ONLINE STUDENT PERFORMANCE EVALUATION IN SYSTEM-Z MAINFRAME

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This thesis submitted in partial fulfillment

of the requirements for the award

of the degree of

Bachelor of Computer Science (Computer Systems & Networking)

Faculty of Computer Systems & Software Engineering

Universiti Malaysia Pahang

JUNE 2012

STUDENT'S DECLARATION

I declare that this thesis entitled "Online Student Performance Evaluation in System-z Mainframe" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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SUPERVISOR'S DECLARATION

"I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of the Degree of Computer Science (Computer System & Networking). "

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DEDICATION

Thankful to Allah the Almighty…

To My Beloved Father and Mother…

Razali Bin Haji Salin & Nor Siah Binti Hassan…

Your Love and Sacrifice Will Be Always In My Mind…

To My Supervisor…

Dr. Mohamed Ariff Ameedeen…

Thank A Lot for Support, Encouragement and Guidance…

To My Academic Advisor…

Mrs. Zarina Dzoldkifli…

Thank A Lot for Support, Encouragement and Guidance…

To All My Friend…

Hope We Can Live Like the Way We Dream Of…

…Thank You for Everything…

ACKNOWLEDGEMENT

Alhamdulillah, firstly I would like to thank to Allah S.W.T because without His blessing I will not finished my PSM successfully. Thanks to our mighty god of Allah S.W.T because give me strength and spirit to finished up my final project entitled "Online Student Performance Evaluation in System-z Mainframe". I also would like to thank to my supervisor, Dr. Mohamed Ariff Ameedeen for his encouragement guidance, advices, critics, help and many more. Without his support, my PSM documentation would not have been the same as presented here. Special thanks to Mr. Shreeka and Mr. Goutham, the consulted instructor from IBM India because they are willing to help my friends and I in order to do this final project.

As for my Academic Advisor, Mrs. Zarina Dzoldkifli, I would like to thanks a lot for all her effort, caring and advises. She had done her duty very well and took a good care of me from the beginning until now. May Allah bless her.

I also very thankful that I have lots of friends here to give me support and sometimes they had helped me when I needed. Never forgotten my family members especially my parents who always give me support and pray for me to get success in everything that I did especially to complete this task. Thank you.

ABSTRACT

Today, the term mainframe can best be used to describe a style of operation, applications and operating system facilities. The z mainframe plays a central role in the daily operations of the world's largest organizations and the daily lives of most people. Nowadays, mostly the system is manual entry into database and use a single entry at a time. There are also unformatted data stored. Thus, this project paper is done to present a design of online student performance evaluation in system-z mainframe where it gives benefit to create automated data entry into the database via COBOL. Besides that, to create a batch type input and output system and to generate a formatted report stored in an independent flat file as output. Furthermore, this project is build to make the recording more efficient, easy to be stored and retrieved from the database. This project design consists of the workflow of the developed system diagrams, logical use case diagram and the example design interfaces itself. This project also reviewed the current system and the existing system that related to online student performance evaluation. Other than that, this project paper reviewed on the current technique on operating system in mainframe which can support thousands of applications and input or output devices to simultaneously serve thousands of users. Generally this system has met its objectives which are to develop "Online Student Performance Evaluation in System-z Mainframe" to make the new systematically. After making a research, analysis, and lastly make a testing to all programs, finally the "Online Student Performance Evaluation in System-z Mainframe" is successfully developed.

ABSTRAK

Hari ini, kerangka utama boleh digunakan untuk menggambarkan gaya operasi, aplikasi dan kemudahan sistem operasi. Kerangka utama z memainkan peranan utama dalam operasi harian organisasi terbesar di dunia dan kehidupan harian masyarakat. Pada masa kini, sebahagian besar sistem kemasukan adalah secara manual ke dalam pangkalan data dan menggunakan entri tunggal pada satu masa sahaja. Terdapat juga data tidak format disimpan. Oleh itu, kertas projek dilakukan untuk membentangkan reka bentuk penilaian prestasi pelajar dalam talian sistem-z kerangka utama di mana ia memberi manfaat untuk mewujudkan kemasukan data secara automatik ke dalam pangkalan data melalui COBOL. Selain itu, projek ini dibina untuk mewujudkan kelompok jenis input dan output, untuk menghasilkan laporan berformat yang disimpan di dalam fail sebagai output. Disamping itu, projek ini dibina adalah untuk membuat rakaman lebih cekap, mudah untuk disimpan dan dikeluarkan daripada pangkalan data. Reka bentuk projek ini terdiri daripada aliran kerjarajah sistem yang dibangunkan, gambarajah kes penggunaan logik dan contoh reka bentuk antara muka sendiri. Projek ini juga telah mengkaji semula sistem semasa dan sistem sedia ada yang berkaitan dengan penilaian prestasi pelajar dalam talian. Selain daripada itu, terdapat teknik semasa ke atas sistem operasi kerangka utama yang boleh menyokong beribu-ribu pengguna. Pada amnya, sistem ini telah memenuhi obejektif yang membangunkan “Penilaian Prestasi Pelajar Online dalam Kerangka Utama Sistem-z” untuk membuat sistematik baru. Selepas membuat penyelidikan analisis, dan akhir sekali membuat ujian kepada semua program, akhirnya “Pelajar Online Penilaian Prestasi Sistem-z Kerangka Utama” berjaya dibangunkan.

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CHAPTER 1

INTRODUCTION

This chapter briefly discuss on the overview of this research. It contains five sections. The first section is introduction of the system that will be introduced; follow by the problem statement. Next are the objectives where the project's goal is determined which related to the problem statement. After that are the scopes of the system and lastly is the thesis organization which briefly describes the structure of this thesis.

1.1 Introduction

Performance evaluation is very important where every semester in our student's life, performance evaluation will take part. Starting with University's life, student being expose to see and know their performance evaluation. They must look at their carry marks in order to get the spirit to do the best for their final examination or do wise plan, so that the results for final will be higher than what they are expected and overall marks will be evaluate carefully through the system that have been provided. Then continue with the real life where they must perform their best works in every semester.

Online Student Performance Evaluation is an online web based application that manages all student marks of Faculty System Computer and Software Engineering (FSKKP) at University Malaysia Pahang (UMP). UMP operator only has manual entry into database. There also has a single entry at a time and unformatted data stored. So, this system which is using z mainframe will be developing to overcome these problems.

There are substantial differences of structure between the mainframe and other platforms, beginning with a flat file naming system that uses catalogs instead of directories. Then there the features all platforms share that are named a little differently. For instance, a mainframe has address spaces instead of processes, and tasks in lieu of threads. Finally, there are the unique concepts, such as a job entry subsystem, along with its host of initiators.

By using the system, the performance evaluation process will become smoother. The manual entry will be change to the automated data entry into the database via COBOL. Other than that, unformatted data will become formatted data report stored in an independent flat file as output. This system also can create a batch type input and output. Nowadays, the universities had their online performance evaluation students already. Sometimes, there have a lot problems faced. So, at last, they cannot get through in the system. So that, online student performance evaluation in system-z mainframe can help to change the system, make the new system systematically to UMP operator.

Today, the term mainframe can best be used to describe a style of operation, applications and operating system facilities. The z mainframe plays a central role in the daily operations of the world's largest organizations and the daily lives of most people. It is known for its reliability, security and enormous processing capabilities. It is actually designed for processing large scale workloads and serving thousands of users and transactions concurrently. It also managed by highly skilled technical support staff. Everyone has used a mainframe computer at one point or another. It runs a variety of operating systems. It is very suitable to make a change or new system which more systematic and efficient for online student performance evaluation. The result of the student performance evaluation will be released faster. Using this system also can attract more university to do this similar in their online system.

1.2 Problem statement

There have a few problems faced in online performance evaluation that have been provided, there are:

1. Manual entry into database
2. Single entry at a time
3. Unformatted data

1.3 Objective

The objectives of this online performance evaluation using z mainframe are:

1. To create automated data entry into the database via COBOL.
2. To create a batch type input and output system.
3. To generate a formatted report stored in an independent flat file as output.

1.4 Scope

Targeted users of this project are:

i) Administration Personnel
ii) Operator (one type of user only)

1.5 Thesis Organization

This thesis organization consists of four (6) chapters. Chapter one (1) is introduction which briefly describes and introduces the system. The system is Online Performance Evaluation Students using z mainframe. This is a new system that will be introduced among the university students. The system preliminary shows the basic concept of the system. This introduction also gives a comparison between the old systems which have a lot of problems that students faced and the new system that will be introduced using z mainframe. There have a few objectives that can make the system more efficient than the old one. The concept of the system, problem statements of the system, objectives, scopes and thesis organization must be in this chapter one (1).

Chapter two (2) is literature review which depicts the manual systems and the existing systems as the case studies of this project. This chapter also reviews the technique, method, equipment, and technology that had been used in the case studies. For this chapter, the related information can get via book, internet, article, journal and others.

Chapter three (3) is methodology which discusses about the overall workflow in the development of this project. This chapter also discusses the method, technique or approach that has been used while designing and implementing the project. It also will explain more about the justification of the proposed approach, hardware and software requirements.

Chapter four (4) is implementation. This chapter discusses about the environment and coding used to develop the system. It also contains some of the coding like the engine for the system. Some examples of the coding are Java, C++, COBOL and etc.

Chapter five (5) is result and discussion. This chapter briefly discusses how the system runs. System testing will be showed here if got any error or not. The system must have error handling and user friendly.

Chapter six (6) or the last chapter is conclusion which will summarize the results of this project. It also presents the summarization of project's methodology, implementation that has used, and finally suggestion for possibility to enhance this project for the future research.

CHAPTER 2

LITERATURE REVIEW

This chapter briefly describes the review on existing techniques with online student performance evaluation using z mainframe. This chapter comprises two sections: The first section describes the comprehensive review on existing related systems. The second section describes the review on method, equipment, and technology previously used in the same domain.

2.1 Existing System Review

This section is to review the current system and the existing system that related to online student performance evaluation. There are three student portals in different universities in order to find out the comparison features in online student performance evaluation between them.

2.1.1 Portal University Kebangsaan Malaysia

University Kebangsaan Malaysia (UKM) was the third university to be established in Malaysia. Today UKM is recognized as one of four research universities in Malaysia. UKM offers a wide variety of academic programmes covering both the arts and sciences. This portal provides a lot of facilities to student especially in their academic session which the student information system.

Figure 2.1: View of homepages for Portal University Kebangsaan Malaysia

Figure 2.2: View of the different features in the Portal University Kebangsaan Malaysia

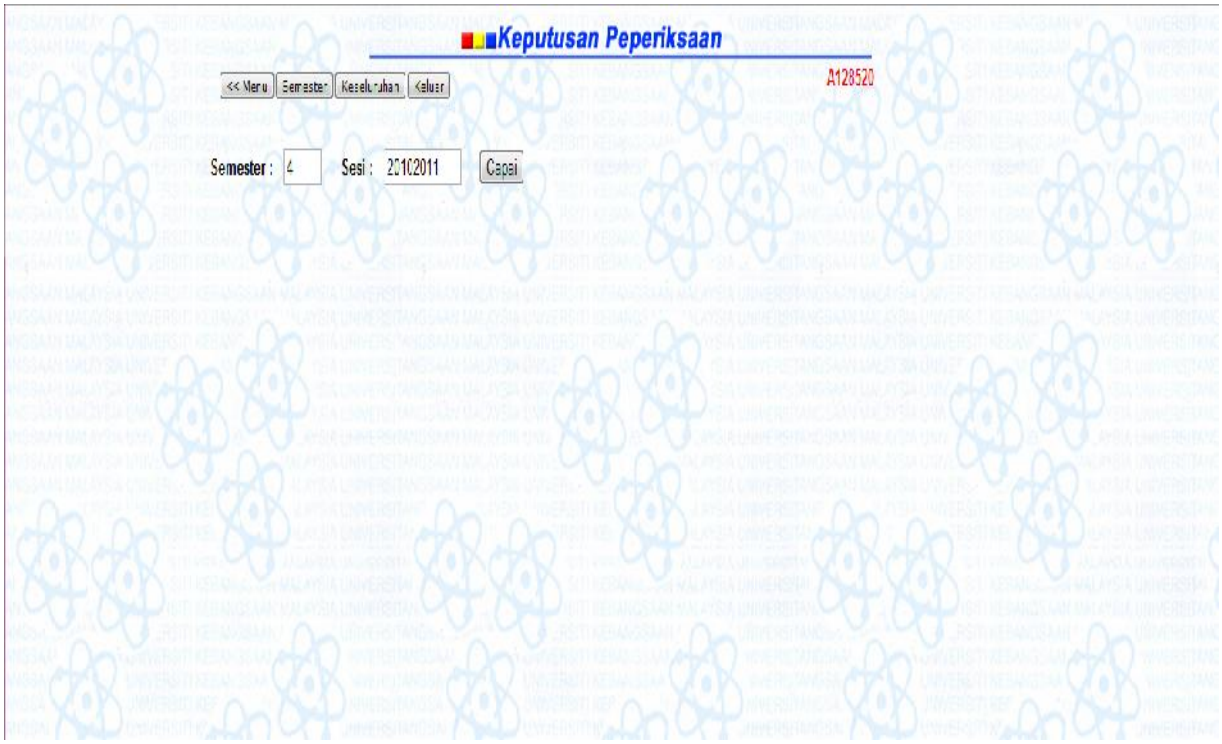


Figure 2.3: View of the exam result in each semester

2.1.2 Portal University Pendidikan Sultan Idris

University Pendidikan Sultan Idris is a public university which one of the oldest functioning institutions of higher learning in Malaysia. The initial instructional regime required students to complete their learning where traditional skills and arithmetic were taught. This portal also provides a lot of facilities to student especially in their academic session which the student information system will be stated.

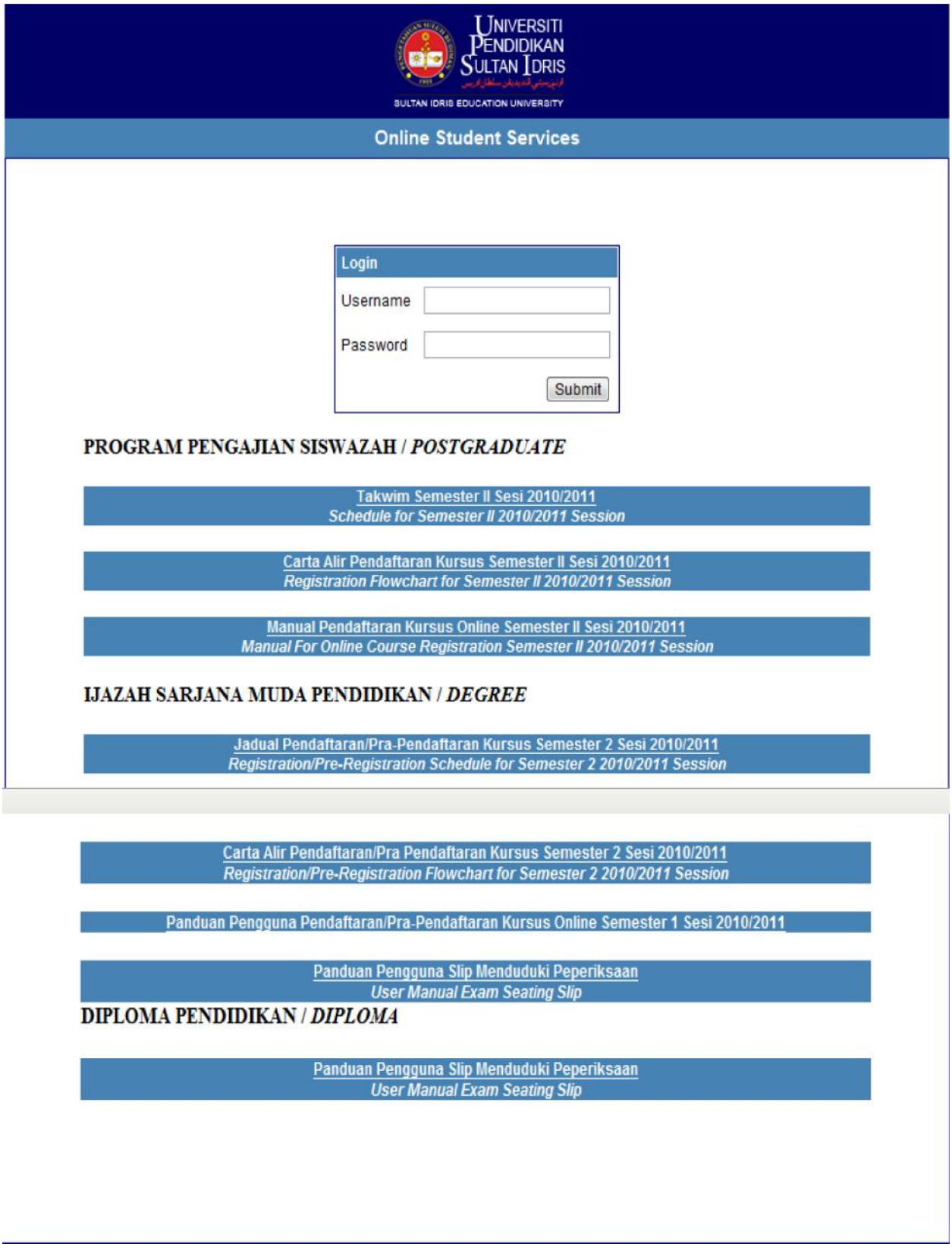


Figure 2.4: View of homepages for Portal University Pendidikan Sultan Idris

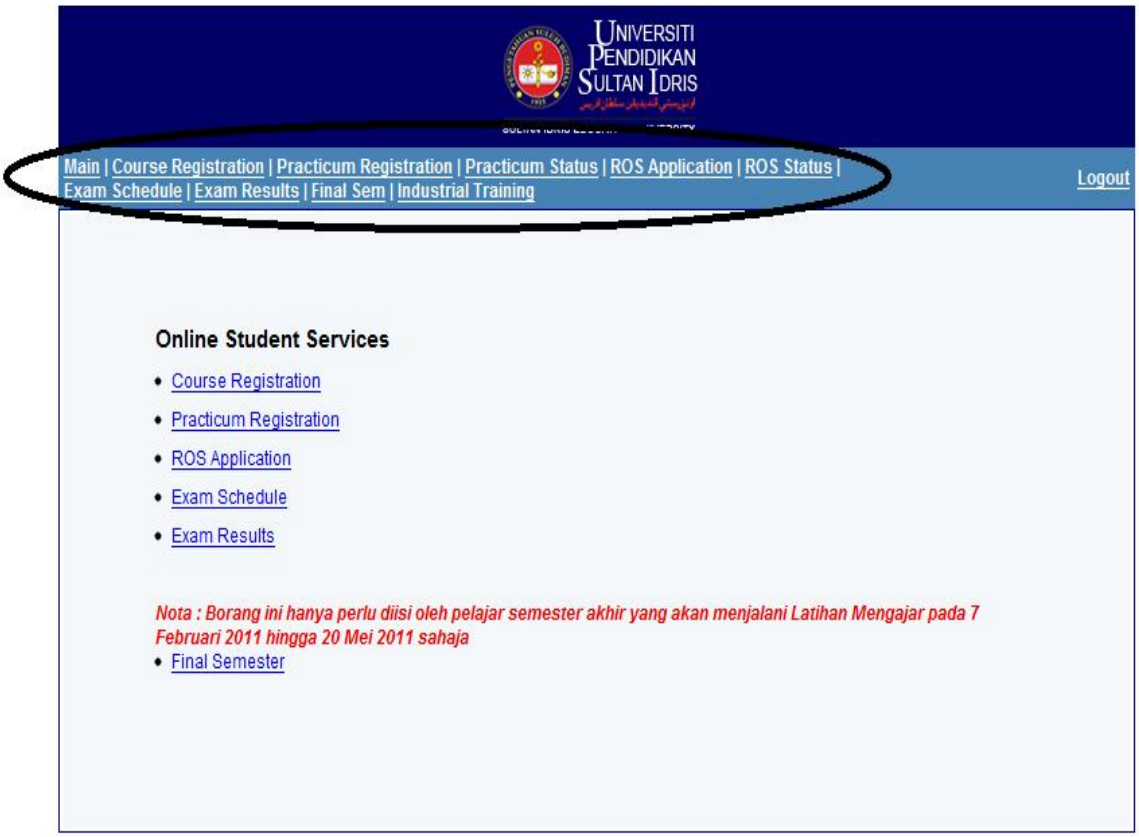


Figure 2.5: View of the different features in the Portal University Pendidikan Sultan Idris

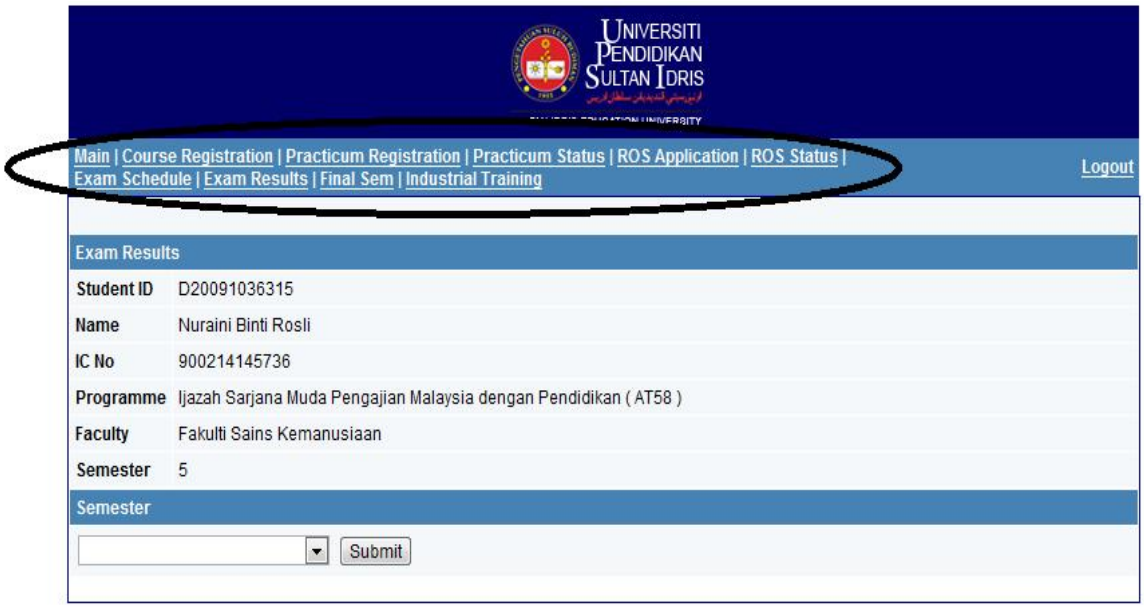


Figure 2.6: View of the exam result in each semester

2.1.3 Portal University Malaysia Pahang

University Malaysia Pahang was established as a public technical university by the Malaysian government. UMP was set up as a competency-based technical university, specializing in engineering and technology. This portal also provides a lot of facilities to student especially in their academic session which the student information system will be stated.

