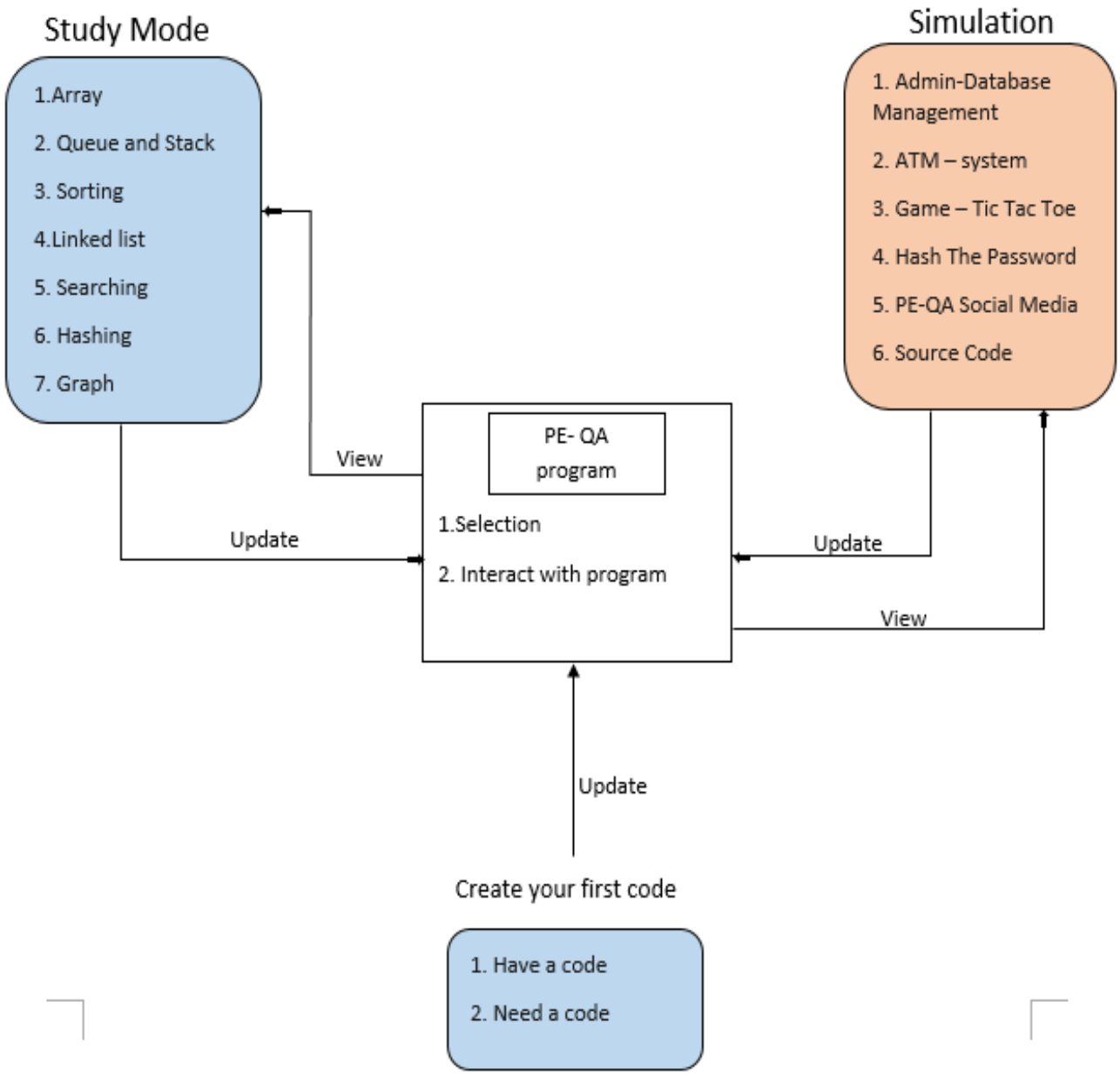
Based on Mokhtar Abdullah, Nor Azilah Husin and Ameer Haider research, due to the pandemic Covid-19, universities and colleges are forced to shut down their campuses. Therefore, students and teachers are struggling with the new sudden law of teaching and learning which they need to change their teaching-learning process and ways of doing assessment by having an online class instead of face-to-face-classes. According to the Ministry of Higher Education Malaysia, online learning will be continued in all universities until 31st of December 2020. There are a few responses from higher educations due to Post-Covid19 Pandemic in Malaysia which said that Malaysian universities have endured enough problems to face before the emergence of Covid-19 Pandemic. According to Husin, Abdullah and Ali, 55% of Malaysia's private institutions of higher education have been financially losing money and some of them have either been shut down or are under serious financial stress. Mokhtar Abdullah, Nor Azilah Husin and Ameer Haider said that the global lockdown of education institutions is going to cause major interruption in student learning [10].