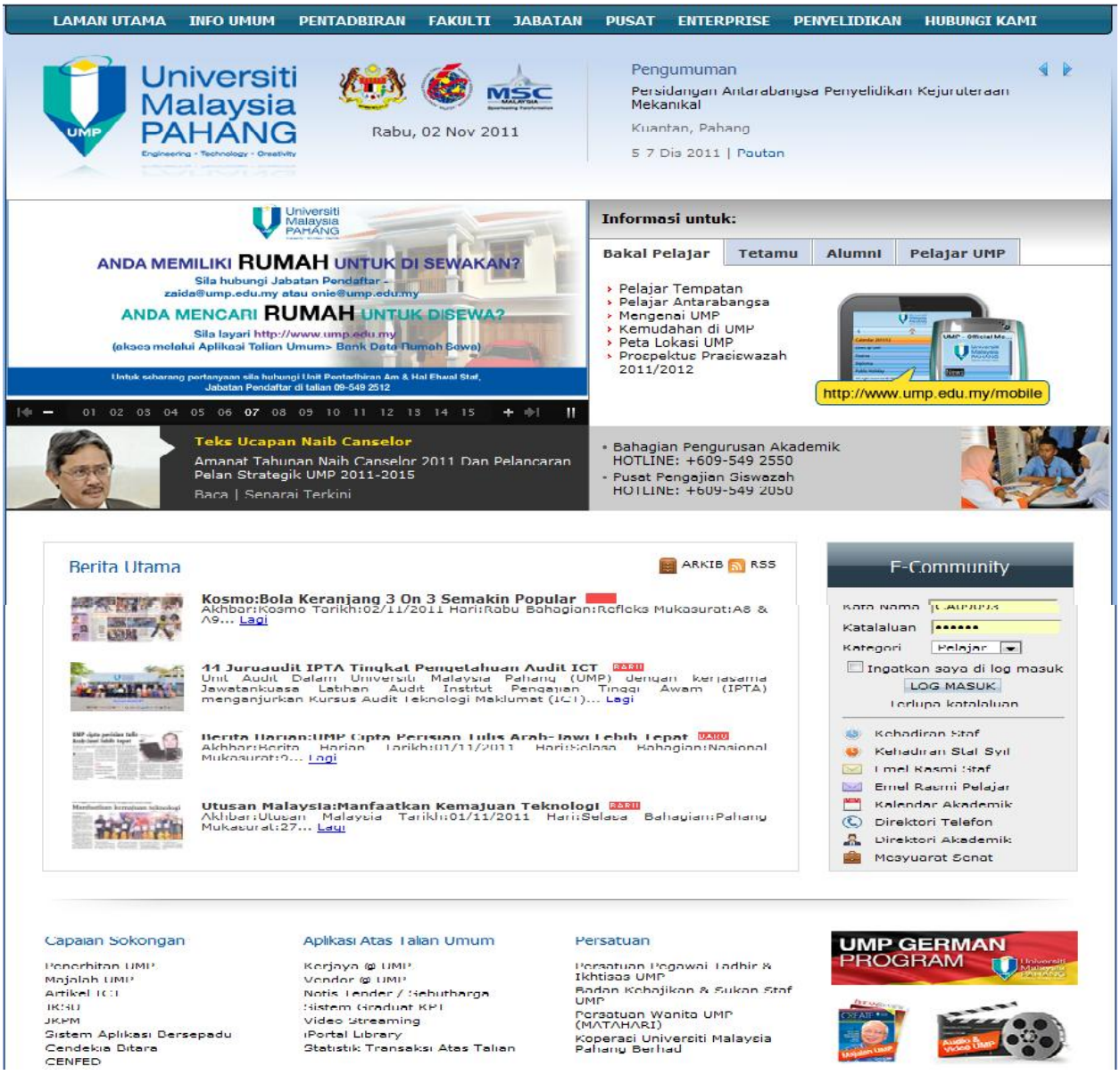


Figure 2.7: View of homepages for Portal University Malaysia Pahang

Figure 2.8: View of the different features in the Portal University Malaysia Pahang

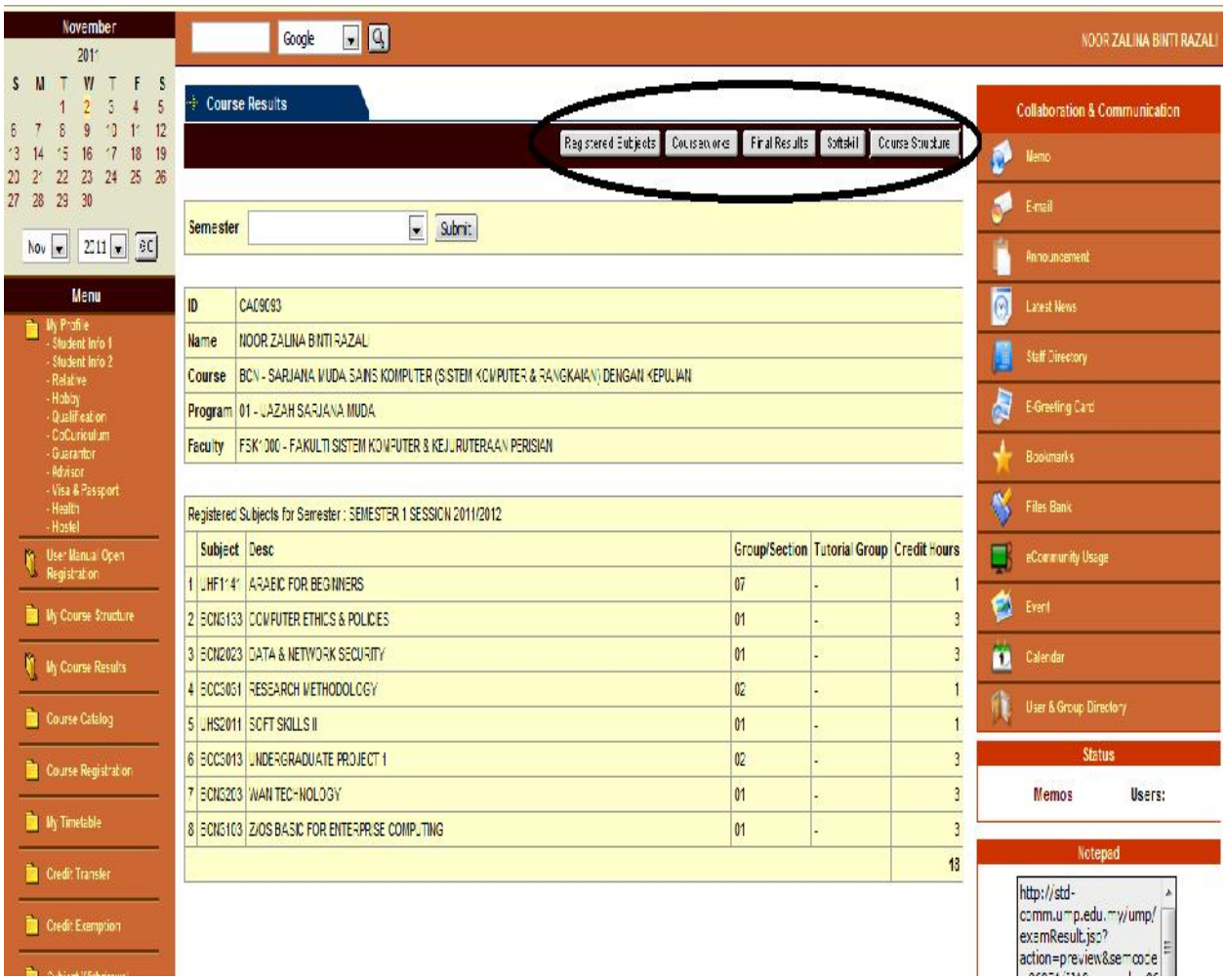


Figure 2.9: View of the exam result in each semester

2.1.4: Comparison between Portal University Kebangsaan Malaysia, University Pendidikan Sultan Idris and University Malaysia Pahang

In the Portal University Kebangsaan Malaysia, there is providing basis information about the student information system. In the features especially for the exam result or student performance evaluation, there have only two things that will appear if the student wants to know their mark. It is whether exam result by semester or as totally result that the student had took the examination. In the Portal University Pendidikan Sultan Idris, there is providing basis information about the student information system too. In the features especially for online student services, there is only five things that will appear when the student click the link that had provided by university.

There are course registration, practicum registration, ROS application, exam schedule, and exam results. But the focus is the exam result by each student. It is only have semester by semester to check the result. In the Portal University Malaysia Pahang, when the student logs in the system, there have some of features provided. But the focus now is the student result or performance evaluation.

No	Features	Portal University Kebangsaan Malaysia	Portal University Pendidikan Sultan Idris	Portal University Malaysia Pahang
1.	Registered Subjects	✓	✓	✓
2.	Courseworks	×	×	✓
3.	Final Results	✓	✓	✓
4.	Softskill	×	×	✓
5.	Course Structure	✓	×	✓
6.	Practicum Registration	×	✓	×
7.	Industrial Training	×	✓	×
8.	Appeal Review of Examination Results	✓	×	×

Table 2.1: Comparison of the features in online student performance evaluation between three portals

2.2 Student performance evaluation

Performance evaluation is very important where every semester in our student's life, performance evaluation will take part. Starting with University's life, student being expose to see and know their performance evaluation. They must look at their carry marks in order to get the spirit to do the best for their final examination or do wise plan, so that the results for final will be higher than what they are expected and overall marks will be evaluate carefully through the system that have been provided. Then continue with the real life where they must perform their best works in every semester.

2.2.1 E-learning

According Dr. Robert Blomeyer (2002), E-learning, also known as Internet-based hybrid learning or distance learning is one of the most significant new learning technologies to emerge in the last 10 years. E-learning should be about creating and deploying technology systems that enable constructive human interaction and support the improvement of all teaching and learning. Computers and other technologies will certainly play an increasing role. A desirable goal may be that every student has and routinely uses his or her own notebook computer. Books and other more traditional technologies will also continue to be important, along with telephones, satellites, compressed videos, and audio and VHS tape. Today's newest technologies, like e-learning, are destined to become tomorrow's stable and established media that will become commonplace for people in all walks of life and throughout our global, cultural, political, and economic systems. [1] According Horton.W, E-learning is the use of Internet and digital technologies to create experiences that educate our fellow human beings. This definition is deliberately open-ended, allowing complete freedom as to how these experiences are formulated, organized, created, packaged, and marketed. [2]

	Author	Problem	Technique	Result
1.	Harry B. Santoso, 2003	-Imbalanced academic quality and weakened national competitiveness.	-Distance Learning System: Student Centered E-Learning Environment (SCELE).	- Can use SCELE by offline - only need synchronize with SCELE's server in minutes.
2.	Sue-Fn Huang, 2008	- Assigned under un-controllable condition (I.e. tiredness, preference).	-RBF-NN (radial basis function-neutral networks) for assisting teachers.	- Can effectively overcome human factors (tiredness, preference).
3.	Jo Davies, 2005	-Argued to promote student-centered learning. -Online discussion should translate into improved student performance.	-Investigate whether online interaction could produce any tangible benefits in terms of improving student learning - measured by 'blackboard' access	-Effective discussion forum facility.
4.	Hu Dali, 2008	-Improves the existing online education evaluation system	-Develop effective E-Learning performance evaluation system	- Helpful to motivate the students to learn online.

5.	Liang Zhao, 2009	- Don't focus on the application of specified multimedia courseware	- Ten items were generated to evaluate the five parts of web-based learning system New Horizon College English (NHCE)	- Helps students to get to know the merits and shortcoming in his/her own learning
6.	Christiane Meiler Baptista, 2008	-Evaluation more complex - Provide sophisticated learning environments, capable of serving the new student's generation.	- New technologies, tools and educational systems, such as LMS (Learning Management System) - MSys frameworks	- Allows the instructor to follow-up the students, monitoring their access time and tasks or actions.

Table 2.2: The E-learning system which from different sources with their problems, techniques and results.

In table 2.2, Harry B. Santoso, (2003) states that Faculty of Computer Science (Fasilkom), University of Indonesia (UI) develops Student Centered E-Learning Environment (SCELE) for Graduate Program in Information Technology as part of Distance Learning system, which is developed using Enterprise Resources Planning approach. An author of this article, Harry B. Santoso, 2003, states that SCELE is also well known as Learning Management System (LMS). The developments of this SCELE are because of imbalanced academic quality and weakened national competitiveness.

Beside SCELE, there have the result of system evaluation. From the evaluation results, it can be concluded that the performance of e-learning for distance learning is comparable with regular or conventional learning. The most important things in the system is when develop 'lightweight' version of SCELE, so student with small bandwidth Internet access can use SCELE by offline, and only need synchronize with SCELE's server in minutes. [3]

Sue-Fn Huang, (2008) explains e-learning has been used as teaching and learning tools and was the most popular learning environments in the information age. However, the problem faced is the learning achievements are rated by teachers and the biases of achievements are assigned under uncontrollable condition, for example tiredness and preference. In order to enhance the e-learning efficiency, the fusion model to assign learning achievements based on RBF-NN (radial basis function –neutral networks) for assisting teachers was created. By using this method, the e-learning can effectively overcome human factors which are tiredness and preference. [4]

Jo Davies, (2005) is a lecturer at University of Glamorgan, UK and they worked on a project evaluating e-learning in South Wales. The problems are most of the lecturers argued to promote student-centered learning and the online discussion should translate into improved student performance. One reason for the importance of online interaction is because learners experience a 'sense of community' (Rovai, 2002), enjoying mutual interdependence and a sense of trust and interaction among community members, which means that the members of the community have shared goals and values. There is therefore much research that reports on the beneficial effects of online participation in terms of widening student involvement, improving the quality of discussions compared with traditional face-to-face interactions, as well as research on the beneficial effects of online interaction in terms of fostering an online community. This study sets out to investigate whether online interaction could produce any tangible benefits in terms of improving student learning, as measured by final grades on a series of different courses. It just measured by 'blackboard' access. This is an effective discussion forum facility. Therefore, by simply encouraging students to get more involved in online discussions is unlikely to automatically improve their performance. [5]

According Hu Dali, (2008) E-Learning is the inexorable trend of the application of modern information technology in education. It is one of the major learning methods in the era of information. Therefore, to carry out effective learning evaluation is one of the significant factors to guarantee the sound development of online education. E-Learning performance evaluation model, improves the existing online education evaluation system from the perspective of technology and methodology, conducts research and exploration into the evaluation process. The objective of performance evaluation of E-Learning is the learning process and learning result; the purpose is not only to identify but also to develop the individual, coordinative and unstructured online learning. In online education, it is necessary to develop effective E-Learning performance evaluation system, inspecting and promoting students' learning results, so as to guarantee the online education quality. This evaluation system demonstrates the concept of combining formative evaluation with summative evaluation and the focus on learners' entire learning process. Evaluation system includes the two technology platforms of blog system and online testing system.

The blog system is used to evaluate the learners' learning process, to motivate learners learning awareness and to provide real-time feedback of evaluation information. The online testing system is used to evaluate the learning result of a certain period, which is helpful for the students to summarize what they have learned and experienced in the learning process. The results are also relying on the theory of fuzzy mathematics and helpful to motivate the students to learn online. [6]

An author Liang Zhao, (2009) states that New Horizon College English (NHCE), as one of the most popular web-based English learning system in Universities, also needs to be evaluated on a broader concept. Web-based learning environment, as an efficient communication medium and content delivery system, has been created and applied to second language acquisition. However, most of the evaluations don't focus on the application of specified multimedia courseware to the classroom teaching and "systematic evaluation" of computer-based education (CBE) in all its various forms.

Ten items were generated to evaluate the five parts of web-based learning system NHCE: two items for communication, two for online classroom, and two for quiz depot, three for learning tools and one for overall expectation. The auto grade system of quiz helps students to get to know the merits and shortcoming in his or her own learning, together with the problems solved, and thus promotes English study. [7]

E-learning content creation is not an easy task, but its evaluation is even more complex. With the technologies evolution and new web applications there has been an enormous challenge for professors and universities to provide sophisticated learning environments, capable of serving the new student's generation. (Christiane Meiler Baptista, 2008) said nowadays most students enjoy the easiness and the benefits that Internet and computers provide and the information arrives in a transparent way, through equipment and devices with robust intelligences and computation to support simpler and friendlier interfaces. Professors using electronic learning and educational systems, as support tools in local or remote (online) activities. However, some professors still do not use interactive and multimedia digital contents to teach. Most of them use these learning systems only as content repository and uploading the same content they use in a classroom lecture.

New technologies, tools and educational systems, such as LMS (Learning Management System), have been developed aiming to facilitate and to increase the interactivity between students and educators, supporting actual education scene and assisting the didactic content distribution through the web. Thus, an important LMS systems functionality allows the instructor to follow-up the students, monitoring their access time and tasks or actions. MSys frameworks can provide dynamism during the educational action. The final goal is that the framework should support runtime monitoring and analysis of an e-learning content and, therefore, it is necessary to track the system performance and to anticipate and detect content faults. Furthermore, the results are allows the instructor to follow-up the students, monitoring their access time and tasks or actions. [8]

2.2.2 Bazaar Online

With the development of the Internet and the World Wide Web, instructors and students alike have begun to see the implementation of computer technology in many aspects of education which from Web discussion boards that supplement in-class lectures to courses that are fully delivered through online methods. According Susan Hesemeier (2003), online course delivery and conferencing systems have indeed shown us an amalgamation of technology and education, especially in the realm of distance education. But although online Course Management Systems (CMSs) have been available for almost a decade now, many instructors are still not using them to any great extent because high cost of proprietary online CMSs may effectively block the inclusion of computer-mediated components in courses.

In order to solve this problem, Athabasca University has developed the Bazaar Online Conference System, an online course management and conferencing system that is free and high-quality. Inspired in part by the open source movement, which presses for free and accessible software on the Internet, Bazaar's features include many useful and important resources typically offered by the more popular and expensive proprietary systems. Bazaar is a flexible course management system that delivers courses online and provides various discussion tools for its users.