6.0 METHODOLOGY

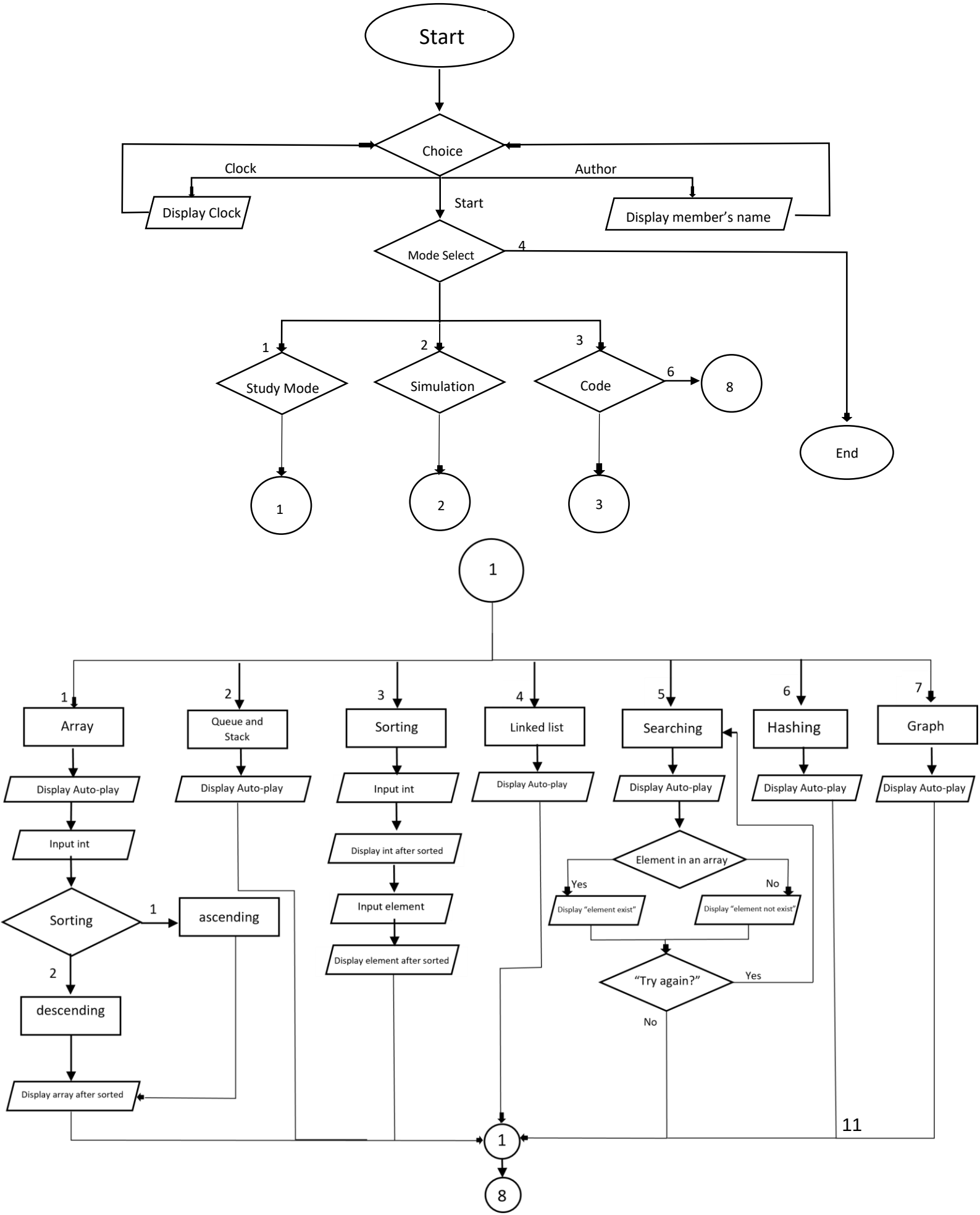
6.1 OVERALL STRUCTURE

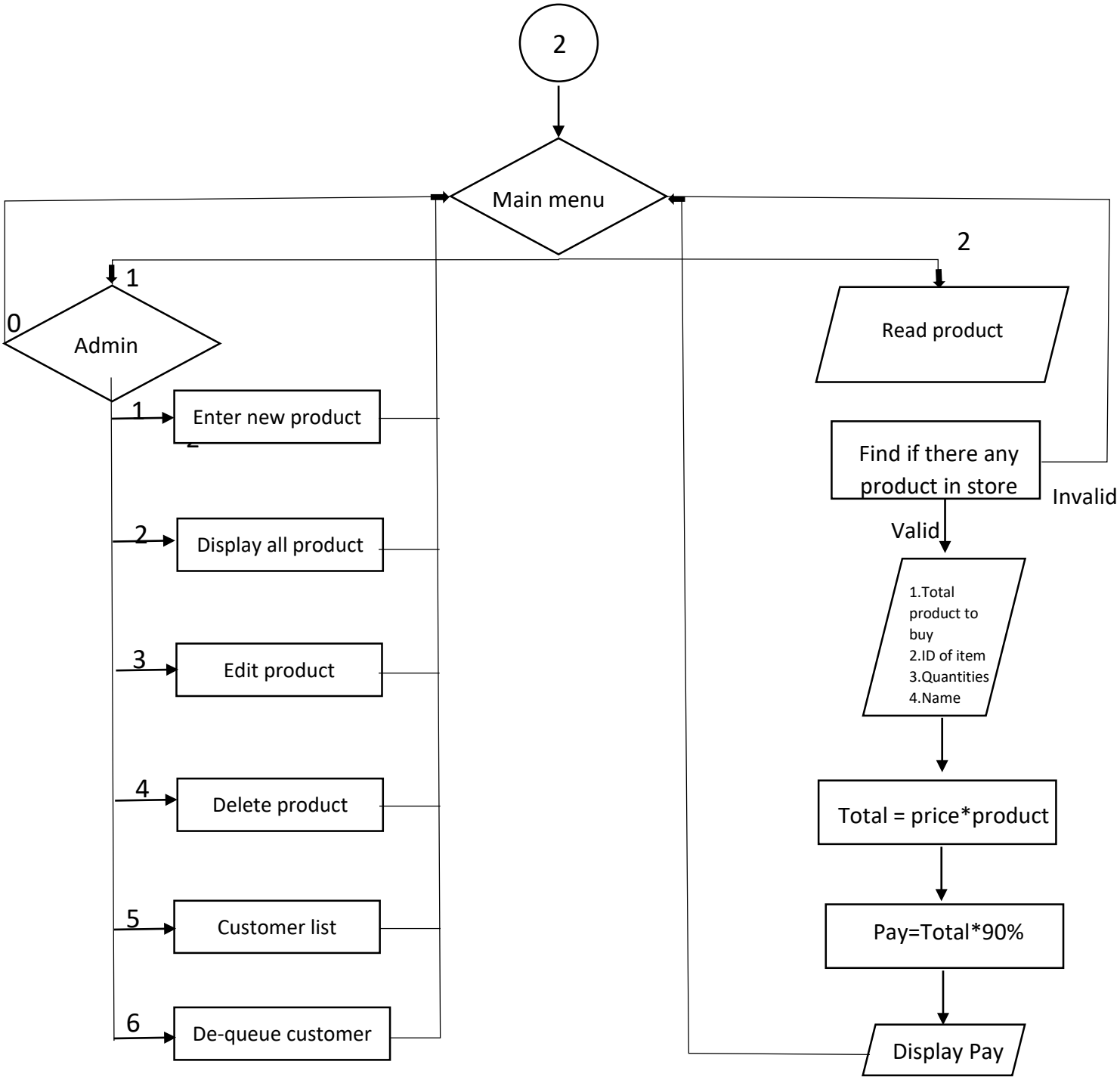
Basically, PE-QA is an educational app which can produce the programmers pioneer and also suitable for all ages. If the user wants to study about the algorithm and data structure, they can go to the study mode option. In the study mode option we provide 7 chapters for the user which is array, queue and stack, sorting, linked list, searching and hashing. Also we are giving certificates for the user once they finish the topics. Next, if the user wants to see the simulation of what algorithms can do, they can go to the simulation mode which show 5 types of simulation that can be made using algorithms. Other than that, the user can try to create their first code and the programme will link the user to the online compiler. Also if the user doesn't have their code the programme will link the user to our website where they can ask for a code in that website. This application also provides entertainment such as tic tac toe and users also can do their online shopping using these apps.