Bazaar also has performed excellently when examined against other course delivery platforms, whether freeware or proprietary. What follows is a description of some of Bazaar's features as they relate to distance education studies and analyses of online education tools. [9]

2.3 Techniques

This section will review on the current technique on operating system in mainframe and others including the differentiation between them.

2.3.1 Operating System

An operating system is the program that after initially loaded into the computer by a boot program, manages all the programs in a computer. All major computer platforms (hardware and software) require and sometimes include an operating system. Linux, Window, Mac are the most popular operating systems in computer field (SearchCIOMidmarket. com) [10]. An operating system's principal purpose is to manage sharable resources (Reynolds, 2002). [11]

2.3.1.1 Windows

Windows has the highest user base, followed by Linux and Mac. True, all three are operating systems, but the internal architectures are different in each. The Windows operating system is pretty versatile, and can be installed on PCs having variable amounts of resources. Windows users get good choices for their operating systems, based on the system resources they have. However, an even greater benefit of Windows users is the user-friendliness of the operating system. The graphical user interface is surprisingly easy to work with, and many complicated tasks on Windows can be performed with a few clicks of a mouse only. Windows has the highest user base, and correspondingly, most software vendors develop software packages, tools and utilities based on this operating system (Liutilities, 2011). [12]

2.3.1.2 Linux

Linux users have the benefit of having low resource requirements as well. Linux can be installed on a PC just having the bare minimum resources. In fact, Linux is so versatile that almost any type of computer and console can probably support it, except Macintosh computers, which come preloaded with Mac OS X. However, the real problem with Linux mostly lies in its lack of user-friendliness. While Linux does have a good graphical user interface, users still have to use the command line to perform many tasks. Command lines only accept textual commands that must be typed by hand, and are often too complicated for novice users (Liutilities, 2011). [12]

2.3.1.3 z/OS mainframe

This latest release delivers enhancements designed to help shorten your batch window, simplify batch programming, and give more flexibility in deploying batch applications. z/OS also delivers improved performance for web-based applications with better overall I/O response times for z/OS UNIX System Services workloads in a Parallel Sysplex, as well as improved performance for traditional workloads using the IEBCOPY utility to copy one PDS (partitioned data set) to another. Enable system programmers to more easily manage and administer a mainframe system by simplifying day to day operations and administration of a z/OS system. Existing tasks are updated and improve your ability to manage incident log data, network security configuration, and cross-platform resource monitoring. [13]

2.3.1.4 Comparison between Linux, Window and z/OS mainframe

Details	Linux	Window (Window 7)	z/OS mainframe
Performance	• Faster booting. • Less memory usage. • Smaller install size. • Broader hardware compatibility.	• Better at synthetic benchmarks. • Faster transfer of large files. • Final version likes to improve. • Suspend/resume works.	• shorten batch window • simplify batch programming • give more flexibility • more easily manage
Cost	Very cheap or free.	Expensive compare to Linux.	Very expensive compare to Linux and Window.

Table 2.3: Comparison between Linux, Window and z/OS mainframe (TuxRadar, 2009) [14]

2.4 Mainframe

This section will review more about mainframe as a main source in online student performance evaluation.

2.4.1 Definition

A mainframe is the central data repository, or hub, in a corporation's data processing center, linked to users through less powerful devices such as workstations or terminals. We use the term mainframe in this text to mean computers that can support thousands of applications and input/output devices to simultaneously serve thousands of users.

Mainframe is an enterprise class server which provides capability for extensive work load management and uninterrupted performance and security and thus suits extremely large workload requirements (Rajat Kathuria, 2008). [15]

2.4.2 Characteristics

Rajat Kathuria (2008) states a mainframe is a high-performance computer used for large-scale and critical computing purposes which need greater availability and security than what a smaller-scale machine can offer. Historically, mainframes have been associated with centralized rather than distributed computing, although that distinction may be blurring as smaller computers become more powerful and mainframes become more multi-purpose. [15] Furthermore, a mainframe is backwards compatibility with previous mainframe operating systems, applications, and data. It also centralized control of resources. Hardware and operating systems that routinely work with hundreds or thousands of simultaneous I/O operations (Mike Ebbers, 2009). [zos notes] According Lu Kun (2008), mainframe platform have some advantages such as high stability, data processing capacity, and so on, particularly for large, simple data structure of data processing have outstanding performance. The system is based on these advantages of the mainframe platform, and makes full use of new development environment with information exchange mechanism provided by the network, to achieve a convenient, fast and safe management classes. [16]

2.4.3 Application programming on z/OS

In this part, we introduce the tools and utilities for developing a simple program to run on z/OS. The sections that follow guide the student through the process of application design, choosing a programming language, and using a runtime environment.

2.4.3.1 Designing and developing applications for z/OS

According S. Loveland, (2002) z/OS is the premier operating system that powers IBM's zSeries processors. It is a general-purpose operating system that many businesses rely on.

Commonly referred to as "mainframes," the zSeries processors (and their predecessors) have been the backbone of commercial computing for decades, renowned for their reliability, scalability, availability, and other industrial strength attributes. [17] When designing an application for z/OS and the mainframe, a key consideration is whether the application will run as a batch program or an online program. In some cases, the decision is obvious, but most applications can be designed to fit either paradigm.

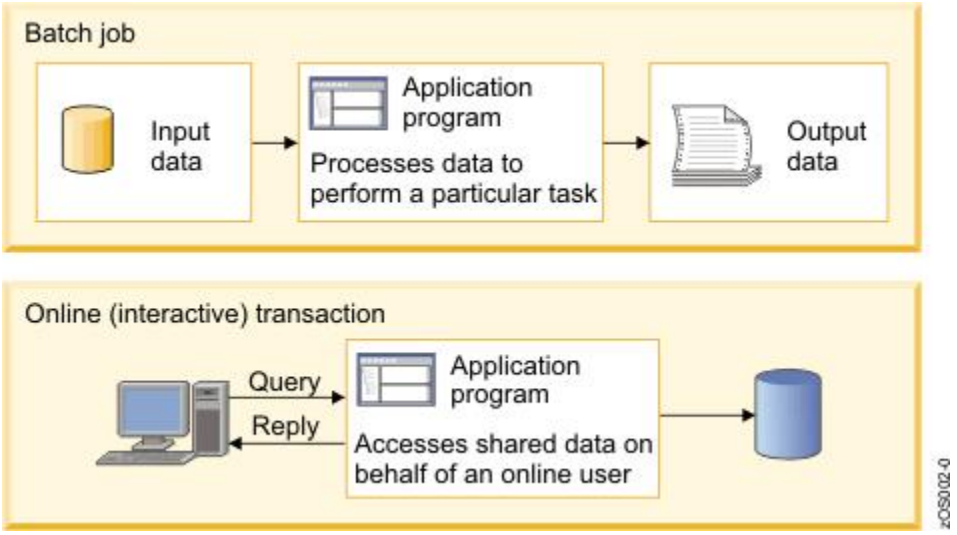


Figure 2.10: Process of batch job and online (interactive) transaction

Batch processing is for those frequently used programs that can be executed with minimal human interaction. They are typically executed at a scheduled time or on an as-needed basis. In figure 2.10 shows the process of batch job and online (interactive) transaction. *Batch* applications are processed on the mainframe without user interaction. A *batch job* is submitted on the computer; the job reads and processes data in bulk— perhaps terabytes of data— and produces output, such as customer billing statements. An equivalent concept can be found in a UNIX script file or a Windows command file, but a z/OS batch job might process millions of records. Transaction processing that occurs interactively with the end user is referred to as *online transaction processing* or OLTP.

One of the main characteristics of a transaction system is that the interactions between the user and the system are very short. The user will perform a complete business transaction through short interactions, with immediate response time required for each interaction.

These systems are currently supporting mission-critical applications; therefore, continuous availability, high performance, and data protection and integrity are required (Eclipse, 2010). [18]

Types of designing for z/OS	Reasons
Batch	• Data is stored on tape • Transactions are submitted for overnight processing • User does not require online access to data
Online	• User requires online access to data • High response time requirements

Table 2.4: Types of designing for z/OS and the reasons

In table 2.4 shows the types of designing for z/OS and their reasons. For batch processing, data is stored on the tape. The transactions are submitted for overnight processing and lastly user do not require online access to data. . These are the reasons using batch processing. While online processing, user requires online access data and high response time requirements (S. Loveland, 2002).

2.4.4 System design and implementation

In this part, we explain more about the design and implementation of the link between web and mainframe.

2.4.4.1 System architecture

In the system, all the programs structure and logic are defined and installed in the *Customer Information Control System (*CICS) region on the mainframe. According David Shelby Kirk, (1992) the User Interface (UI) selects the WEB method which everybody is familiar with. Communication between the front-end Web and the back-end mainframe is a technical difficulty [19]. CICS Transaction Gateway is used to access mainframe resource by WEB [20].

CICS Transaction Gateway (CTG) is software provided by IBM, which is designed for the application integration of traditional CICS applications. CTG allows users to integrate the Web application and the back-end business application running in CICS. It can provide the most convenient, efficient and scalability connectivity for the application running on the CICS server.

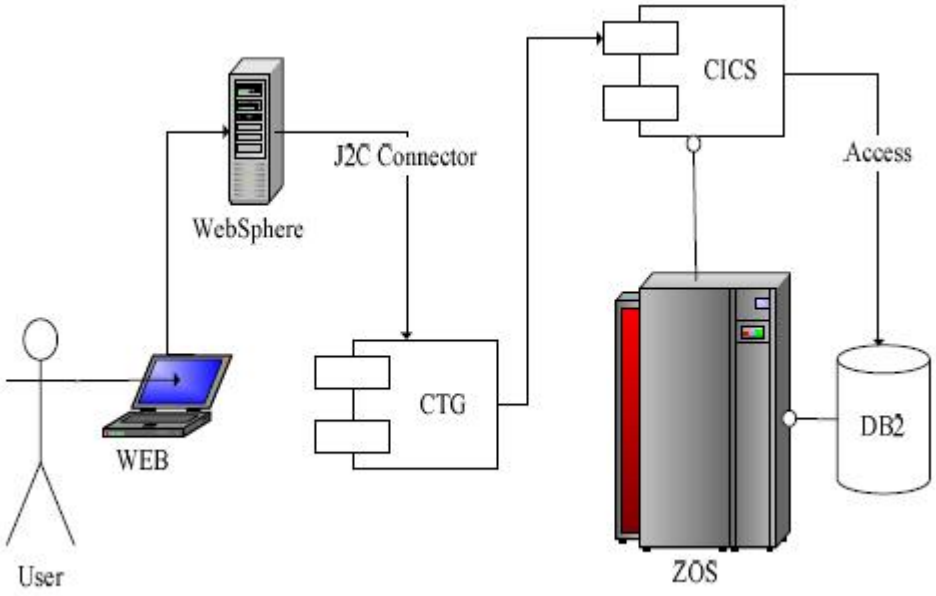


Figure 2.11: Gives the method that how the data communicate between WEB and back-end mainframe.

It will use the login module as an example to explain how to achieve the application solutions which use JCA to exchange data between WEB and mainframe DB2. The flow process is as follows: User firstly input the user name and password in login page, and then submits the form. The input data is transferred to Websphere application server. WebSphere application server handles the Web logic and access the login service installed on the mainframe CICS by invoking EJB service.

During this process, the server transfers the login data to EJB Service who responsible for sign on.EJB Service access the resource defined in CICS through JCA (Java Connector Architecture). EJB visits the sign on program defined in CICS system by CTG, invokes, execute it, and access the DB2 on mainframe to determine whether the user name password is right, finally give the feedback to the WebSphere application server. Through JCA technology achieves the connection between WEB and mainframe, it realize the WEB client full cooperation with high performance mainframe. Take full advantage of the strong data processing capability of mainframe platform, the flexibility and stability of J2EE network architecture, improving the previous decentralized data access and management model, replaced by the unification of information management and provide network terminal interface to achieve distributed visit. Users can access to data through the browser conveniently (Phil Wakelin, 2002). [21]

CHAPTER 3

METHODOLOGY

This chapter briefly describes about the methodology which explain of how data was collected or generated. This is also explaining of how data was analyzed through the explanation of methodological problems and their solutions or effects.

3.1 Introduction

There is a lot of methodology or software process that can use as a guideline in software development process likes waterfall model, spiral model and etc. Methodology is very important part in process developing this project.

3.2 Software Process

Generally, software process is a set of activities and associated results which lead to the production of a software product [22]. When the process involves the building of some products, we sometimes refer to the process as a life cycle. This project will develop through System Development Life Cycle (SDLC). System Development Life Cycle (SDLC) has four primary objectives:

(i) Defines activities to be carried out
(ii) To ensure that high quality system are delivered
(iii) To provide strong management controls over the projects
(iv) To maximize the productivity of the system student

The software process is divided into eight (8) phases which project identification and selection, project initiation and planning, analysis, design, testing, implementation and lastly maintenance.

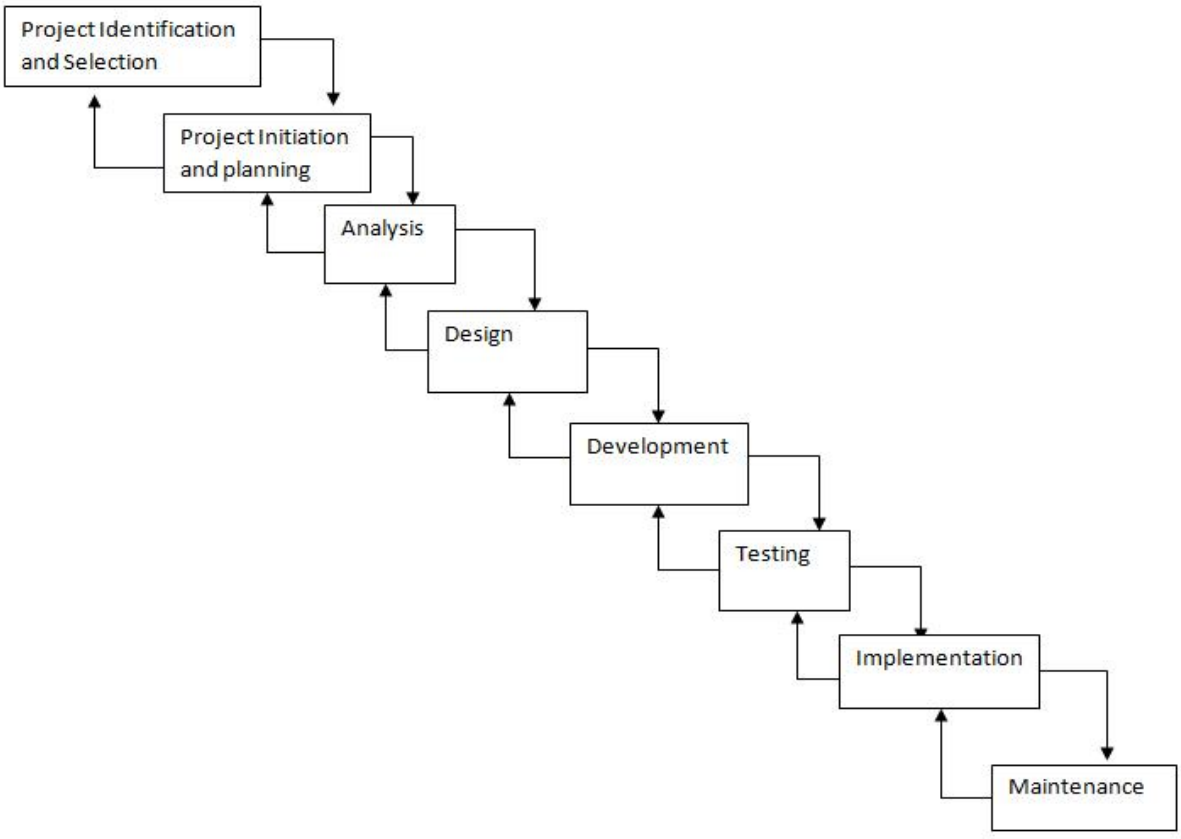


Figure 3.1 System Development Life Cycles

3.3 The Justification Choosing System Development Life Cycle (SDLC)

The System Development Life Cycle (SDLC) abstracts the essential activities of software development and lists them in their most primitive sequence of dependency. Real development projects (software and other) rarely follow such a model literally, mainly because the model can and is applied to itself recursively, yielding an almost fractal fabric of actual activity.

The verbs of waterfall development are ‘analyze’, ‘design’, ‘code’, and ‘test’. Some people insert ‘specify’ somewhere in there probably between ‘analyze’ and ‘design’.

Often considered the classic approach to the systems development life cycle, waterfall model describes a development method that is linear and sequential. Waterfall development has distinct goals for each phase of development.

3.4 The Steps of System Development Life Cycle (SDLC)

There have eight (8) steps of System Development Life Cycle (SDLC) and every step have their explanation.

3.4.1 Project Identification and Selection

In the first phase, the best title for this project was identified which to create a new system in online student performance evaluation in system-z mainframe. The existing system that is web-based system does not really systematic method because lack of recording efficiency from the database and hard to find out or view the final result.

Information about the system that needed is collected, gathered and determined to make sure the related and needed information only collected [23]. Outcome from this phase is to determine which system developments project should be taken and total information systems needs are identified, analyzed, and prioritized.

3.4.2 Project Initiation and Planning

The primary objectives of the planning phase are to identify the scope of the new system, ensure that the project is feasible, develop a schedule allocate resources and budget for the remainder of the project. This phase consist of activities that are required to get the project organized and started. These activities include are:

i) Define the problem
ii) Confirm the project
iii) Produce the project schedule
iv) Involved students and lecturers
v) Launch the project

Information about the system that needed is collected, gathered and determined to make sure the related and needed information only collected. Outcome in this phase is to determine which system developments project should be taken and total information systems needs are identified, analyzed, prioritized and solve due to the problems.

3.4.3 Analysis and Specification Requirements

A requirement is a feature of the system or a description about what is the system capable of doing in order to fulfill the system's purpose [24]. The primary objective of the analysis phase is to understand and document the business needs and the processing requirements of the new system. Analysis is essentially a discovery process. The key words to drive the activities during analysis are discovery and understanding [25].

In this project, the important thing should be considered, is the fundamental concepts of how the system will work as a whole needs to be established because it will provide the basic of how the system is to be designed and implemented. As a result, the following needs to be considered:

(a) There needs to be a database layer, which is only operator can insert the data into the database via COBOL without too much difficulty. So that, the information can be stored retrieved and updated efficiently by the system operator.
(b) Business logic layer will be the database back-end to the system. This will be the 'backbone' of the system.
(c) Presentation layer cannot be used because it is save user bandwidth and this is only for operator. So that, there is no need to do the presentation layer or interface.

3.4.3.1 Use Case Diagram

In the analysis phase, all the expected activities and Figure 3.2 shows the interactions between use cases and actors for this system. Use cases represent system functionality and actors represent the people or system that provides from the system [26]

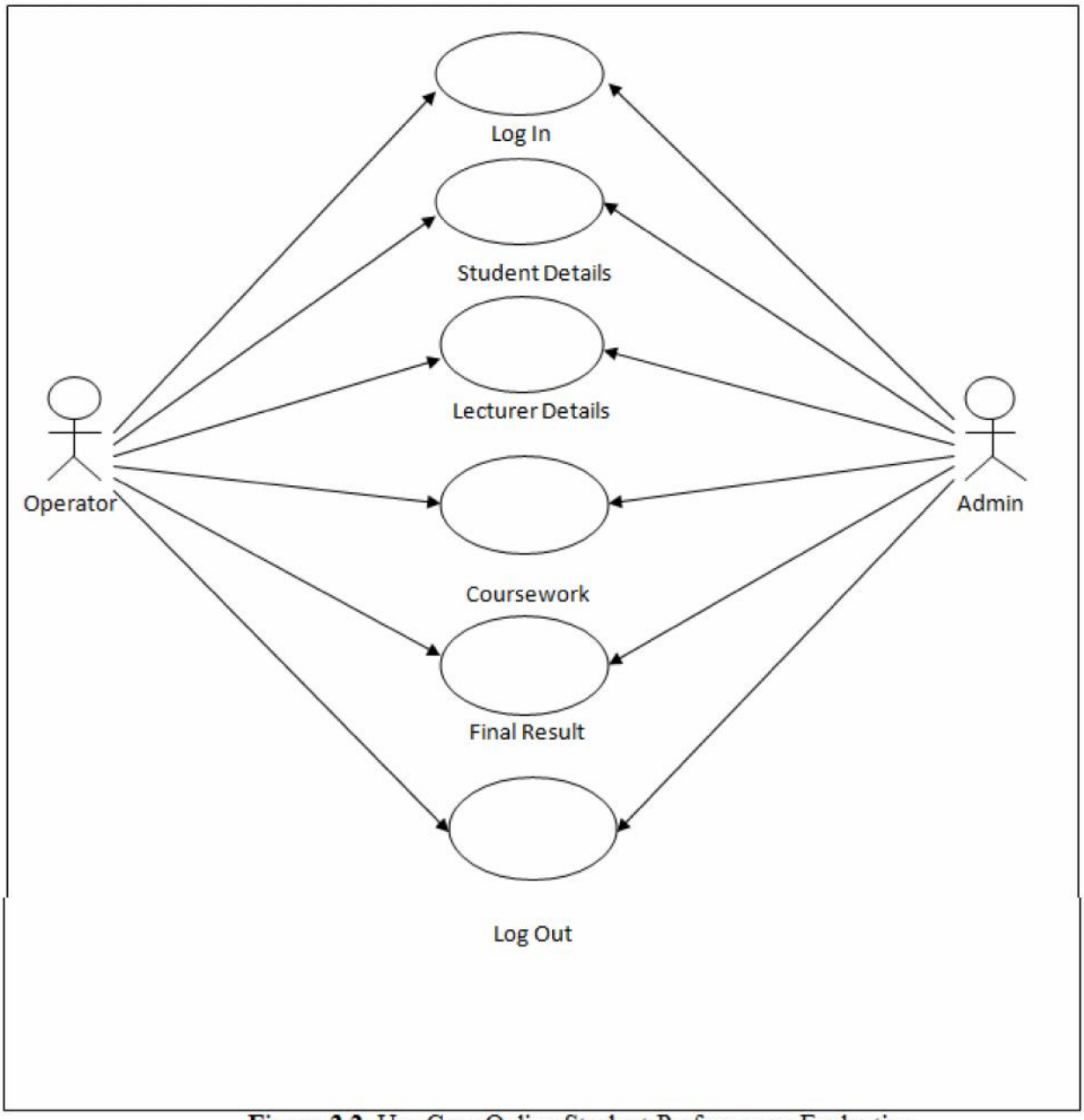


Figure 3.2: Use Case Online Student Performance Evaluation

Figure 3.2 shows the interaction between use cases and actors for this system. Use cases represent system functionality and actors represent the people or system that provides from the system. Below is the explanation for every of functioning use case diagram:

(i) Log In

User (Operator or Admin) will log in to start the session

(ii) Student Details

After user log in the session, user will go to create a table of student in the Data Set Utility (3.2) and insert the student's data into the database. The report of student details will appear after create the source in COBOL, Job Control Language (JCL) and submit the job.

(iii) Lecturer Details

It is same as student details. User will go to create a table of lecturer in the Data Set Utility (3.2) and insert the lecturer's data into the database. The report of lecturer details will appear after create the source in COBOL, Job Control Language (JCL) and submit the job.

(iv) Coursework

This use case is initiated by user which is Operator or Admin. The Operator or Admin will insert student coursework based on the quiz, assignment, project and test in the end of every semester. Before that, the same processes like student details and lecturer details above have to be created in this use case. The operator or Admin allow editing or updating the coursework.

(v) Final Result

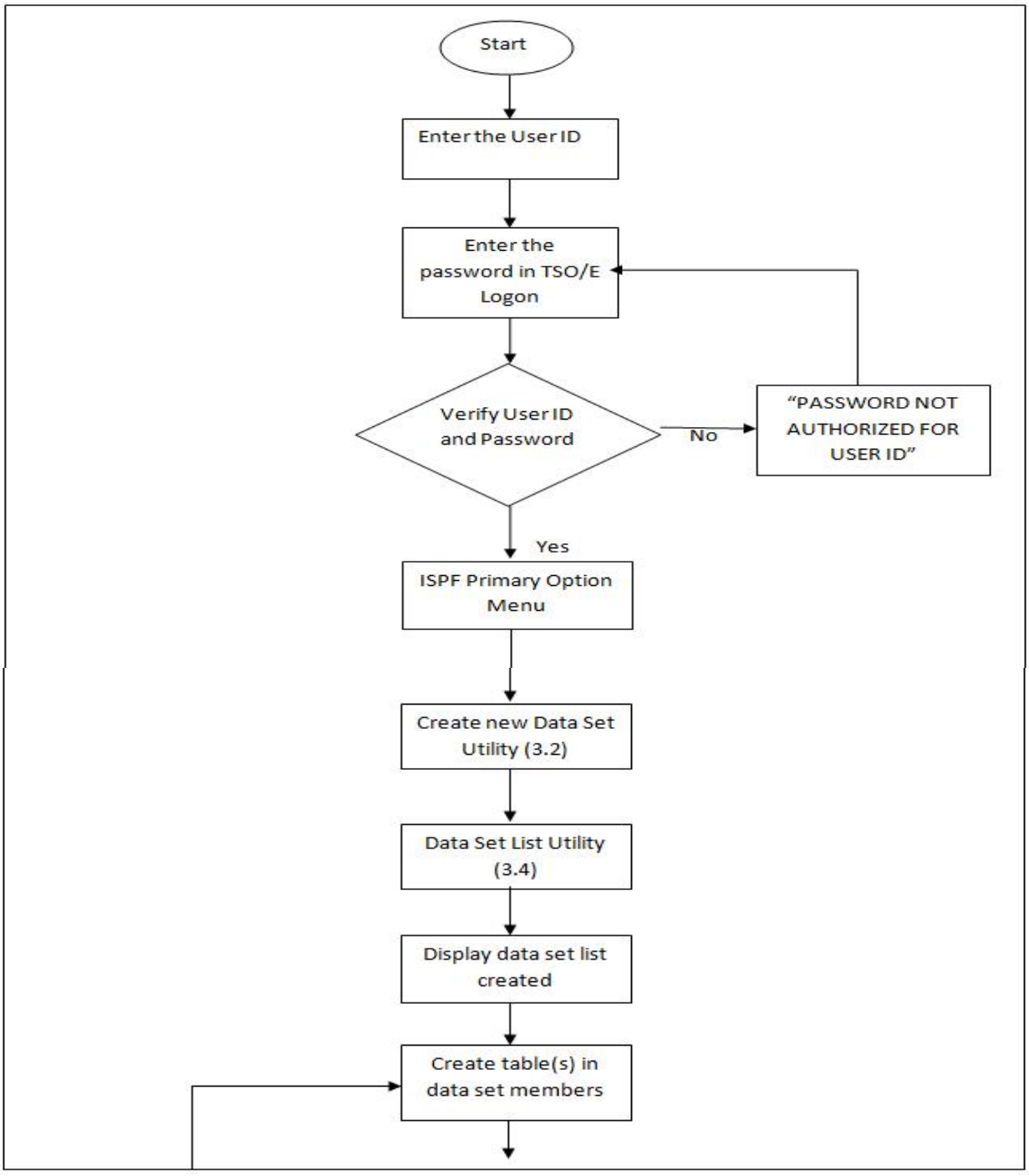
The Operator or Admin will do the same process. After final examination in every semester, final result will released. So, the Operator or Admin will be responsible to insert the data into the database.

(vi) Log Out

User will log out to end the session

3.4.3.2 Flowchart

A flow chart is a graphical or symbolic representation of a process [27]. Each step in the process is represented by a different symbol and contains a short description of the process step. The flow chart symbols are linked together with arrows showing the process flow direction [28].



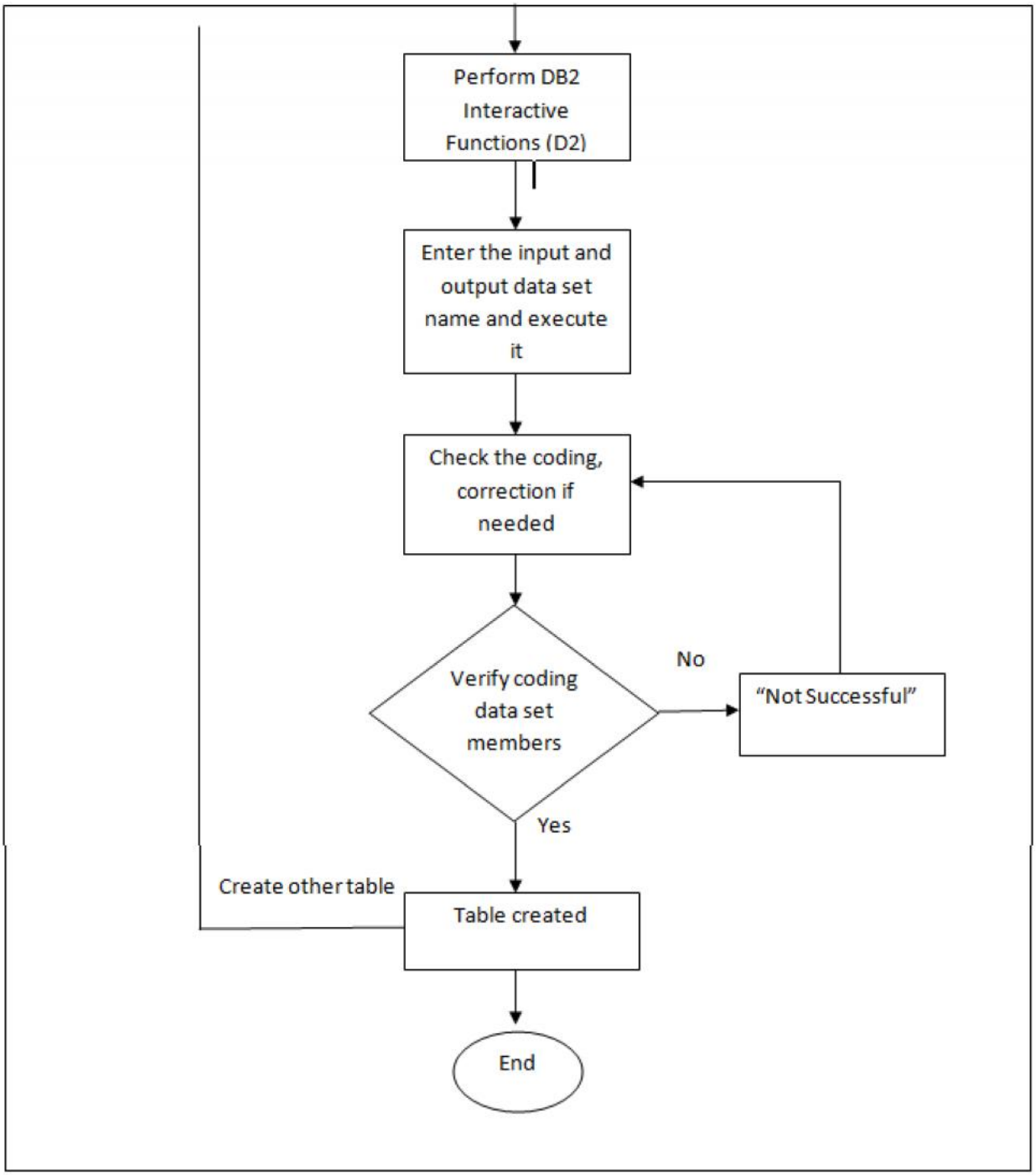
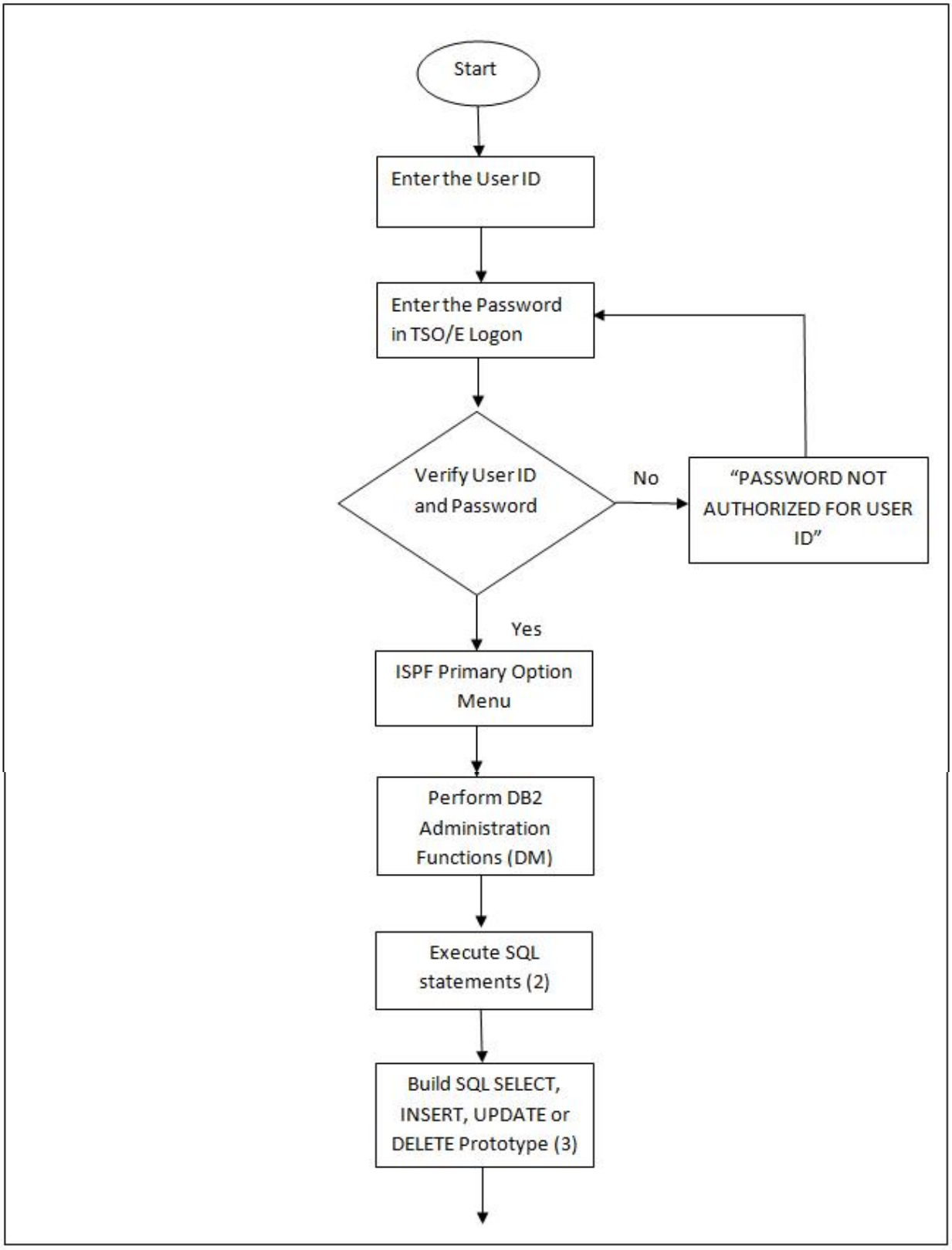


Figure 3.3: System flow shows how to create the tables in System-z Mainframe


Start
Enter the User ID
Enter the Password in TSO/E Logon
Verify User ID and Password
No
"PASSWORD NOT AUTHORIZED FOR USER ID"
Yes
ISPF Primary Option Menu
Perform DB2 Administration Functions (DM)
Execute SQL statements (2)
Build SQL SELECT, INSERT, UPDATE or DELETE Prototype (3)

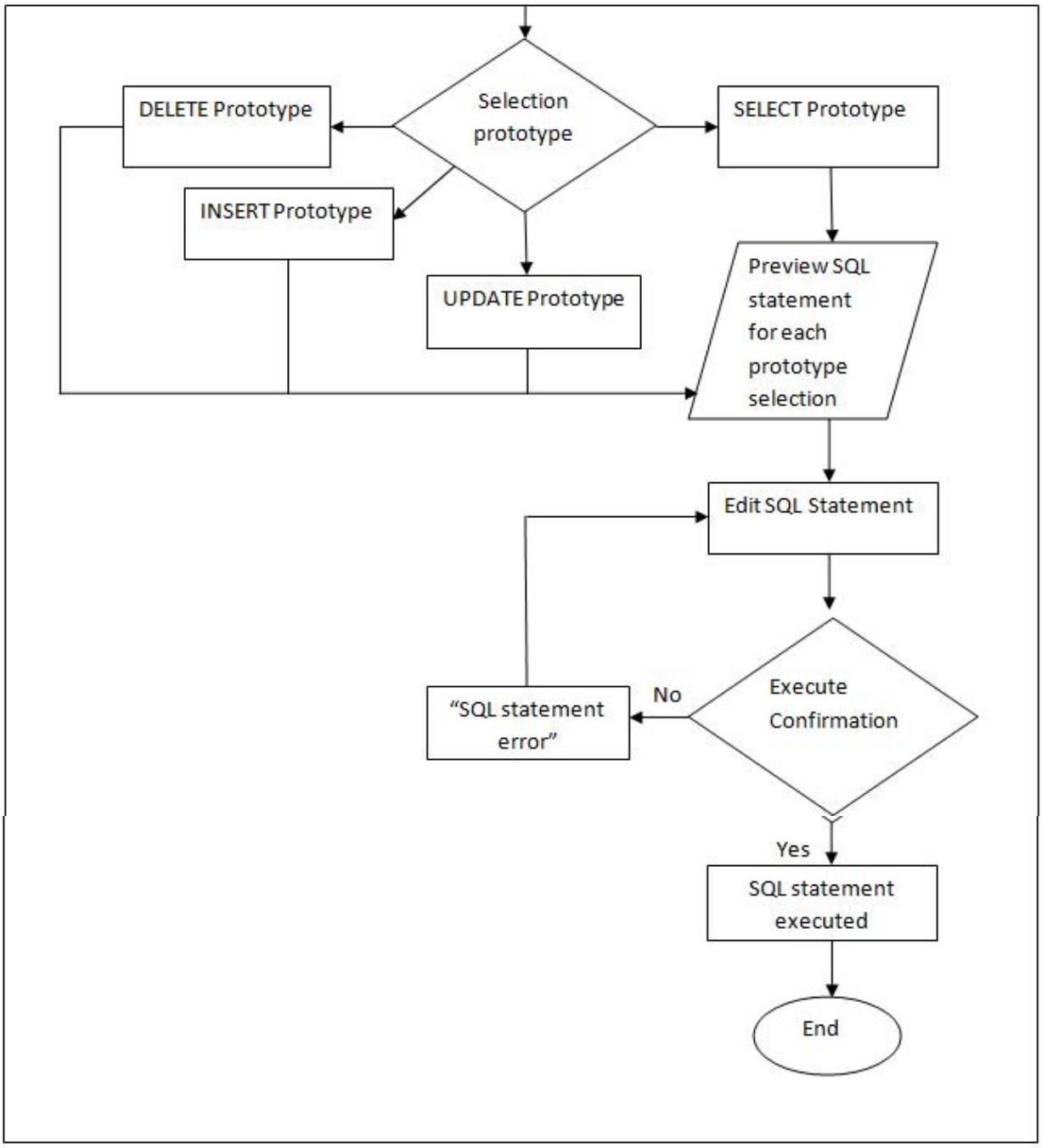
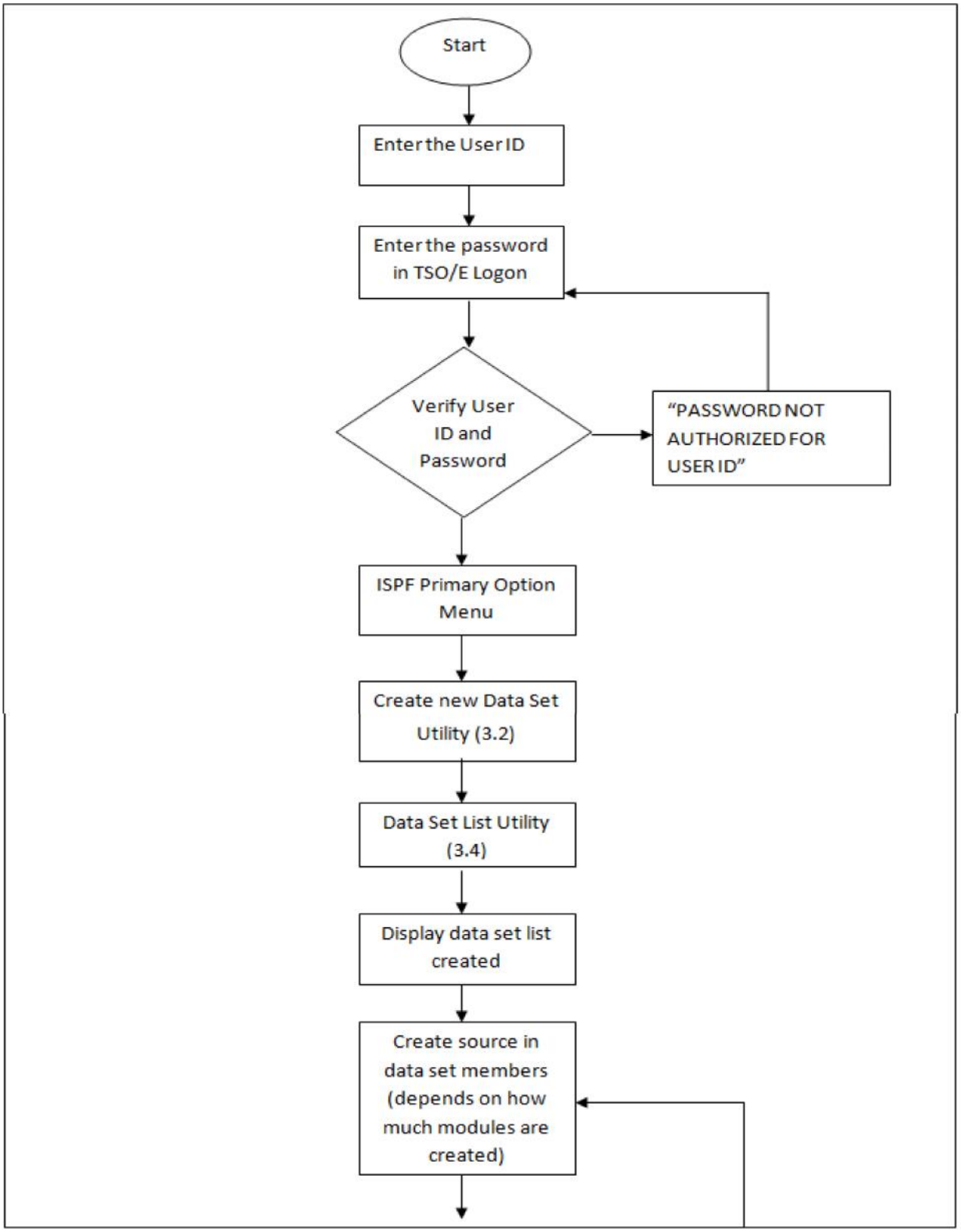