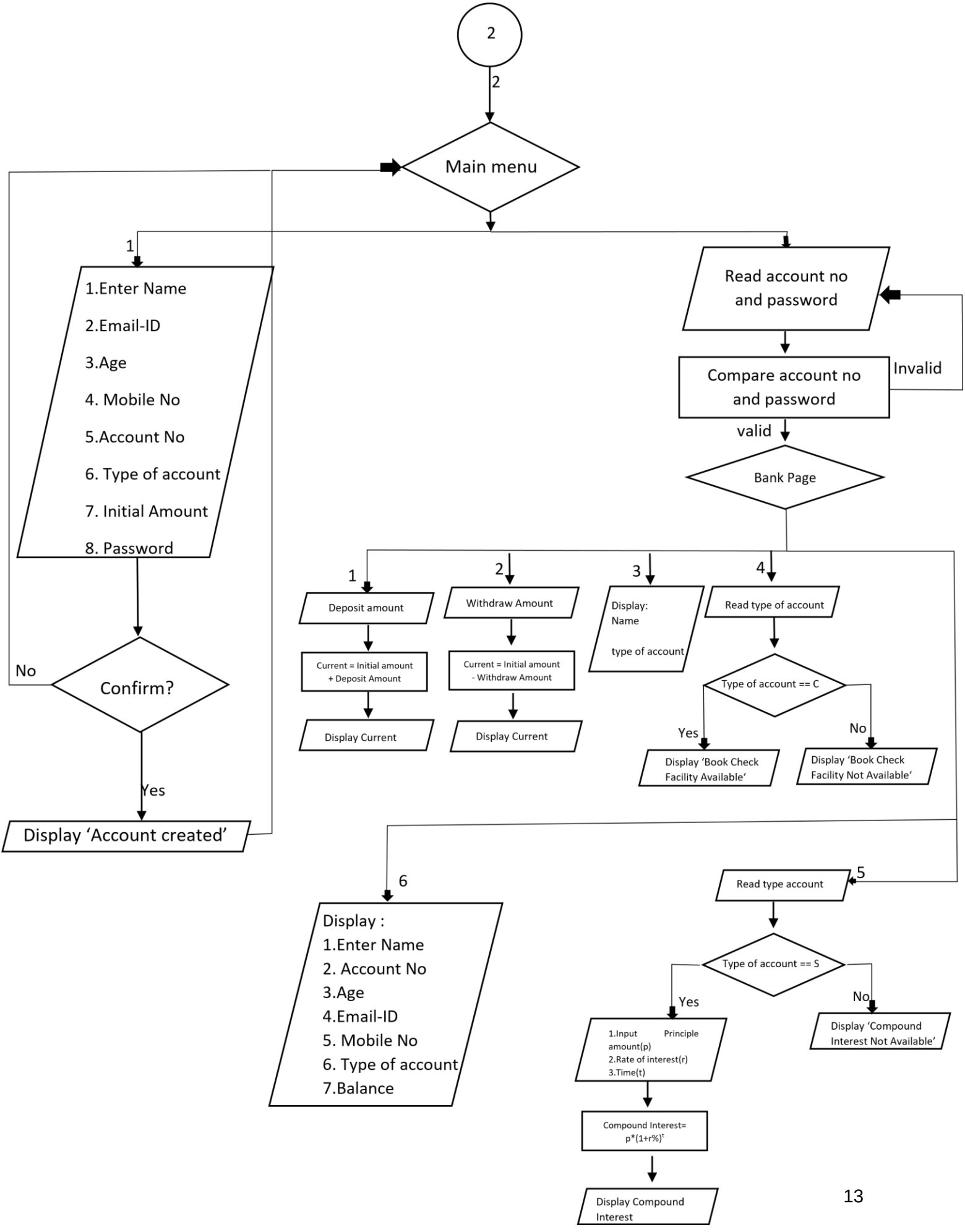
6.2 BLOCK DIAGRAM

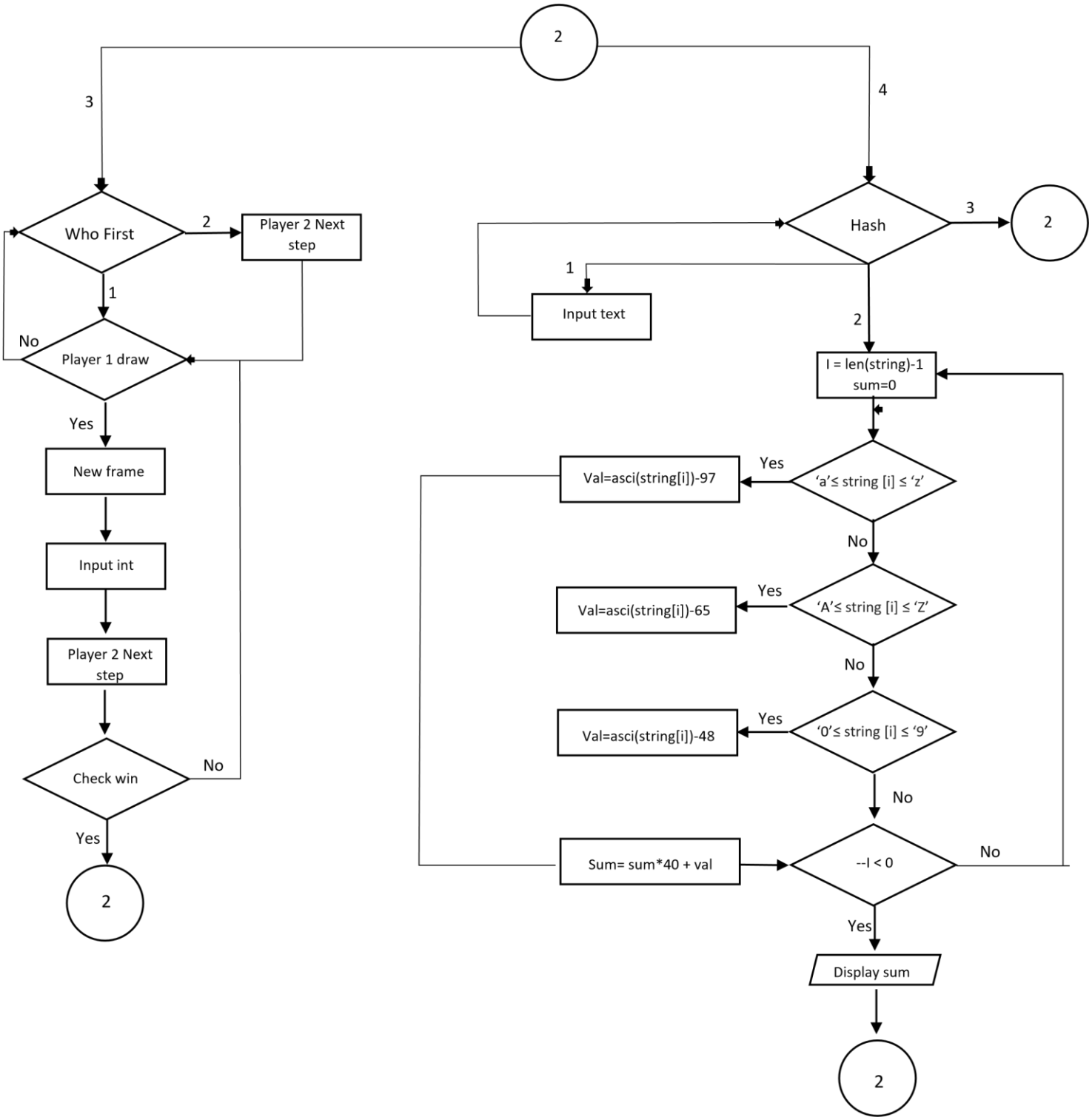


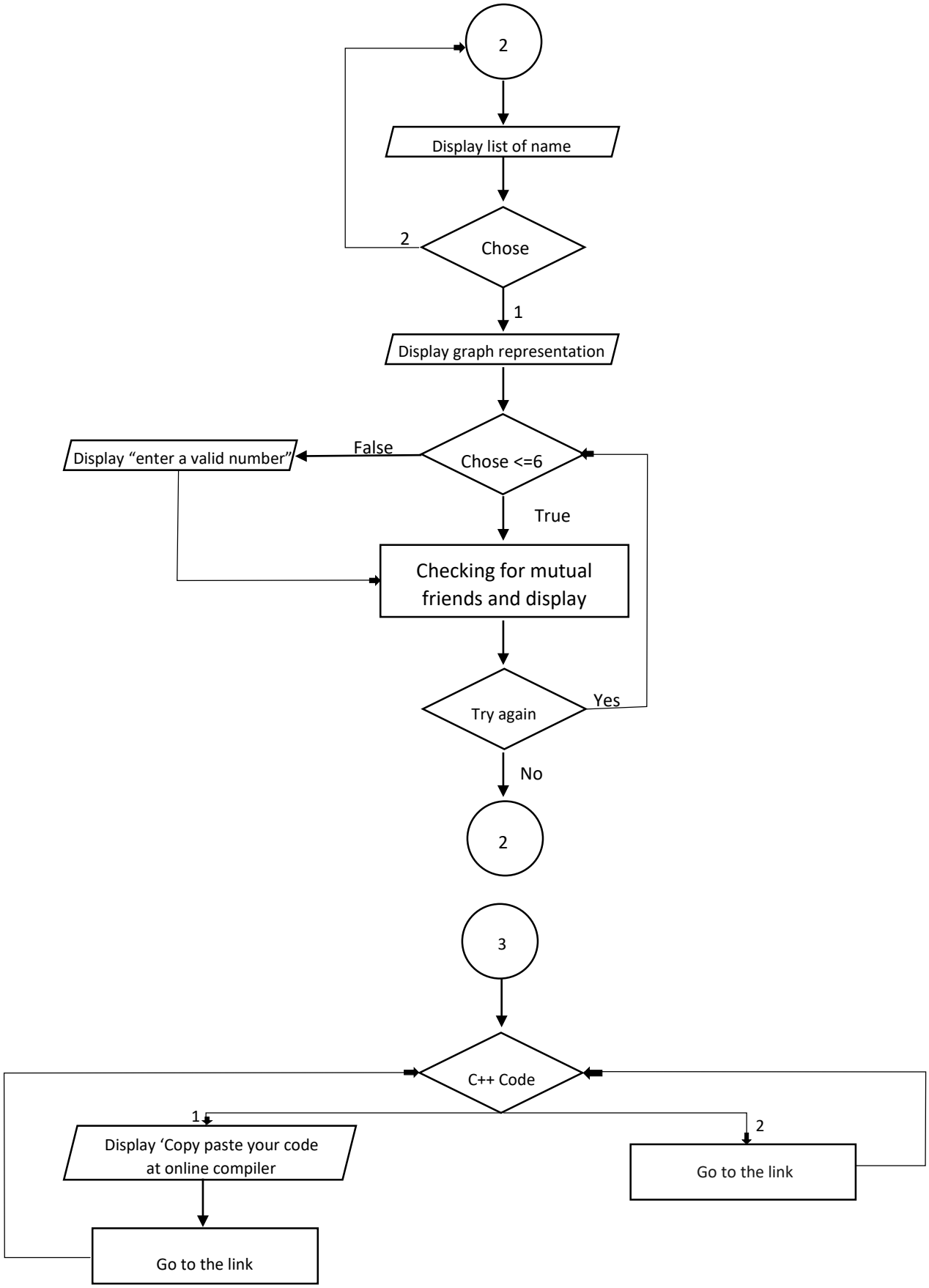
6.3 FLOWCHART

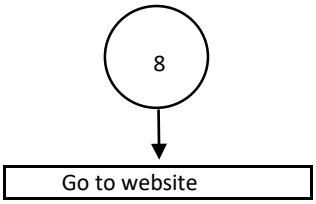



2
Main menu
2
1
0
Admin
Read product
1
Enter new product
Find if there any product in store
Invalid
2
Display all product
Valid
1.Total product to buy
2.ID of item
3.Quantities
4.Name
3
Edit product
4
Delete product
Total = price*product
Pay=Total*90%
5
Customer list
6
De-queue customer
Display Pay


2
2
Main menu
1
1.Enter Name
2.Email-ID
3.Age
4. Mobile No
5.Account No
6. Type of account
7. Initial Amount
8. Password
No
Confirm?
Yes
Display 'Account created'
Read account no and password
Compare account no and password
Invalid
valid
Bank Page
1
Deposit amount
Current = Initial amount + Deposit Amount
Display Current
2
Withdraw Amount
Current = Initial amount - Withdraw Amount
Display Current
3
Display:
Name
type of account
4
Read type of account
Type of account == C
Yes
Display 'Book Check Facility Available'
No
Display 'Book Check Facility Not Available'
6
Display :
1.Enter Name
2. Account No
3.Age
4.Email-ID
5. Mobile No
6. Type of account
7.Balance
5
Read type account
Type of account == S
Yes
1.Input Principle amount(p)
2.Rate of interest(r)
3.Time(t)
Compound Interest= p*(1+r%)^t
Display Compound Interest
No
Display 'Compound Interest Not Available'


2
3
4
Who First
2
Player 2 Next step
1
No
Player 1 draw
Yes
New frame
Input int
Player 2 Next step
Check win
No
Yes
2
Hash
3
2
1
Input text
2
I = len(string)-1
sum=0
'a'≤ string [i] ≤ 'z'
Yes
Val=asci(string[i])-97
No
'A'≤ string [i] ≤ 'Z'
Yes
Val=asci(string[i])-65
No
'0'≤ string [i] ≤ '9'
Yes
Val=asci(string[i])-48
No
--I < 0
No
Sum= sum*40 + val
Yes
Display sum
2


2
Display list of name
2
Chose
1
Display graph representation
False
Display “enter a valid number”
Chose <=6
True
Checking for mutual friends and display
Try again
Yes
No
2
3
C++ Code
1
Display ‘Copy paste your code at online compiler
Go to the link
2
Go to the link


8
Go to website

6.4 EXPLANATION OF OVERALL FLOWCHART

6.4.1 STUDY MODE

At the start of the program, the users are shown the front page of the program where choice was declared. The users are prompted to continue. The choices are clock, author and start. If the clock is chosen then the program will display the clock and go back to the front page. If the author is chosen then the program will display the member's name and back to the front page. If start is chosen then the program will proceed to mode select pages where there are 3 choices available study mode, simulation and code. If the user enters the choice 1 which is the study mode, the front page of study mode will be displayed. The page will show 8 choices for the user to prompt in which is array, queue and stack, sorting, linked list, searching and hashing. If the user enters 1 - array, the system will display auto-play then they will need to enter int input to move for the next step. For the next step, the users are given choices to pick the ascending or descending and they will be displayed array after sorted. If the user enters the 2 - queue and stacks, the system will display auto-play. If the user enters the 3- sorting, the user is prompted to key in int as input, the system will display the int after sorted. Next, the program will ask the user to enter input element then the system will display element after sorted. If the user enters the 4 - linked list, the system will display auto-play. If the user enters the 6 - searching, the system will display auto-play. The users are prompted to key in elements in an array that has been shown. If the element is in the array, the program will display "element exists". If not, the program will display "element not exist". After the display, the users are asked to "Try again?" if "Y" then the user will be shown the array again. If "N" then the user will show the study mode front page. If the user enters 6 - hashing, the system will display auto-play. If the user enters the 7 - graph theory, the system will display auto-play. If the user enters the 8 - main menu, the system will go back to the front page of the mode select. After finishing all the auto-play of each choice. The user will be linked to the website and shown the front page of study mode again.