Figure 3.4: System flow how to build SQL SELECT, INSERT, UPDATE, or DELETE prototype after table have been created


Start
Enter the User ID
Enter the password in TSO/E Logon
Verify User ID and Password
"PASSWORD NOT AUTHORIZED FOR USER ID"
ISPF Primary Option Menu
Create new Data Set Utility (3.2)
Data Set List Utility (3.4)
Display data set list created
Create source in data set members (depends on how much modules are created)

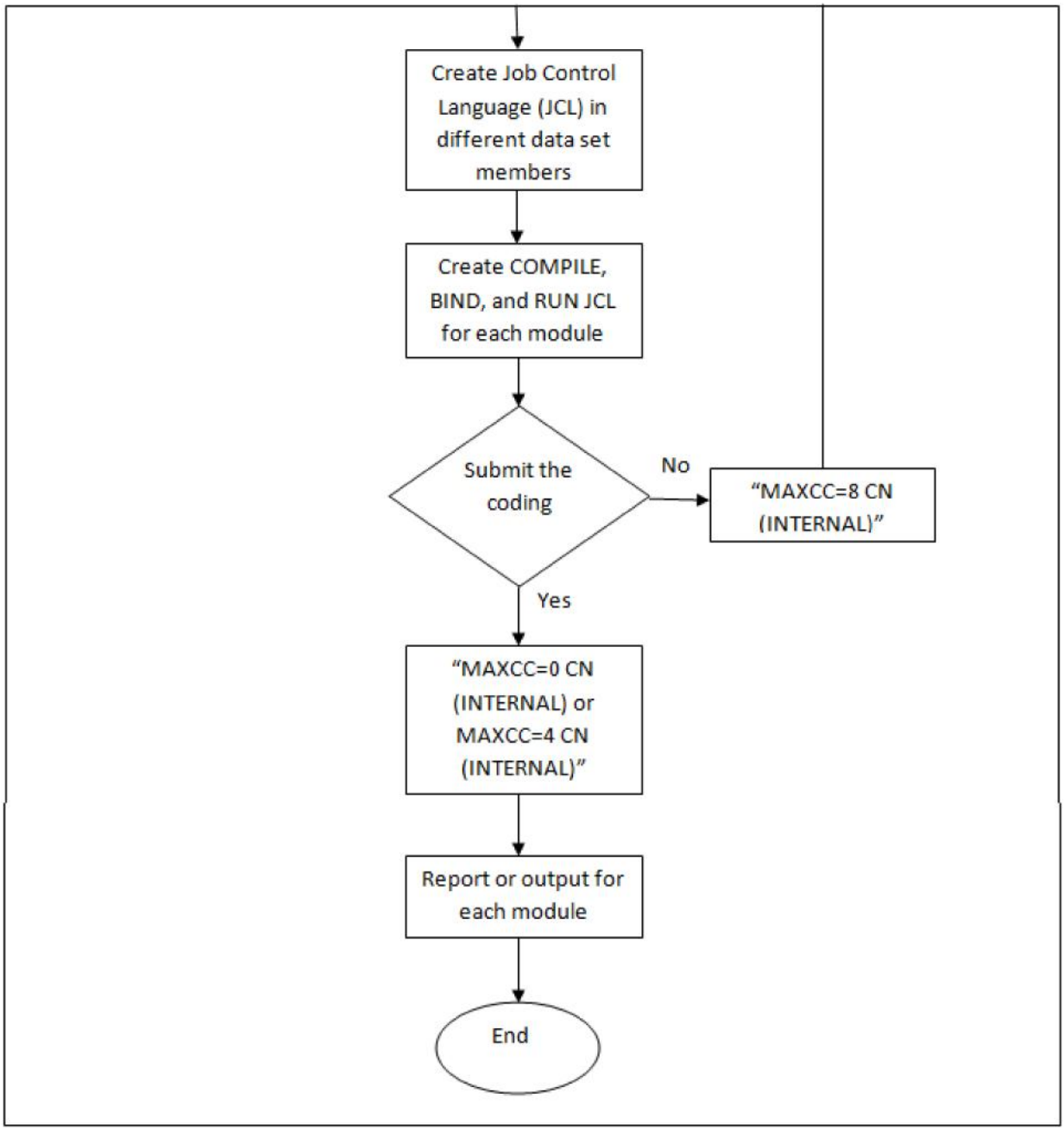


Figure 3.5: System flow in source COBOL and Job Control Language (JCL) to get the report or output

3.4.3.3 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in Online Student Performance Evaluation in System-z Mainframe. DFD will depict the overview of the system inputs, processes and outputs.

The advantages using DFD are:

- Further understanding of the interrelatedness of modules and sub modules of Online Student Performance Evaluation in System-z Mainframe.
- Analysis of a proposed system to determine if the necessary data and process have been defined.
- Freedom from committing to the technical implementation too early
- Communicating the system knowledge to users through data flow diagrams.

Figure 3.6 is an overview process of all the major modules in Online Student Performance Evaluation in System-z Mainframe that includes all the data stores, entities and process involved.

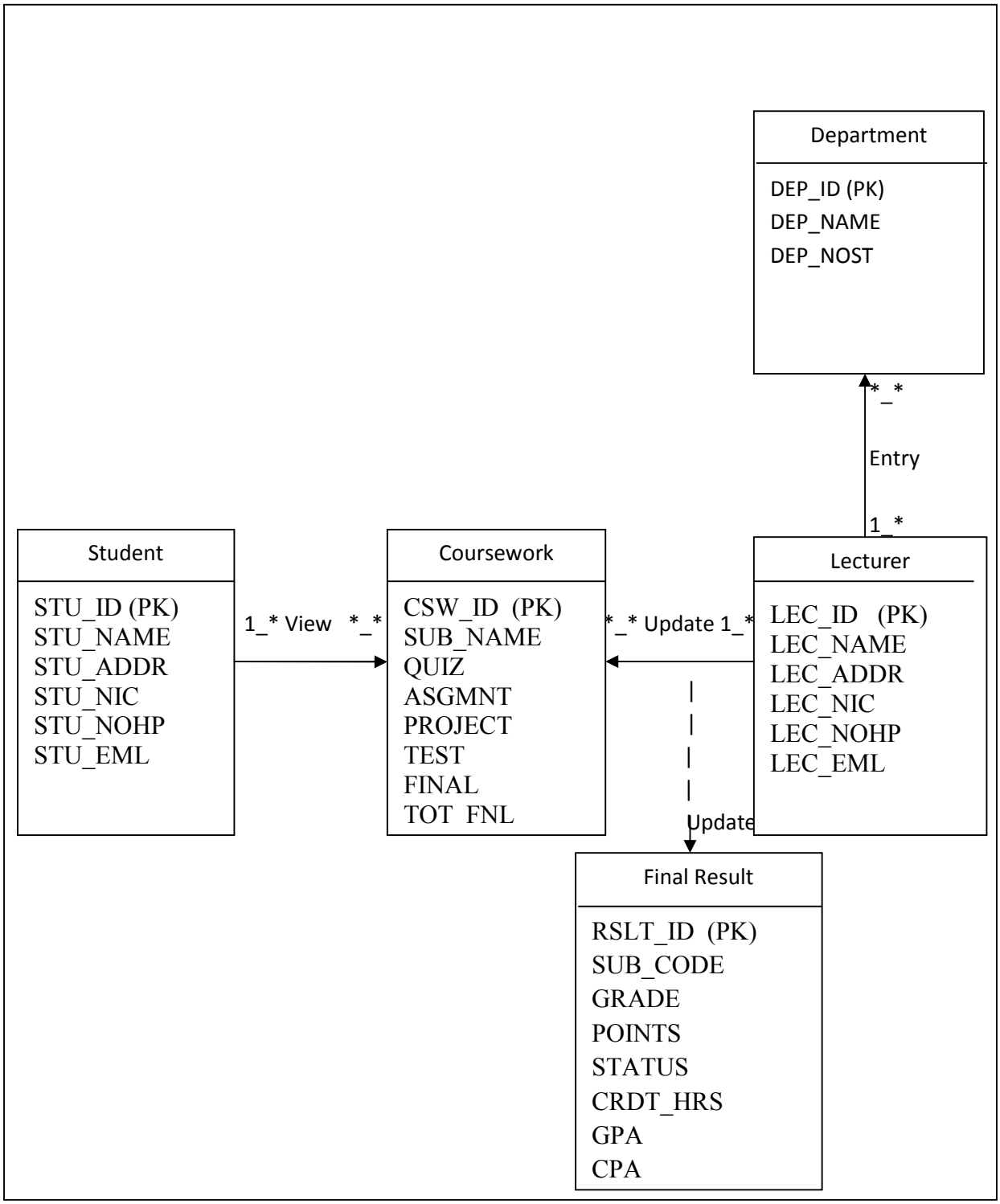


Figure 3.6: Entity Relationship Diagram of Online Student Performance Evaluation in System-z Mainframe

3.4.4 Design Phase

The objective of the design phase is to design the solution system. High-level design consists of developing and architectural structure for software programs, databases, the user interface and the operating environment. Low-level design entails developing the detailed algorithms and data structures that are required for program development. In this phase, there are no interfaces are designed because it is just for Operator and it is actually can save a bandwidth. No interface needed for Operator. It is just insert the data into the database. There is only z/OS interface Interactive System Productivity Facility (ISPF) and System Display and Search Facility (SDSF) using terminal emulator.

3.4.4.1 1nterface

Vista TN3270 is the software which can connect to Marist server. After connect to the desired server and login to a remote mainframe, the z/OS interface (ISPF, SDSF) using terminal emulator will appeared. Only Operator or Admin who has the International Business Machines (IBM) id can login into the system. At first, login into the system with enter “L” or “l”. Then, the system requests for the IBM id and password. After that, if the IBM id and password successful, the interface ISPF menu will appeared, if not successful, it will write “PASSWORD NOT AUTHORIZED FOR USERID”. Figure 3.7 until Figure 4.1 below shows the login interface for Operator or Admin.

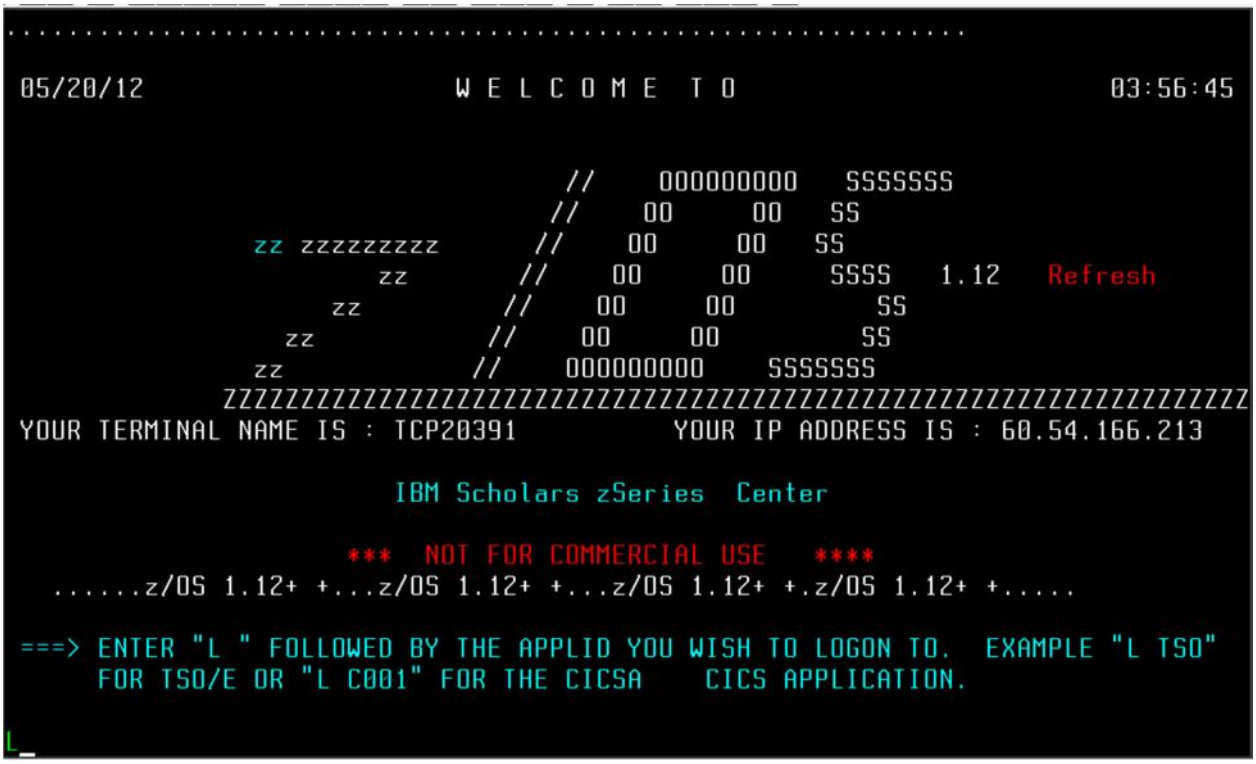


Figure 3.7: Login for Operator or Admin.

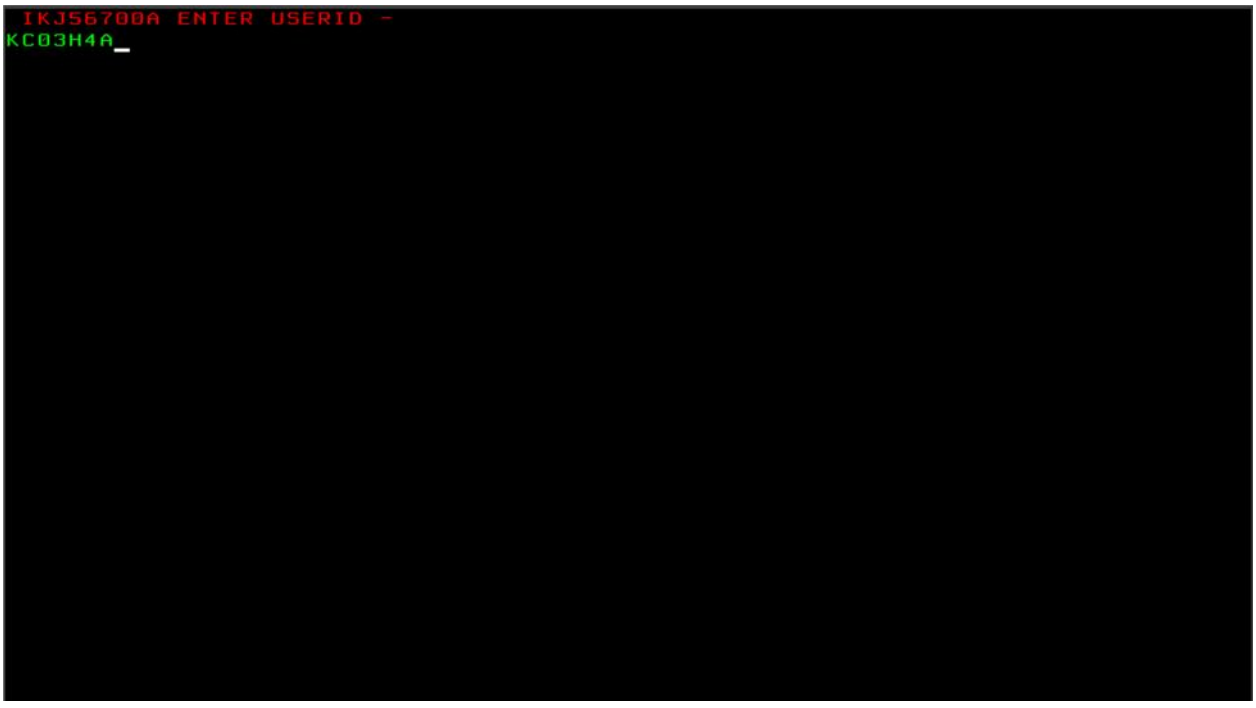


Figure 3.8: Enter the user id for Operator or Admin.

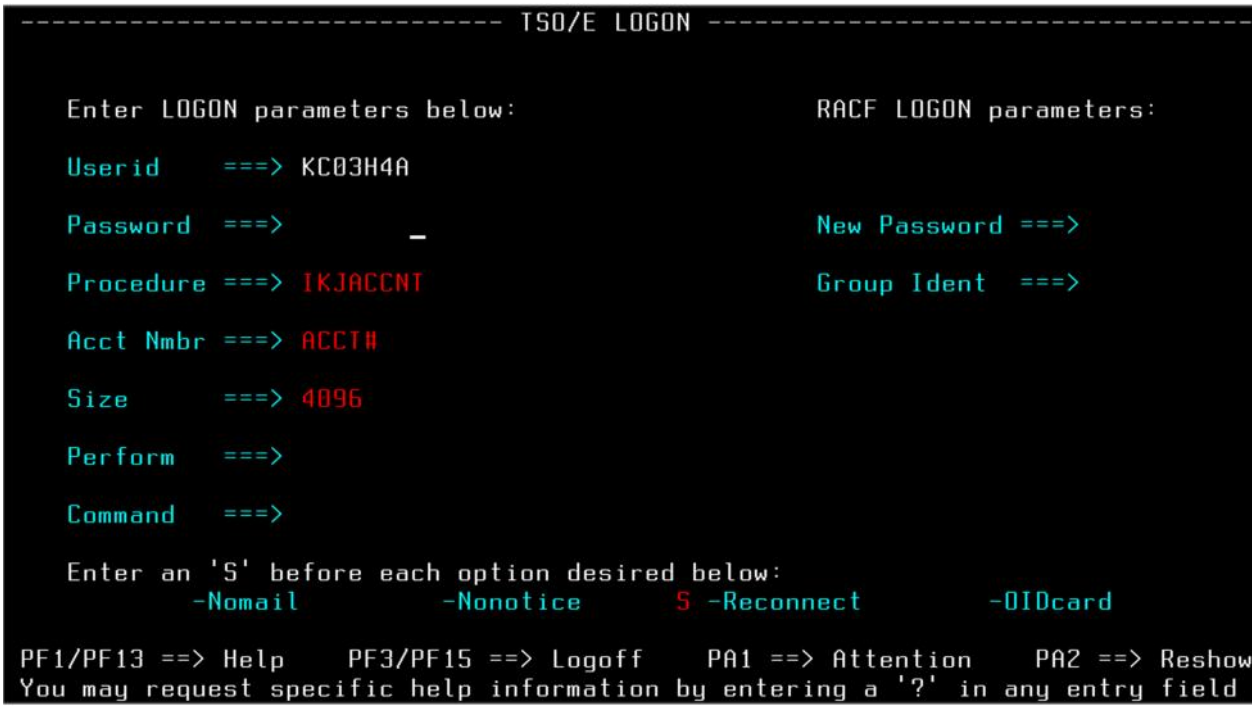


Figure 3.9: Enter the password for Operator or Admin.

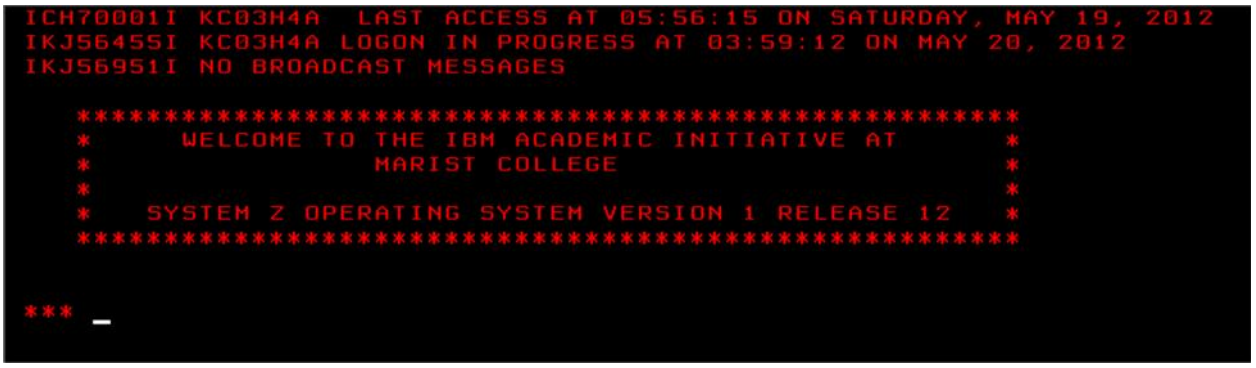


Figure 4.0: Welcome to the IBM interface will appear after the user id and password are success.

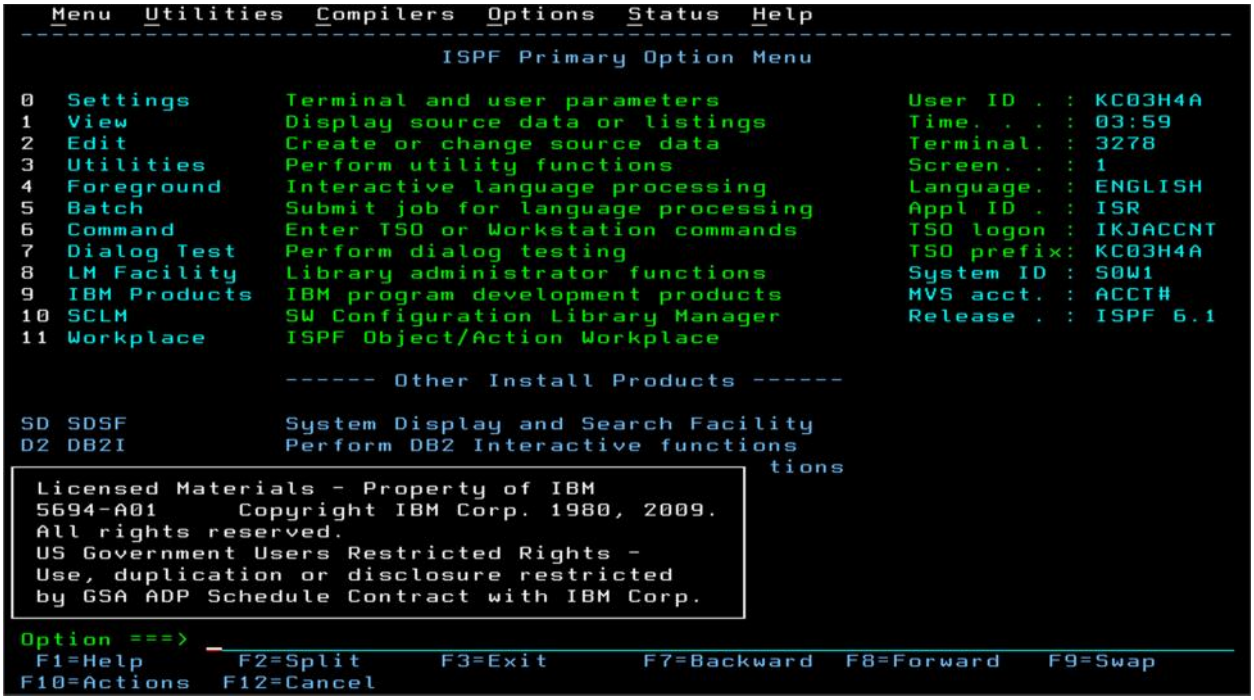


Figure 4.1: This is ISPF menu which contain many applications.

3.4.5 Development Phase

The most important task in the development phase is to build the system. The development phase is the point where the system itself is created. This is typically done by first developing the tables, followed by insert the data into the DB2. IBM DB2 is a relational model database server developed by IBM. In this database layer, all information about the student details, lecturer details, student's coursework and final result can be stored and updated efficiently by the system operator. On the technical part, a successful system requires an understanding of back-end system development also known as business logic layer. This will be the 'backbone' of the system.

This involves writing valid code which is in COBOL language. COBOL is stand for Common Business-Oriented Language which is one of the oldest programming language. All content are created in a format that can be viewed and interacted with via the Internet. The development phase also includes testing the various components. Design and development phases are sometimes combined.

3.4.6 Testing Phase

As specified above, the system is first divided in units which are developed and tested for their functionalities [29]. These units are integrated into a complete system during Integration phase and tested to check if all modules or units coordinate between each other and the system as a whole behaves as per the specifications. After successfully testing the system, it is delivered to the customer. The types of testing can be divided into four as below:

Type of Testing	**Description**
Coding testing	To ensure all of code written are function properly without error
Functionality testing	To ensure all functionality of system achieve goals
Random testing	To test all of function in an applications
Database testing	To ensure all data can be save in the database without any error

Table 3.1: Type of Testing

3.4.7 Implementation Phase

During the implementation phase, the final system is built, tested and installed. The objective of this phase is not only to have a reliable, working information system but also to ensure that the users are all being trained and the business is benefiting.

In this phase, the detailed specifications produced during the design phase are translated into executable system [30]. The system has gone through unit testing, integration testing and retested in a systematic manner. Then hardware and the Operating System requirement have to be met at this phase.

3.4.8 Maintenance Phase

The final phase of the SDLC is maintenance. When a system that been developed, and user might having problems of difficulties of the system and think the better performance of the system [31]. After the implementation is being done, any errors and interoperability problem which were not discovered in earlier phase of life cycle will be correct at this phase and also modification will be done to fulfill the system requirements. Inevitably the system will need maintenance. Besides that, the application is developed to accommodate changes that could happen during the implementation period.

There are many reasons for the change. Change could happen because of some expected input values into the system. In addition, the changes in the system could directly affect the system operations. The system should be developed to accommodate changes that could happen during the post implementation period.

3.5 General Requirements

3.5.1 Software Requirements

For the duration of completing this system development, there are three main tools are use:

NO	Tools	Detail Description	Purpose
1	Operating system	1) Microsoft Word 2007 2) Microsoft Visio 2007 3) Microsoft Visual Basic 2008	-To write a document -To draw use case diagram and flowchart -To draw the interface of the system
2	Notebook software	Microsoft Windows 7 Professional	-Control and coordinate use of hardware among various application and user
3	Mainframe	z/OS terminal	-Build, manage and run rule-based applications for mainframe
4	AVG Anti Virus	AVG Anti Virus Latest	-Protect from virus
5	WinRAR	WinRAR latest	-Compressing files

Table 3.2: Software requirement

3.5.2 Hardware Requirements

All personal computer are required connect to the internet for access the online system. The minimum hardware requirements for this project are shown to the table below:

NO	Item Types	Detail Description	Purpose
1	Notebook	Intel® Core™ i3 or 2.53GHz	-Write document, develop system and run application, store data in database
2	Back up or file server	Intel® Core™ i3 or 2.53GHz	-Back up all document
3	Printer	Brother	-To print document
4	Mainframe	IBM Mainframe	-Connectivity with host mainframe system
5	Pen Drive	Kingston 4GB	-Backup data and file

Table 3.3: Hardware Requirement

CHAPTER 4

IMPLEMENTATION

4.1 Introduction

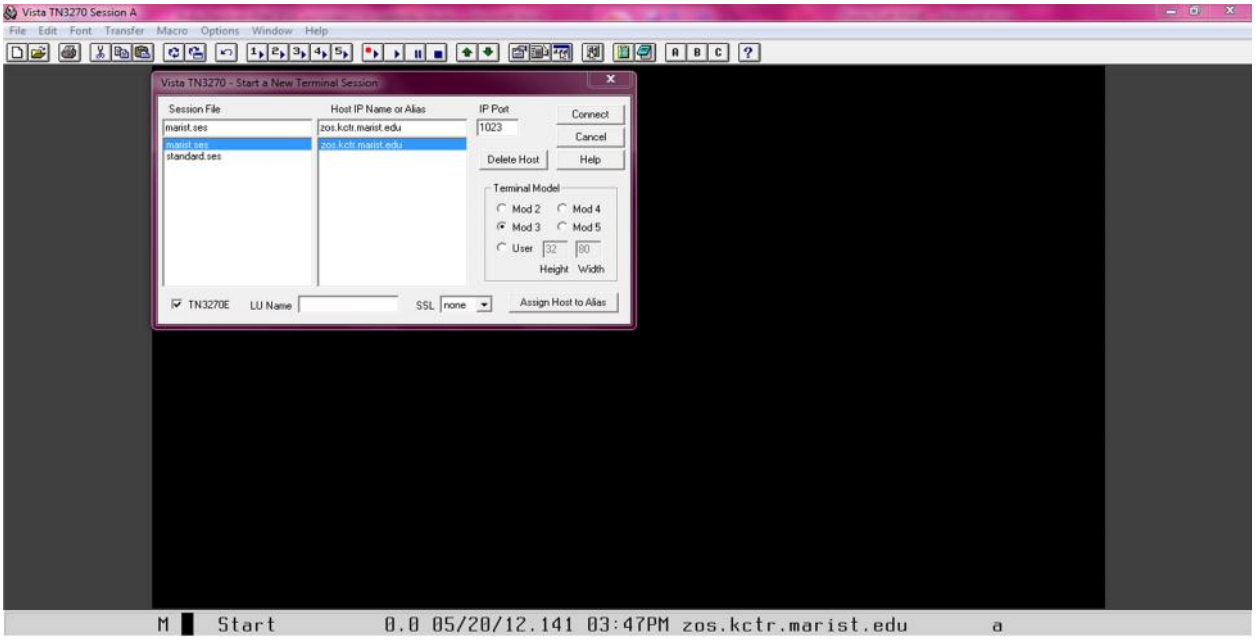
The chapter covers the implementation phase of Online Student Performance Evaluation in System-z Mainframe. The implementation phase focuses on the development of the workable system activities. The implementation activities include the system coding, debugging and documenting. System coding and debugging are the main activities in this implementation phase. The coding includes the structure of the coding system that is used to run the functions in this system.

During implementation, the developer has to ensure that she or he has fulfilled the system requirements before implementing the system to avoid system error or any complications. In this implementation stages, the system will be develop step by step based on function modules.

Implementation phase is an important phase in order to develop on effective system. In this phase, the developer will determine the tools that will be used to implement the system, starting from building interfaces to running the system with free error until completing all functions that have been state in the previous chapter. The programming is the main factor of this phase whereby the developer has to manage the coding properly to make sure the system run with free error and to determine the effectiveness of the system. The software development environment setup, software and the implementation status of the system will be discussed in this chapter.

4.2 Tools and Technologies

Online Student Performance Evaluation in System-z Mainframe is developed using Vista TN3270. This software is connecting to Marist server. Upon the completion of this project, configure the TN3270 to connect to the desired server which is Marist and login to remote mainframe and familiarize with the z/OS interface (ISPF, SDSF) using terminal emulator. Other than that, check CPU configuration, page data set usage and Initial Program Load.



On the dialog box, insert the following parameters:

i. Session File: marist

ii. Host IP Name or Alias: zos.kctr.marist.edu

iii. IP Port: 1023

iv. Terminal Model: Mod 3

v. Click 'Connect'.

4.3 Database Creation and Manipulation

In this phase, the method of database management and implementation will be explained in details. In the application and system development, database layer is the most important part that needs to be considered. Each application and system nowadays uses at least one database in order to store any data and program that accessed by user. The database manipulation can be done by using the Structured Query Language (SQLCE query), the standardize language for all type of the database. The main language used in this project is COBOL language. Figure 4.2 and Figure 4.3 will show how to create a database for Online Student Performance Evaluation in System-z Mainframe.

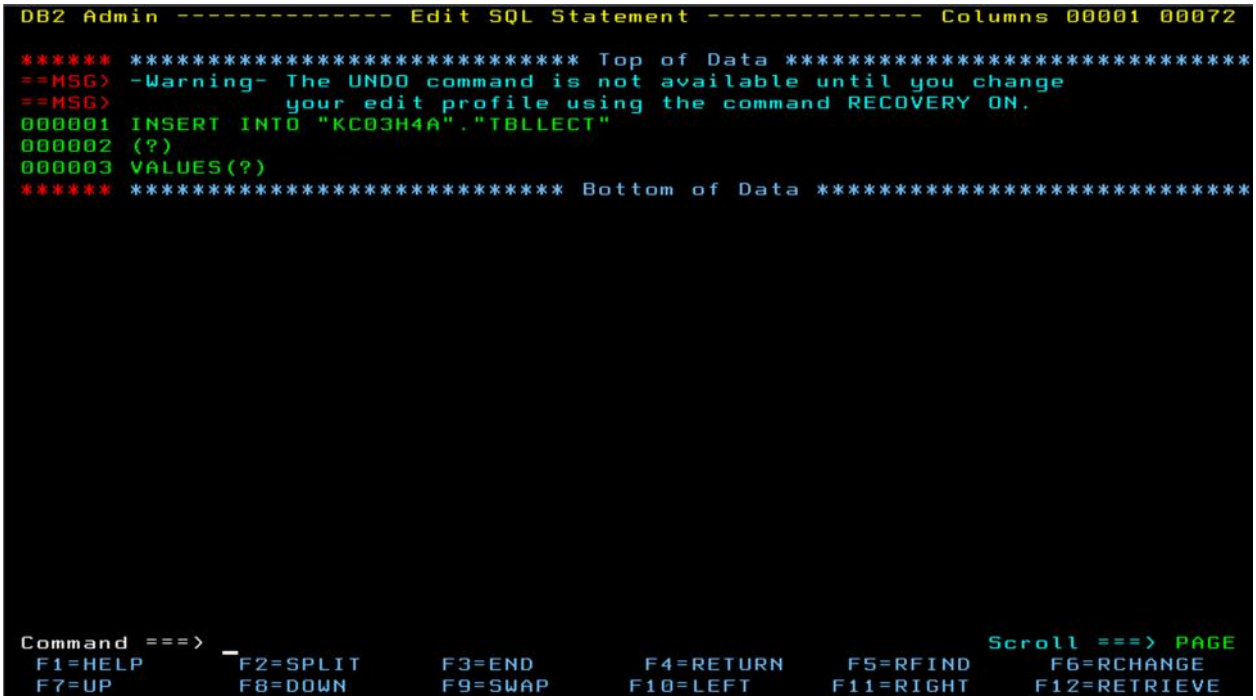


Figure 4.2: Create Lecturer Database

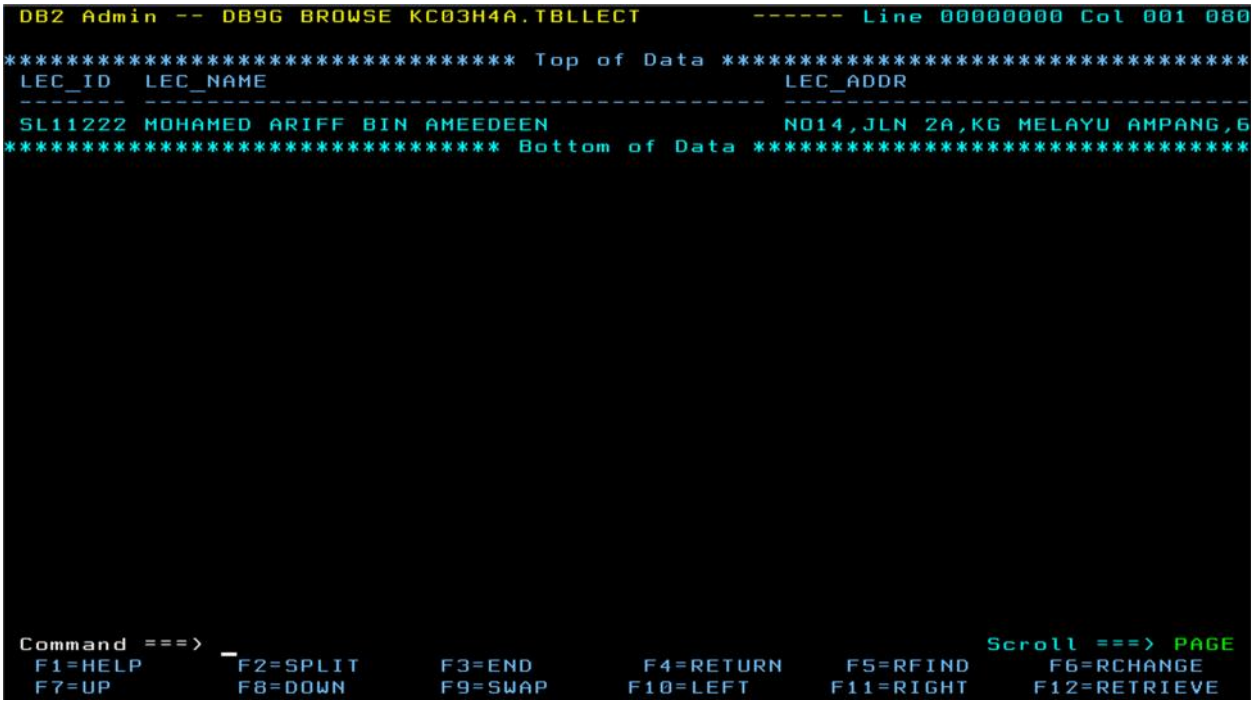


Figure 4.3: The database of lecturer that has been filling up.