6.4.2 SIMULATION MODE (ADMIN-DATABASE MANAGEMENT)

The users are shown the front page of simulation if they choose 2 - option for the mode select page. The front page of the simulation consists of 7 choices. If the user key in 1 - option which is the admin-customer database management. They will be directed to the main menu of the admin-customer database management. The main menu consists of 4 choices. If the user keys in 1 - option, they will be shown the admin page where they can enter any number from 0 to 6 for each choice they are making. If the user enters the number 1, then they will need to key in the product id, product name, and product price and product quantity. The input that has been keyed in by the user will be stored in the program. If the user enters the number 2, the program will show all products that have been stored by the user. If the user enters the number 3, the program will show the page where the product being stored can be modified. If the user enters the number 4, the program will show the page where the product being stored can be deleted. If the user enters the number 5, the program will show the page where the customer name list is shown. If the user enters the number 6, the program will show the page where the customer name can be de-queue. If the user enters the number 0, the program will show back the admin page. If the user key in 2 - option. They will be shown the customer page where they can see the amount of product stored by the program admin. Then the program will prompt the user to key in the total item that they want to buy and the id of the items. If valid, the user can continue. If invalid user will need to enter the id of items that are available. If valid, the user will key in the total product to buy, id of item, quantities and name. Then the program will calculate the pay by multiplying the total price and 90 percent. The program will display pay. The users are shown back the main menu of the admin-customer database management.

6.4.3 SIMULATION MODE (PE-QA BANK ATM)

In simulation mode, the user will enter PE-QA Bank if they choose 2. Inside the simulation mode, there are two modes, create a new account and sign in to the created account. If the user creates a new account, they are needed to key in their info's such as name, email, age, mobile number, type of account, initial amount and password. The account was created after the user has keyed in their personal information. After that, the user can enter their account by sign in their account number and password. If the account number and password does not match, the system will reject the user from signing into the bank. Meanwhile, if the account number and password matches, the user will gain access to the bank. In the bank, the user can deposit an amount, withdraw an account, display account balance and read the type of account. If the account is current, a book check facility is available. If the account is a savings account, the compound interest can be calculated. The bank can also display info's of the user personal data inside the bank system.

6.4.4 SIMULATION MODE (TIC TAC TOE GAME)

In simulation mode, the user will enter Tic-Tac-Toe Game if the user enters 3 in simulation mode. At the start of the programme, the system will ask whether we want to be player one or player two. If the user enters 1, player 1 will be selected. The game process is easy as there are 9 unoccupied locations to store. Now the users are needed to store the remaining unoccupied locations by inserting numbers from 1 to 9. If the location is already occupied, the program will prompt that location is occupied so the user needs to insert another location. If the user gets tripled locations, they will win the game. If vice versa, they will lose the game.

6.4.5 SIMULATION MODE (HASH THE TEXT)

In simulation mode, the user will need to enter 4 to get into Hash the Code option. Inside the hash the code option, a special hashing library was used to hash the string. The users are needed to give input of the string first. After that, the user can hash the inserted text to get the hash value. The hash value may be varied and random.

6.4.7 SIMULATION MODE (GRAPH THEORY)

In simulation mode, the user will need to enter 5 to get into PE-QA Social Media (Check Mutual Friends) by using graph theory. This can be used in the social media application out there. Firstly, the user was given a list of names. Then, they are also given the graph representation to show the connected friends. The users are given a choice to check mutual friends by clicking 1 - check mutual friends. Adjacency matrix was used in the linked list. Then, after checking the mutual friends, the system will ask the user whether to try again the programme or exit programme.

6.4.8 CREATE YOUR FIRST CODE

In creating your first code, the user was given a chance to code their own C++ code. The user can now code C++ if they choose option number 1 where they will be directed to the online website C++ compiler. If they choose 2, they will be directed to the PE-QA website where they can get their code. Lastly, they can choose 3 to go back to the main menu.

7.0 RESULTS AND DISCUSSION

In the simulation of the program, the users are given 3 choices to enter. The choices are STUDY MODE, SIMULATION MODE and CREATE YOUR FIRST CODE. This section is called mode select as shown in Fig. 1 below.

Fig. 1. The front page of the program.

If the user enters 1 on option they will be shown the STUDY MODE page where there are another 8 options that the user can enter. In STUDY MODE, we have applied all Engineering Algorithms concepts in coding. Each number represents each topic that is available in the study mode. Choice 1 is array. Choice 2 are queue and stacks. Choice 3 is sorting. Choice 4 is a linked list. Choice 5 is searching. Choice 6 is hashing. Choice 7 is graph theory and choice 8 for the user to go back to the main menu as shown in Fig. 2.

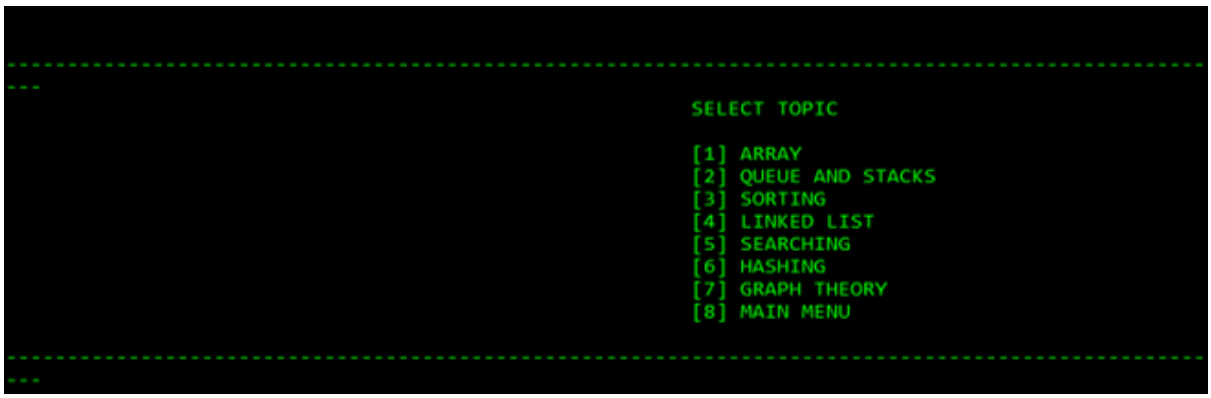


Fig. 2. The page for study mode.

For example, if the user entered option 1, array topic will be selected. Then, they will be directed to the system auto play page where the system will teach the user the basics of the topic array as shown in Fig. 3.

Fig. 3. System Auto play.

We applied array coding inside the array study mode. After finishing the topic, the user will be shown the end page of the completion topic as illustrated in Fig. 4.

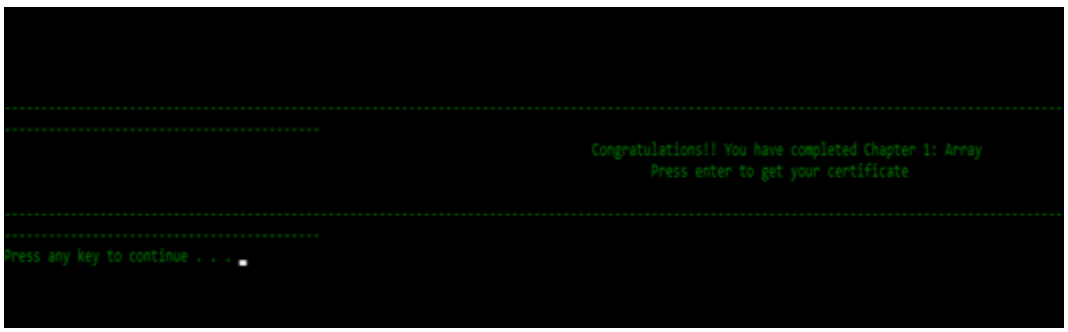


Fig. 4. Notice of Completion.

Next, they will link straight to the PE-QA.EXE website in Fig. 5 where they can get their certificate of completion for the topic as in Fig. 6.

Fig. 5. PE-QA.EXE Website.

Fig. 6. Certificate Given.