4.3.1 Table Creation

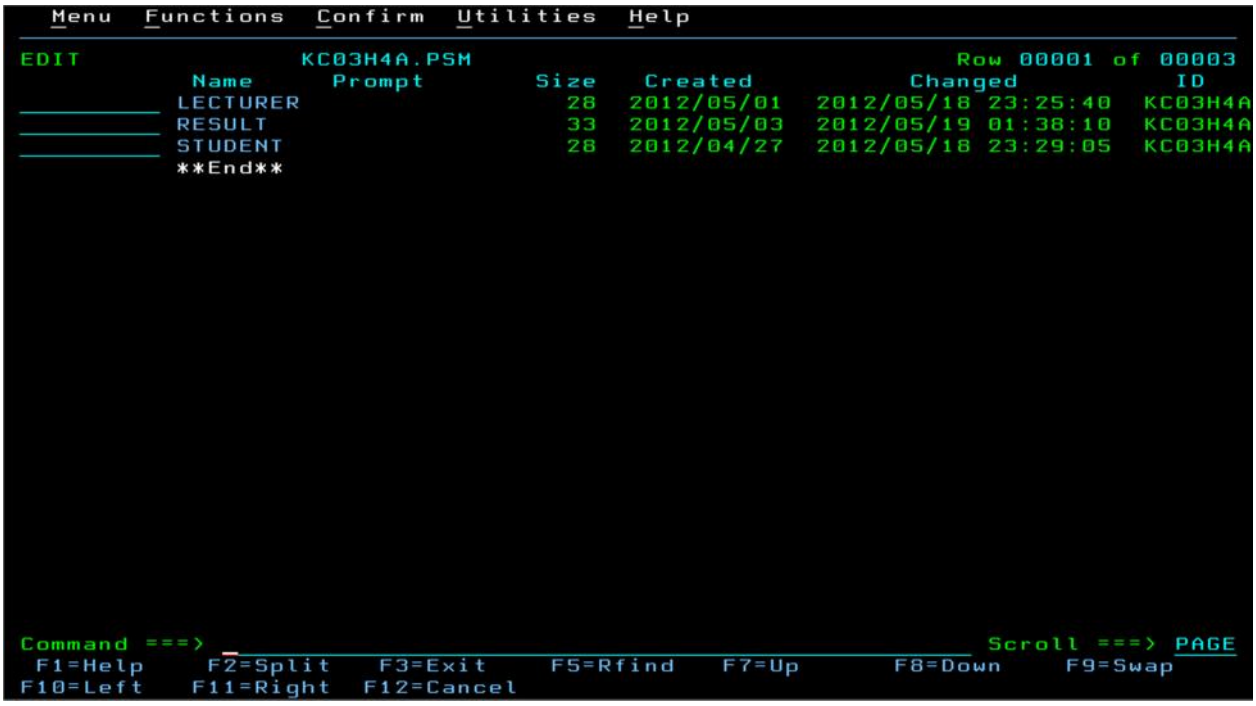


Figure 4.4: There have three tables in this project which are lecturer, student, and result.

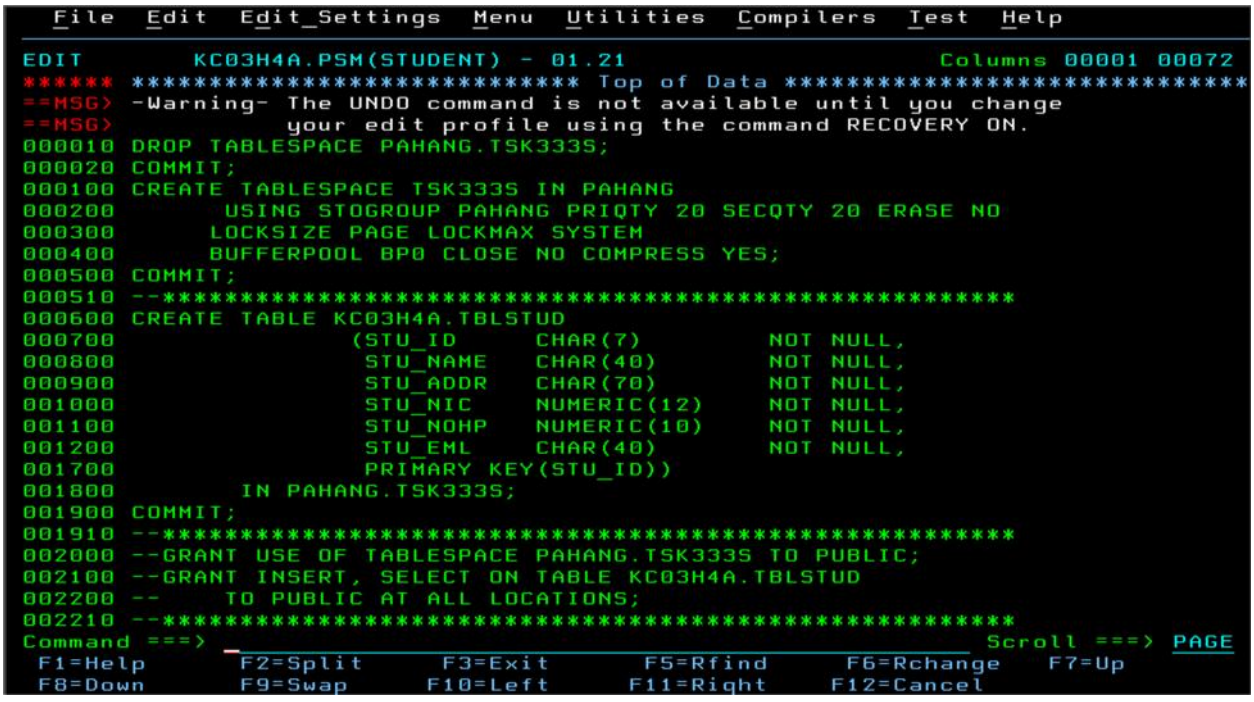


Figure 4.5: This is the coding of how to create the table of student.

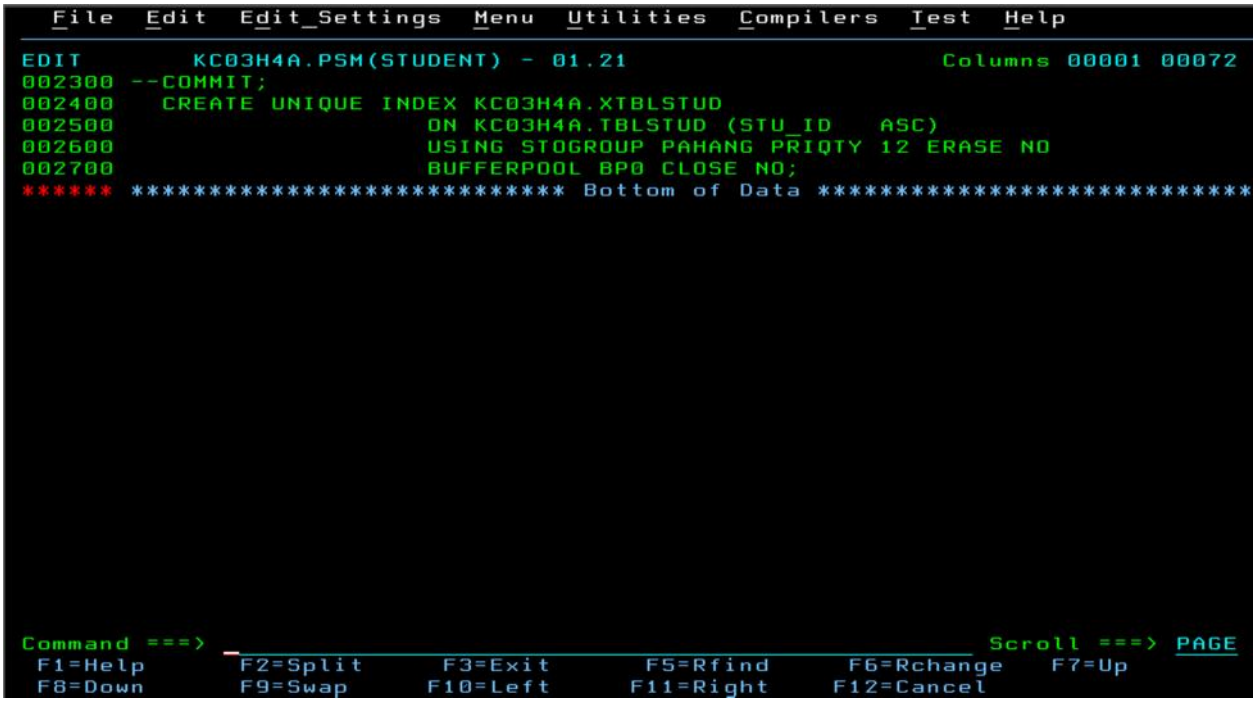


Figure 4.6: The continuation coding of how to create the table of student.

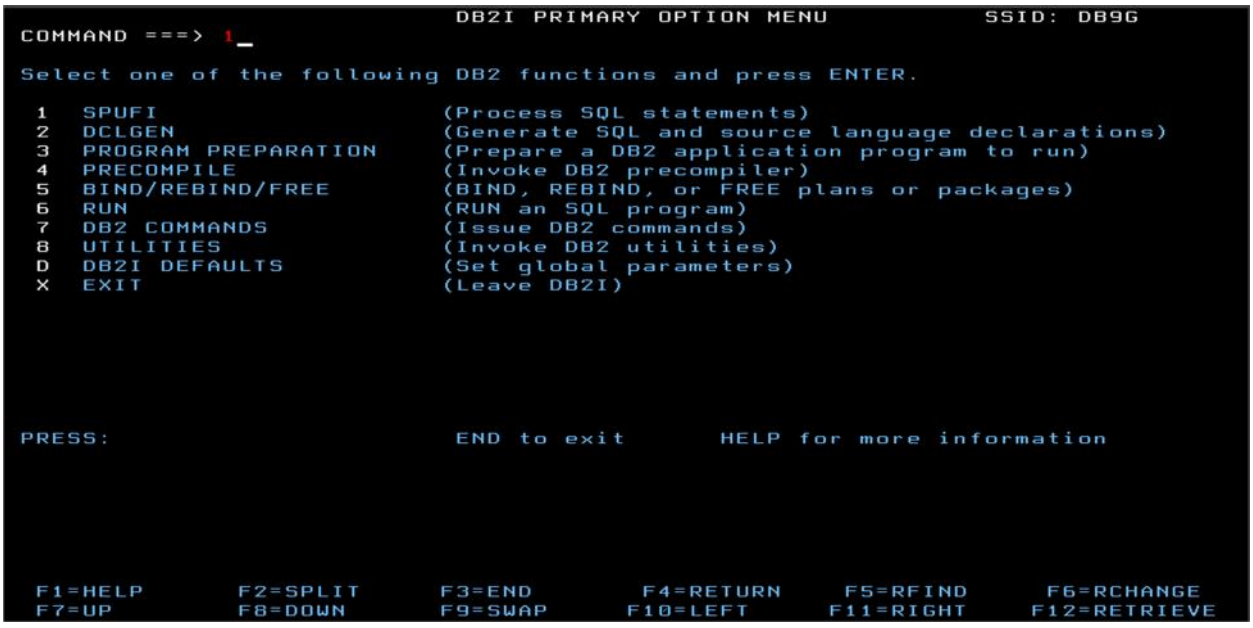


Figure 4.7: Go to ISPF Primary Option Menu then choose Option 12 (DB2). From the menu, choose 1 for SPUFI and press enter.

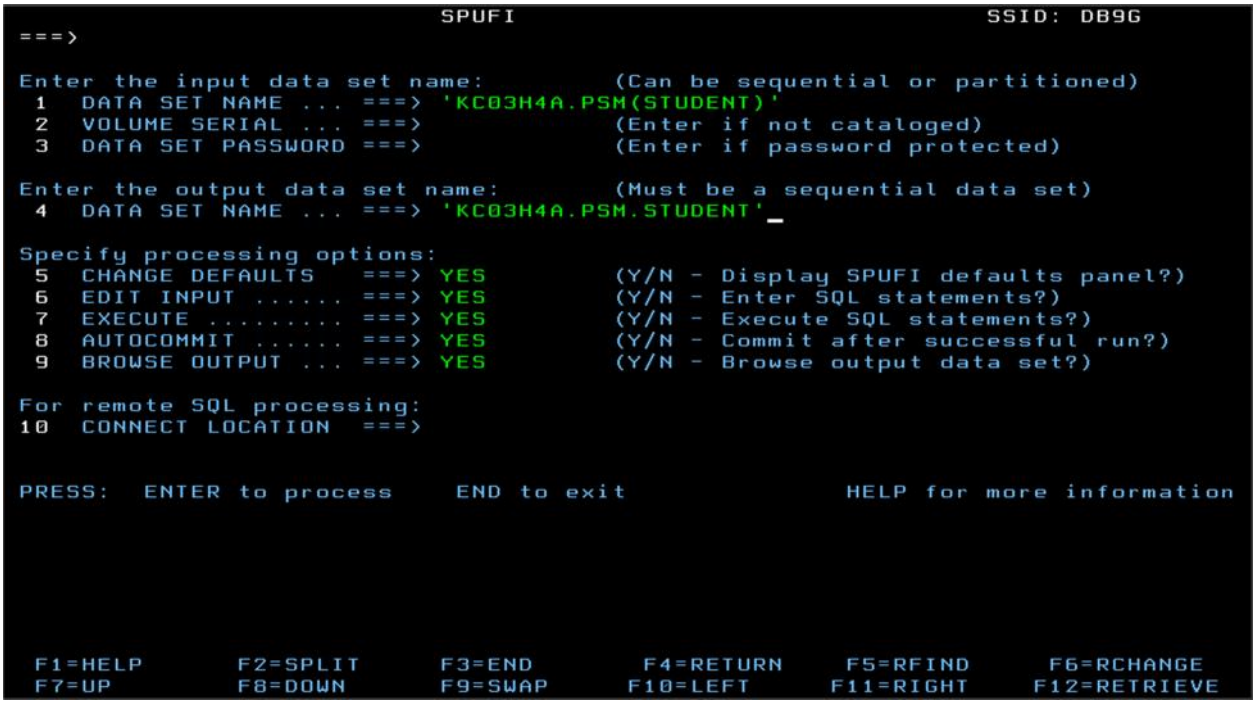


Figure 4.8: This is how to create the table of student. In the input and output data set name, it can change to lecturer or result.

Figure 4.9: When the statement execution was successful, means that the creation table of student success.

Figure 4.4 until 4.9 shows how to create the table of student. The function of this table is to keep data about the data of the user including lecturer and the result of students. After create the tables, insert, edit, and delete the data will always be used by developer.

4.3.2 Database Manipulation

In developing Online Student Performance Evaluation in System-z Mainframe, the database manipulation is a major phases to complete the system module. This project has insert, delete, select, update, view and searching method to be implemented in the database. All the function need to be related to its data, so the developers need to connect and manipulate all this data and system using COBOL language. This is also known as a business logic layer which will be the database back-end to the system. This will be 'backbone' of the system.

4.3.2.1 Database Connection

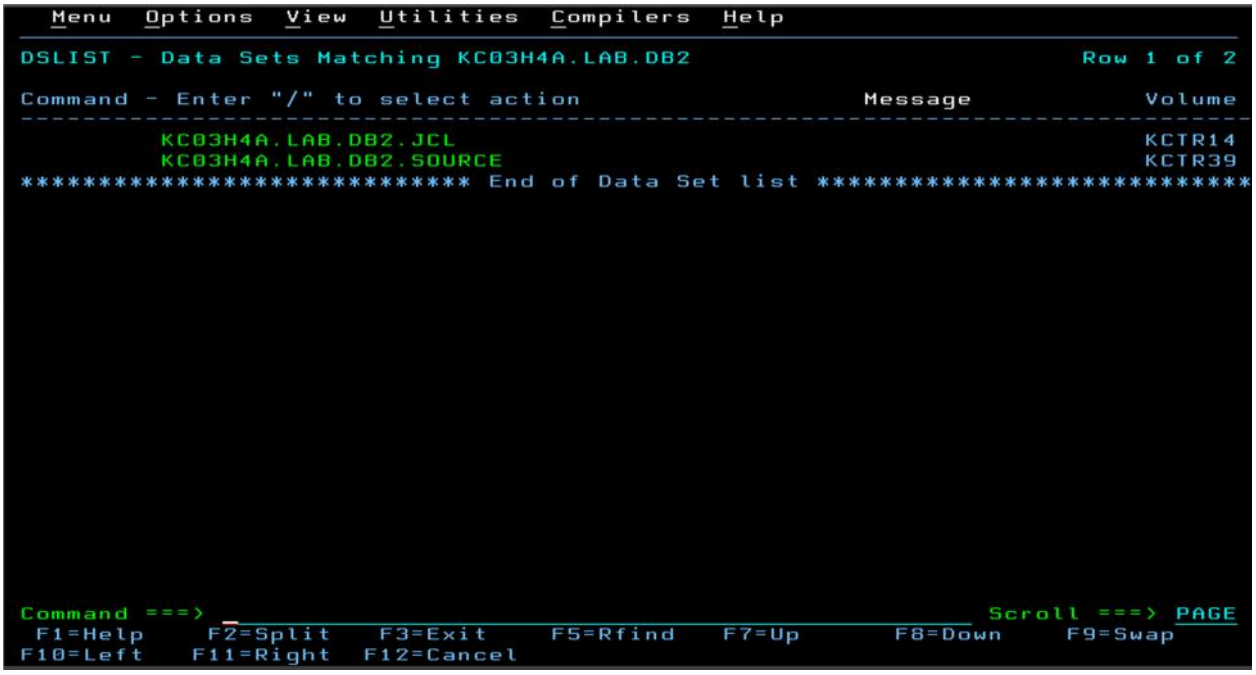


Figure 5.0: In the source, the coding will always be edited if the running has an error in the Job Control language (JCL) part.

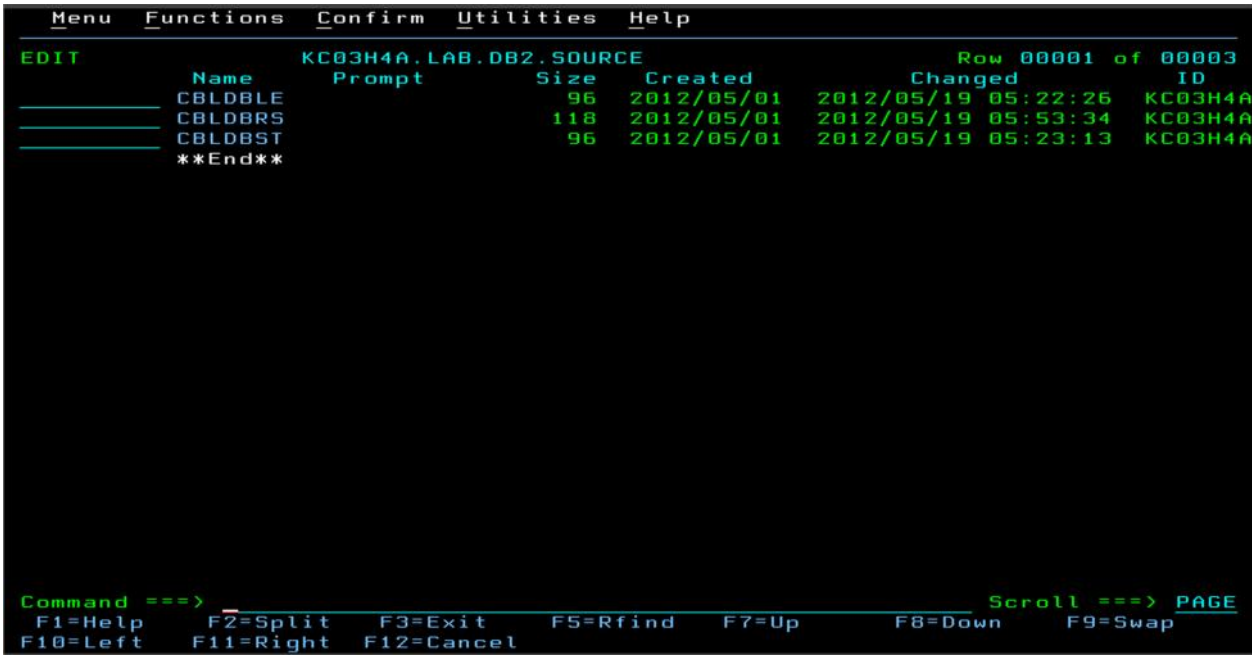


Figure 5.1: There have three parts which are for lecturer, result and student. If there have three tables, that's mean in this source there must be three also.