Then, the users are directed back to the front page of study mode as in Fig. 2 after they have gotten their certificate for the topic finished where the user can pick to continue another topic or back to the main menu. For each option the process of the program will be the same as the option 1, array topic. The other choices may be linked list, searching and hashing. All of the topics have applied Engineering Algorithms concepts and ideas.

Fig. 7. Main Menu in Simulation Mode.

Now let's move into simulation mode. For this main menu which is Fig. 7 in simulation mode, if a user enters 1, it will go to Admin Customer Database Management. After that the screen will appear as illustrated in Fig. 8. We have applied a linked list and queue and stacks concepts throughout this mode.

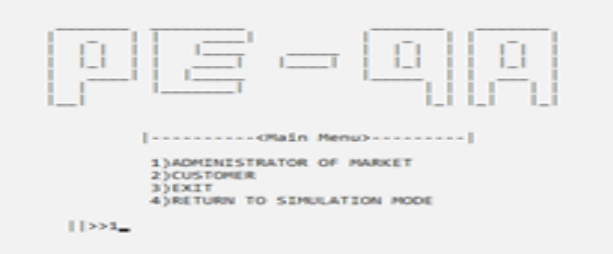


Fig. 8. The Main Menu of Admin Customer Database Management.

Fig. 8 shows the option for the user to choose. If a user enters 1, it will go to the Administrator of Market and then the screen will show the administrator portal as shown Fig. 9.

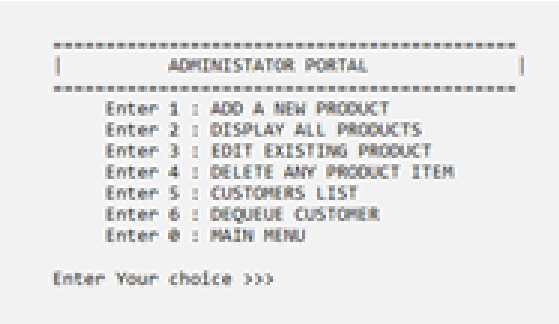


Fig. 9. Administrator Portal.

In Fig. 9, if the user enters 1, users are able to enter a new product and the program will ask the user to enter the product Id, Name, price and also the quantity as shown in Fig. 10. If a user enters 2, the program will display the product that has been saved as shown in Fig. 11.

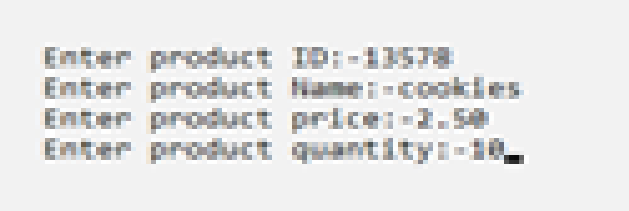


Fig. 10. User inserts new data.

Fig. 11. Existing Product.

Meanwhile if the user enters 3, users are able to edit the existing product. The program will show you the old details of your product and it will ask users to enter new details for the products that they want to edit as shown in Fig. 12. Then the program will display the new details of the product as shown in Fig. 13.

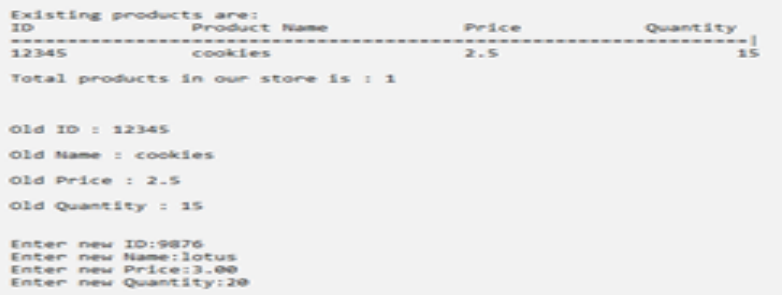


Fig. 12. Modify existing data.

Fig. 13. Modified data.

If the user enters 4, the user can delete the product and the program will ask the user the id that they want to delete as in Fig. 14.

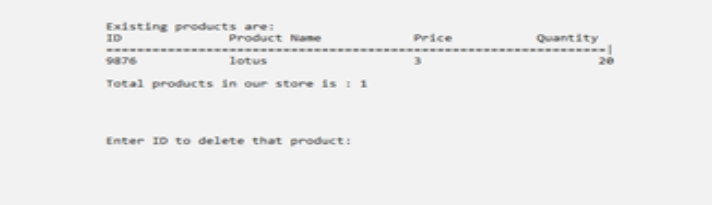


Fig. 14. Delete existing data.

For example, if a user enters the product id 9876, the program will immediately delete the product and display it as shown in Fig. 15.

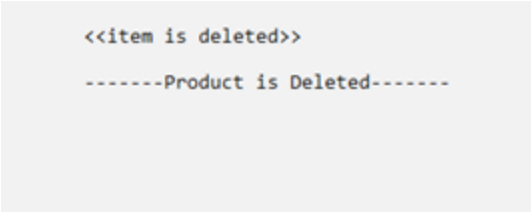


Fig. 15. The program displays deleted data.

If users enter 5, the program will display the existing customer list as shown in Fig. 16. If a user enters 6, the program will dequeue the customer list and display Fig. 17.

Fig. 16. Display existing customer list.

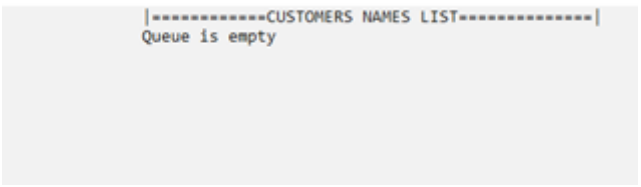


Fig. 17. Dequeue customer list.

Next, if the user enters 0, it will go back to the main menu as shown in Fig. 8. For option 2 is for customers and if the user enters 2 it will display the number of your trolley in Fig. 18.

Fig. 18. Trolley left indicating customers limit per day.

Then, the program will ask the user how many items and details of the product that customer wants to buy as in Fig. 19 and Fig. 20. After that it will display to the user the price and discount as shown in Fig. 21.

Fig. 19. The program asks how many items want to add to cart.

Fig. 20. The customer fills in their data information to record their purchase.

Fig. 21. The system displays the original price and discounted price of 10%.

After that, if the user enters 3 or 4 the program will go back to the main menu as shown in Fig. 8. Back to Fig. 7, users will need to enter 2 to use the ATM System. We have applied arrays in this mode. The screen that will appear is as shown in Fig. 22. The user will need to create an account first before signing in into PE-QA Bank. The information that the user enters in the create account section will be safe into arrays.

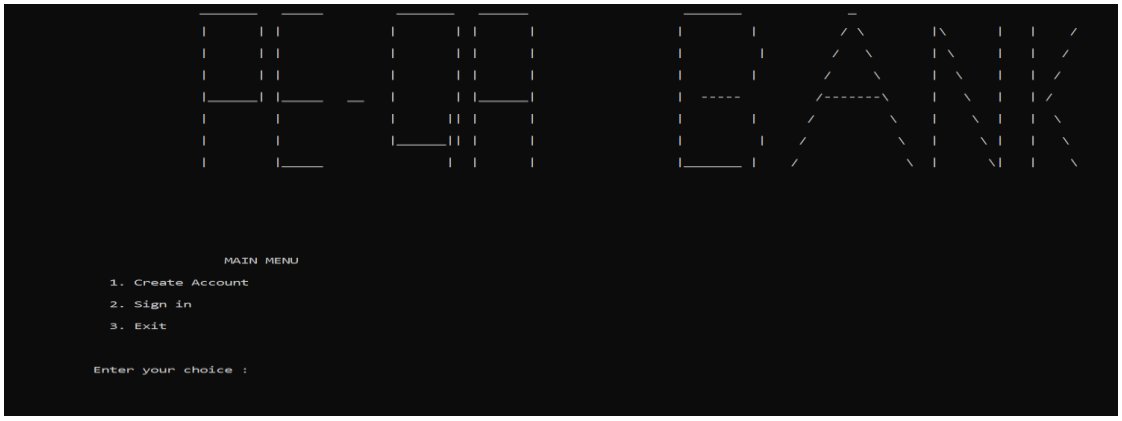


Fig. 22. Main Menu for ATM System.

Then the user can sign in as in Fig. 23. If the password entered is wrong, the system won't let the user get into the system, but if the user key in the correct username and password, they will gain access to their bank account. Our system has used asterisk characters, so that the user can protect their password from being seen by others. The next selection menu will be shown as in Fig. 24.

Fig. 23. User Sign in ATM System.

Fig. 24. Selection Menu for ATM System.

The user can either deposit or withdraw their money from this website and the balance will be shown as in Fig. 25. The simple math is used in the coding to get the balance amount after withdrawal and deposit cash.

Fig. 25. Balance Amount in ATM System.

The other option like check book facility and calculating compound interest can also be used by users if they enter 4 and 5. For the check book facility option, the user can see if it is available or unavailable as shown in Fig. 26.

Fig. 26. Check Book Facility.

For compound interest which users need to enter 5, it will be shown as in Fig. 27.

Fig. 27. Check compound interest in current account.

Lastly, users can check their account info as in Fig. 28.

Fig. 28. Account info in the ATM System.

Next, in simulation mode in Fig. 7, if the user selects option number 3, the program goes to the Tic Tac Toe Game. In Fig. 29, the user will have a choice to be player one or player two. If the user chooses player one, the user will get the character of player one, but if the user chooses player two, the user will get the character of player two.

Fig. 29. The game asks whether we want to be player one or player two.

In Fig. 30, after the user has chosen the player number, the user is prompted with the Tic Tac Toe 3X3 box. Now, the user is supposed to key in the input number from 1 to 9 in the 3X3 box. The default value of the number is 0. For an example, the user chooses player one, then if the user gives the input of 1 to 9 in the 3X3 box, the value of 0 will be overwritten by 1. As for the second player, the value of 0 will be overwritten by 2. If the user occupies the space with number of 1 tripled, the user wins the game as in Fig. 30.

Fig. 30. Player one wins the Tic Tac Toe Game.

Just in case if the user gives the input in the same 3X3 Tic Tac Toe box, the programme will prompt out “This location is already occupied” as in Fig. 31.

Fig. 31. The location is occupied.

Done for Tic Tac Toe. Now the user should go back to simulation mode in Fig. 7. If the user enters 4 in Fig. 7, it will go to Hash the Password. After that the screen will appear as shown in Fig. 32. We have applied hashing methods by using a special library in C++.

Fig. 32. Hash The Password main menu.

Fig. 32 shows the option for the user to choose. If the user enters 1, the program will ask the users to enter the text like Fig. 33. Meanwhile, if the users enter 2 the program will hash the data automatically that is stored in the program like Fig. 34. If the users enter 3 it will go to simulation mode like in Fig. 7.

Fig. 33. Enter text to be hashed.

Fig. 34. Hashed text was generated.

After the users enter the text to hash it will automatically be stored in the program, if the users want to change the text the users need to enter 1, if the users want to hash the password users need enter 2 then it will appear as Fig. 35. After the text has been hashed it will go back to the main menu.

Fig. 35. Hashed text (another data).

Next, we will move on to the last simulation mode, PE-QA Social Media (Check Mutual Friends) whereby the user is needed to enter 5 in Fig. 7. We have used graph theory in this programme. At first we made a linked list in Fig. 36. Secondly, we have linked certain people according to their friends based on the graph representation shown below.

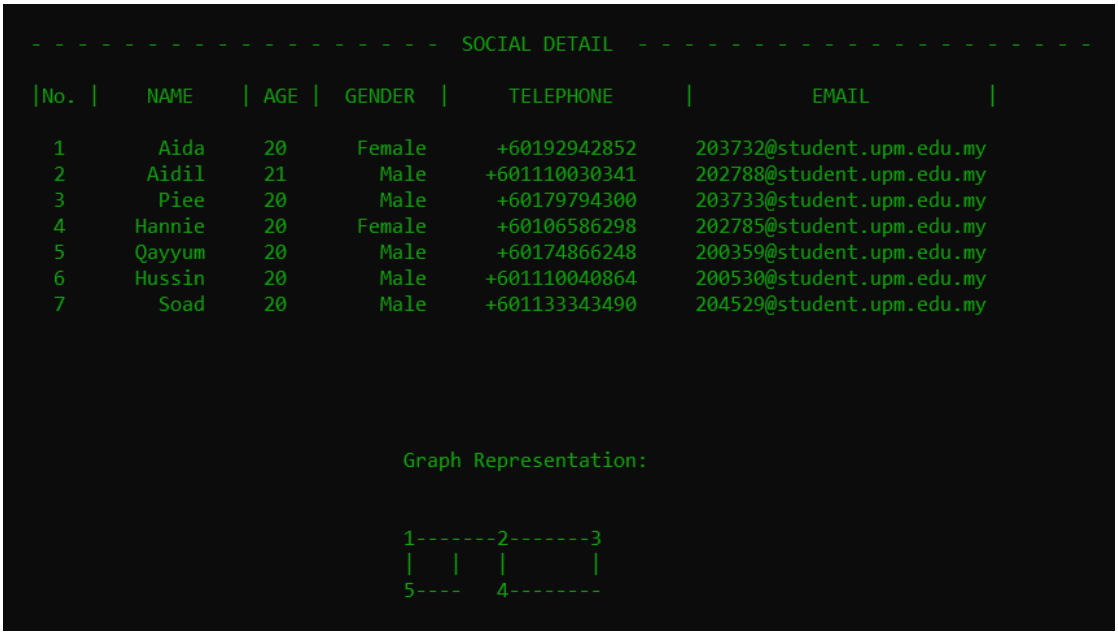


Fig. 36. List of Users in the Social Media Account.

To check mutual friends, the user needs to choose 1 to check mutual friends as in Fig. 37. In the results that we have tested, we have chosen Aidil to check his mutual friends. As seen in Fig. 38, Aidil's mutual friends are Aida, Hannie, Piee and Qayyum.

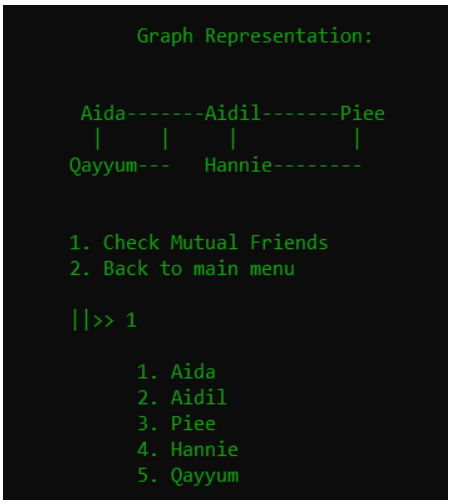


Fig. 37. The Graph Theory Representation of Mutual Friends.

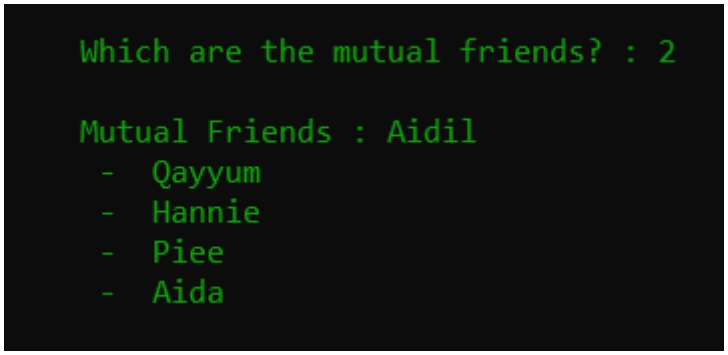


Fig. 38. Aidil's mutual friends.

After the user has known Aidil's mutual friends in Fig. 38, the system asks the user whether to try again or not. If the user presses 'Y', the user will be directed back to Fig.36 and repeat the process. In the second trial, we have chosen Aida to check her mutual friends. As a result, Aida's mutual friends are known to be Qayyum and Aidil.

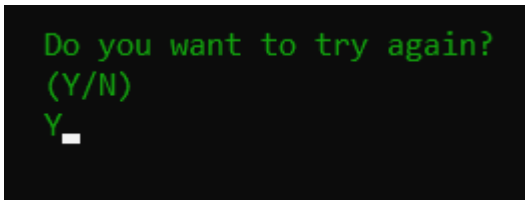


Fig. 39. Asking the user if they want to try again.

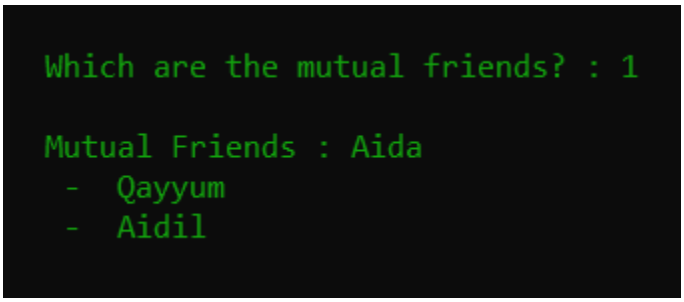


Fig. 40. Aida's mutual friends.

Lastly, in Fig. 7, if the user enters 3, it will lead the user to start coding their own C++ code. The main menu is shown in Fig. 41 below where the users need to choose one out of the three options. If the user enters 1, the user will be directed to an online compiler online in the url of https://www.onlinegdb.com/online_c++_compiler. If the user enters 2, the user will be directed to PE-QA.EXE Linktree website in Fig. 5.

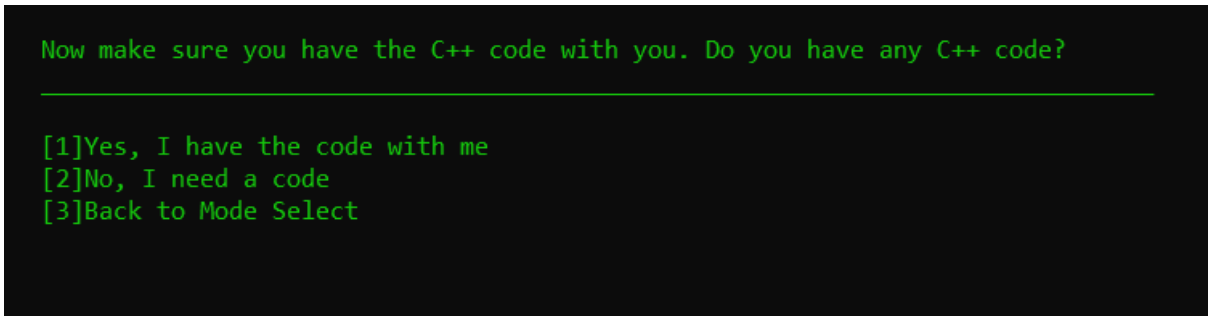


Fig. 41. Start to code C++.

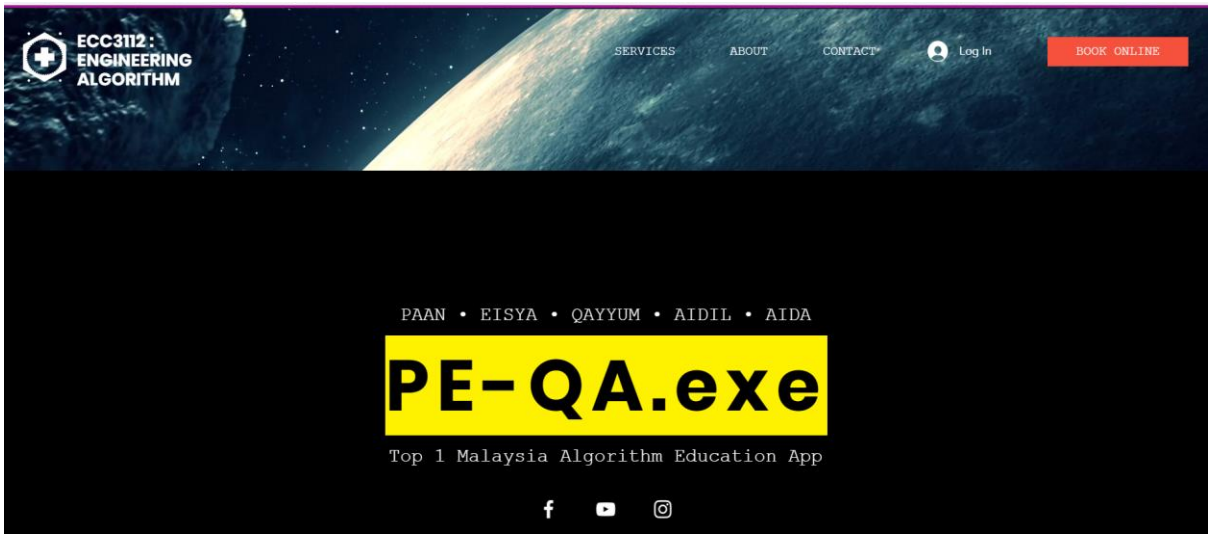


Fig. 42. PE-QA.EXE official website.

8.0 CONCLUSION

In conclusion, this project is beneficial for everyone because it is suitable for all ages and it also can assist the students in learning algorithms and data structure by providing some of the topics related to it. In a nutshell, this project is successful because it solved the problem that has been stated by achieving the objectives.

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10.0 PROJECT MEMBER'S ROLE

MATRIC NO	MEMBER'S NAME	ROLE
202788	AIDIL HARITH ANWAR BIN AZMI	Report (block diagram, flowchart and results)
202785	EISYATUL HANNIE BINTI MOHAMMAD RUSHDAN	Report (abstract, introduction, slides, reference format and results)
203732	NURUL AIDA BINTI ZAIROL AKMAR	Report (objective, results, overall structure and conclusion)
203733	NIK MUHAMMAD FARHAN BIN OWI SIONG KIAT @ RUSTAM AL	Report (abstract, problem statement, explanation of overall flowchart and results)
200359	AHMAD QAYYUM FIKRI BIN AHMAD JAZIMIN	Coding, literature review, explanation of overall flowchart and results