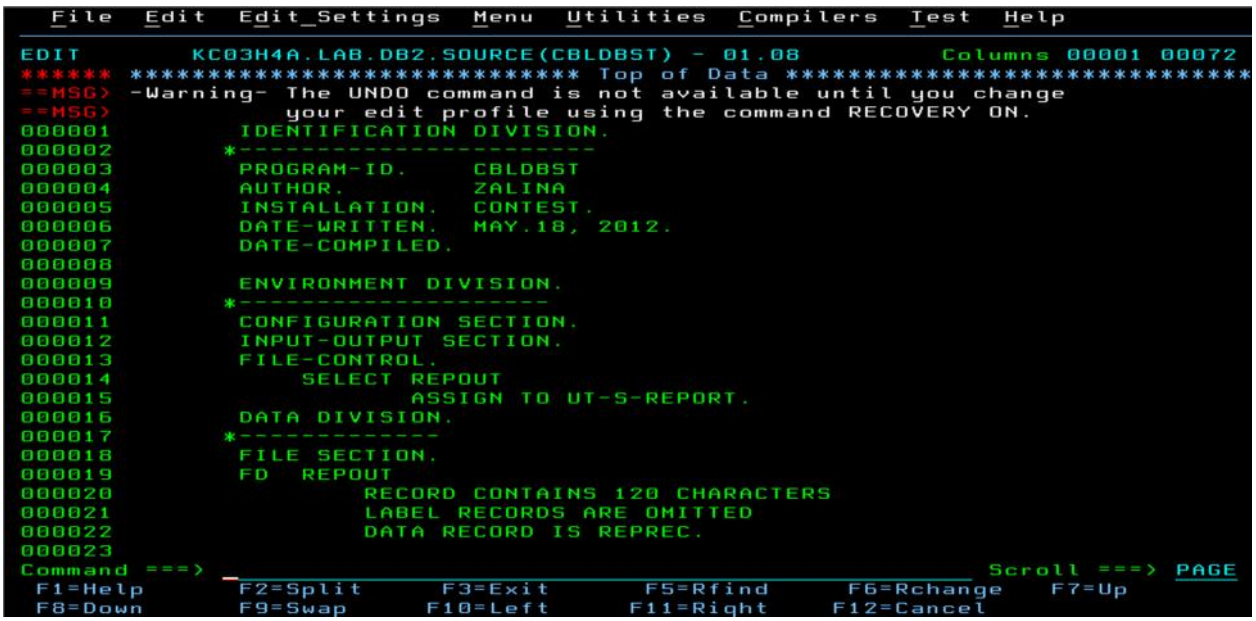


Figure 5.2: The structure of COBOL program, there has four divisions which are identification division, environment division, data division and lastly procedure division.

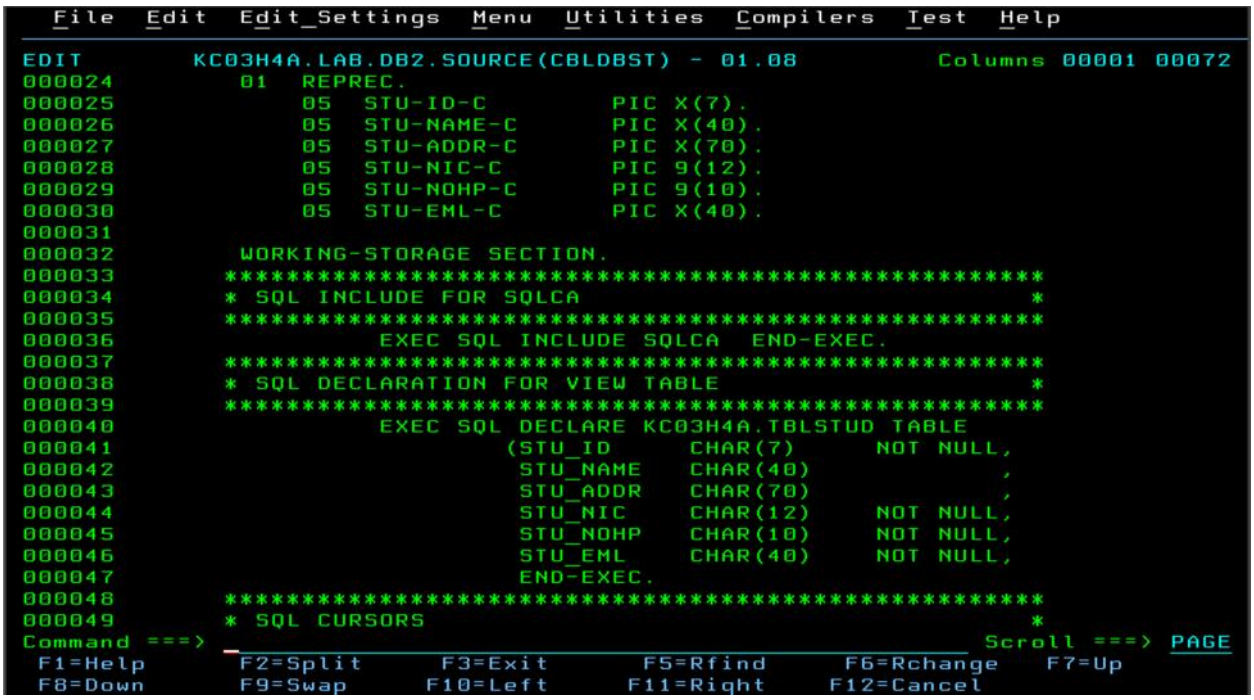


Figure 5.3: There have three parts which are for COBOL, SQL and cursor.

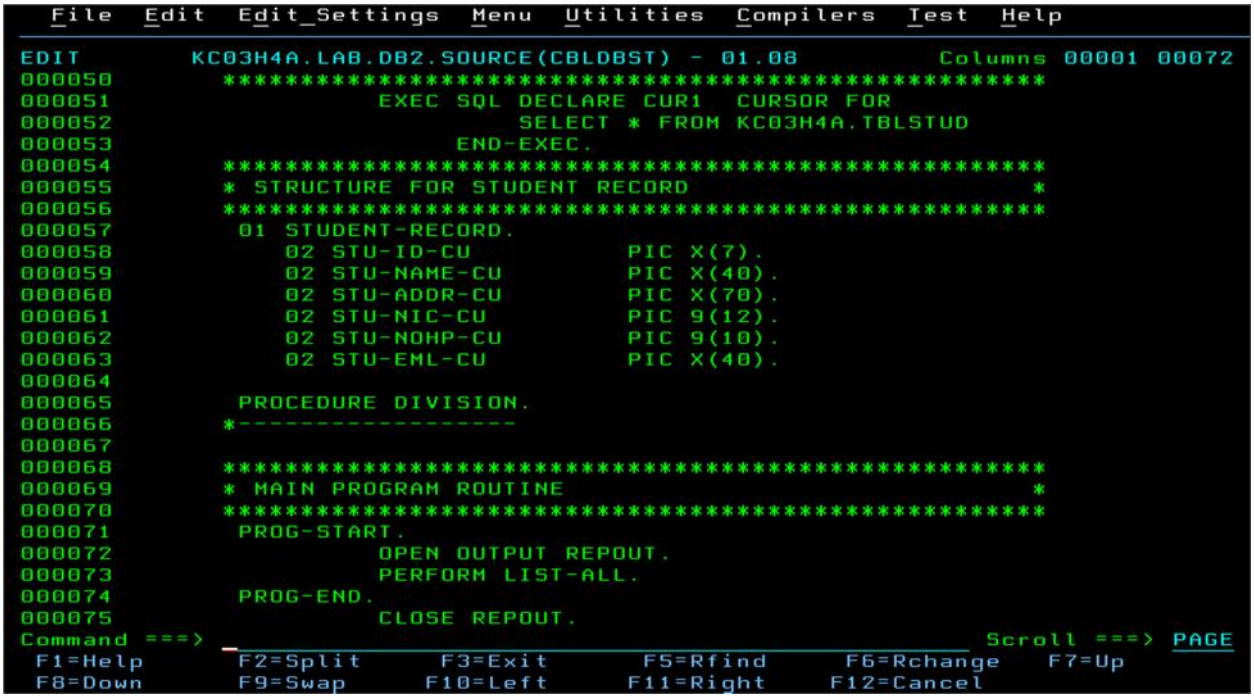


Figure 5.4: This is the continuation coding from Figure 5.3.

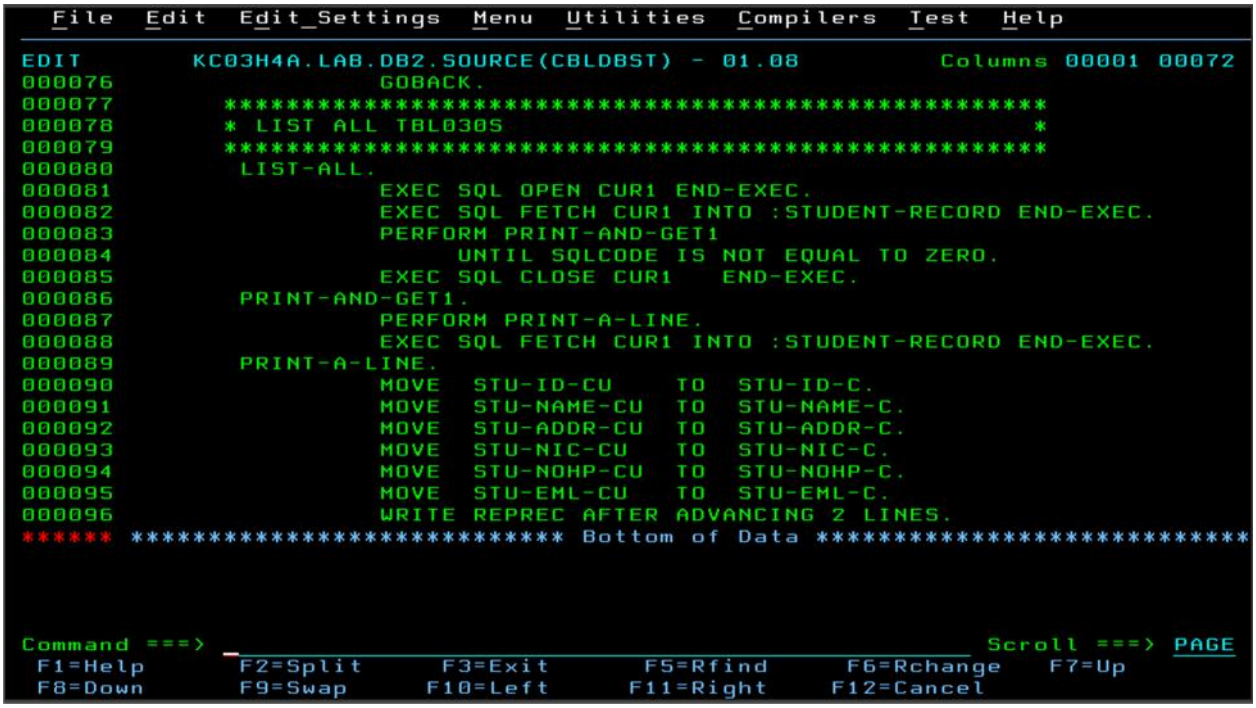


Figure 5.5: This coding shows to give an output after running in the JCL part.

4.3.3 Debugging and Running the System

After finishing the coding in source part, the developer needs to run or debug the system to test the running system if there have any error in the coding stage before. The system is running in the Job Control Language (JCL) part. Figure 5.6 until Figure 6.1 will shows how to running the coding in the JCL part.

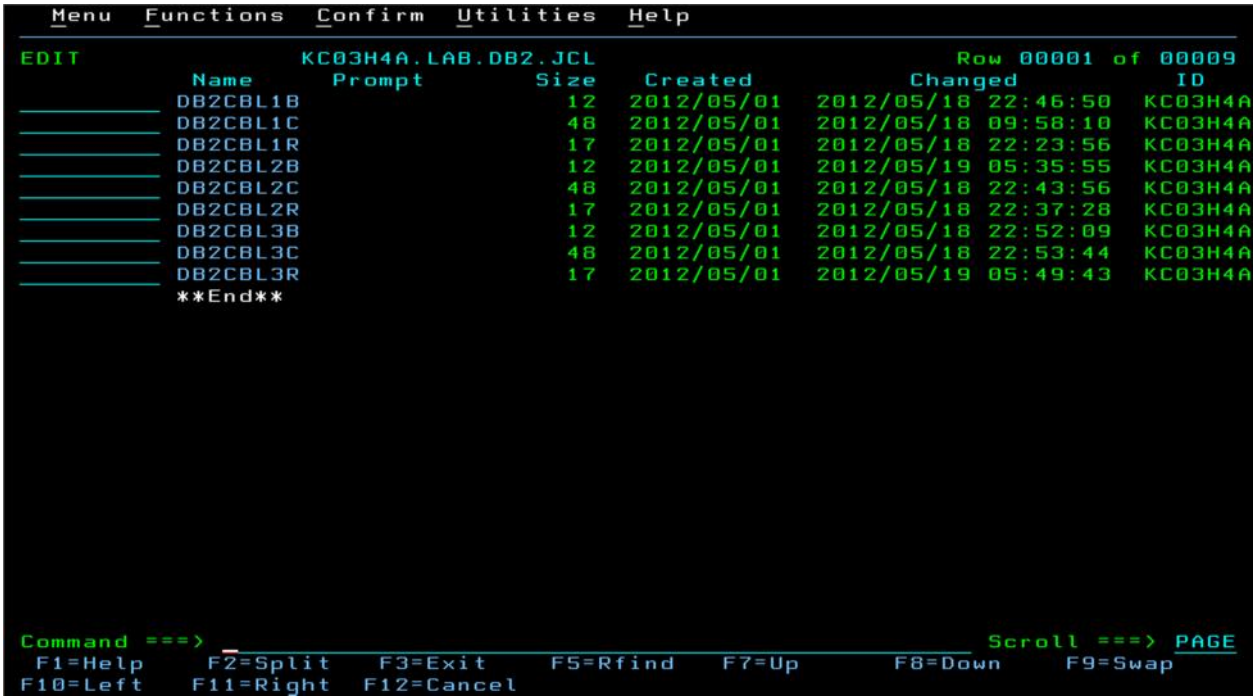


Figure 5.6: In this JCL part, there have three main parts which are for bind, cobol and run. Since there have three tables, so that it will have nine at all.

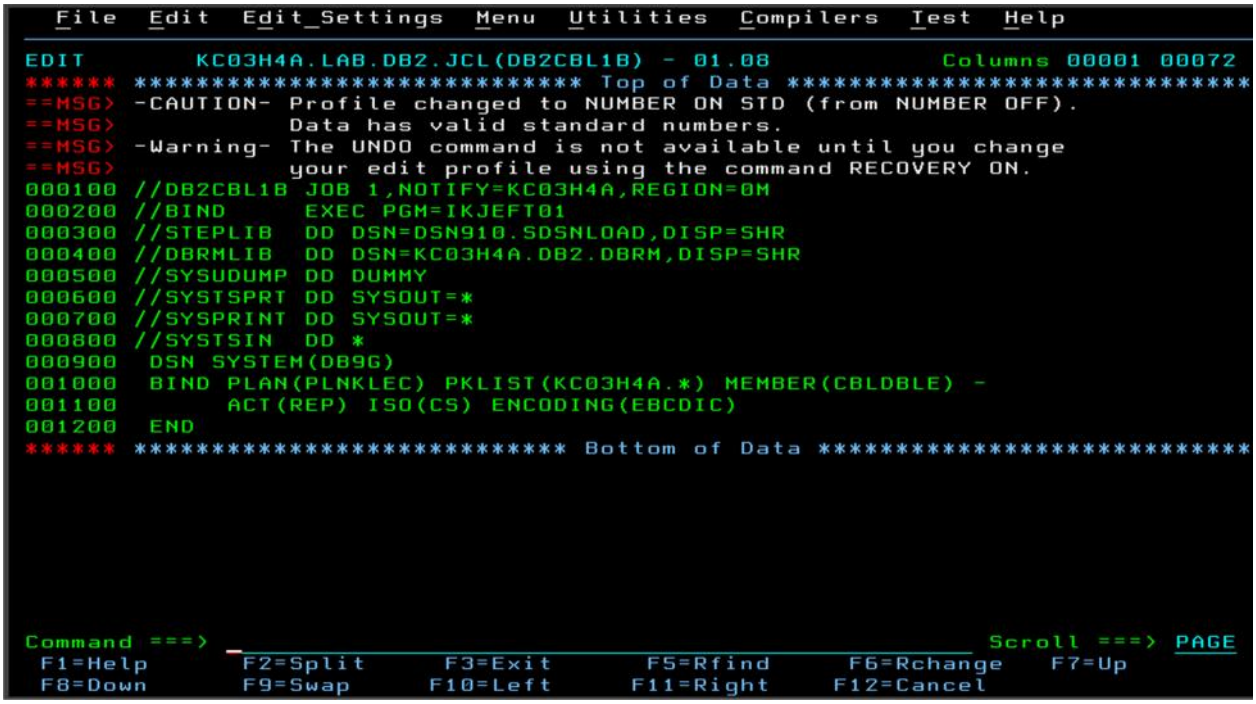


Figure 5.7: This coding is for lecturer table (bind).

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
EDIT       KC03H4A.LAB.DB2.JCL(DB2CBL1C) - 01.04            Columns 00001 00072
****** ***************************** Top of Data ******************************
==MSG> -Warning- The UNDO command is not available until you change
==MSG>           your edit profile using the command RECOVERY ON.
000100 //DB2CBL1C JOB 1,NOTIFY=KC03H4A,REGION=0M
000200 //*******************************************************************
000300 //*         PRE COMPILE - PROCESS API STATEMENTS (EXEC SQL ..)      *
000400 //*                       OUTPUT IS PASSED TO COMPILE STEP BELOW    *
000500 //*******************************************************************
000600 //PC        EXEC PGM=DSNHPC,PARM='HOST(IBMCOB)'
000700 //STEPLIB   DD   DISP=SHR,DSN=DSN910.DB9G.SDSNEXIT
000800 //          DD   DISP=SHR,DSN=DSN910.SDSNLOAD
000900 //SYSIN     DD   DISP=SHR,DSN=KC03H4A.LAB.DB2.SOURCE(CBLDBLE)
001000 //DBRMLIB   DD   DISP=SHR,DSN=KC03H4A.DB2.DBRM(CBLDBLE)
001100 //SYSCIN    DD   DSN=&&DSNHOUT,DISP=(MOD,PASS),UNIT=SYSDA,
001200 //                SPACE=(800,(500,500))
001300 //SYSLIB    DD   DISP=SHR,DSN=DSN910.DB9G.SRCLIB.DATA
001400 //          DD   DISP=SHR,DSN=DSN910.SDSNLOAD
001500 //SYSPRINT  DD   SYSOUT=*
001600 //SYSTERM   DD   SYSOUT=*
001700 //SYSUDUMP  DD   DUMMY
001800 //SYSUT1    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
001900 //SYSUT2    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
002000 //*******************************************************************
002100 //*         COMPILE - OUTPUT IS OBJECT MODULE AND INPUT TO LINKEDIT  *
002200 //*******************************************************************
002300 //COB       EXEC PGM=IGYCRCTL,
Command ===>                                                 Scroll ===> PAGE
 F1=Help       F2=Split      F3=Exit       F5=Rfind      F6=Rchange    F7=Up
 F8=Down       F9=Swap      F10=Left      F11=Right     F12=Cancel
```

Figure 5.8: This coding is for lecturer (cobol).

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
EDIT       KC03H4A.LAB.DB2.JCL(DB2CBL1C) - 01.04            Columns 00001 00072
002400 //                PARM=(NOSEQUENCE,QUOTE,RENT,'PGMNAME(LONGUPPER)')
002500 //STEPLIB   DD   DISP=SHR,DSN=IGY420.SIGYCOMP
002600 //SYSPRINT  DD   SYSOUT=*
002700 //SYSTERM   DD   SYSOUT=*
002800 //SYSLIN    DD   DSN=&&LOADSET,DISP=(MOD,PASS),UNIT=SYSDA,
002900 //                SPACE=(800,(500,500))
003000 //SYSIN     DD   DSN=&&DSNHOUT,DISP=(OLD,DELETE)
003100 //SYSUT1    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003200 //SYSUT2    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003300 //SYSUT3    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003400 //SYSUT4    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003500 //SYSUT5    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003600 //SYSUT6    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003700 //SYSUT7    DD   SPACE=(800,(500,500),,,ROUND),UNIT=SYSDA
003800 //*******************************************************************
003900 //*         LINKEDIT - OUTPUT IS EXECUTABLE MODULE                  *
004000 //*******************************************************************
004100 //LKED      EXEC PGM=IEWL,PARM='LIST,XREF',
004200 //           COND=(4,LT,COB)
004300 //SYSLIB    DD   DISP=SHR,DSN=CEE.SCEELKED
004400 //          DD   DISP=SHR,DSN=DSN910.SDSNLOAD
004500 //SYSLMOD   DD   DISP=SHR,DSN=KC03H4A.DB2.LOAD(CBLDBLE)
004600 //SYSPRINT  DD   SYSOUT=*
004700 //SYSUT1    DD   SPACE=(1024,(50,50)),UNIT=SYSDA
004800 //SYSLIN    DD   DSN=&&LOADSET,DISP=(OLD,DELETE)
****** ***************************** Bottom of Data ***************************
Command ===>                                                 Scroll ===> PAGE
 F1=Help       F2=Split      F3=Exit       F5=Rfind      F6=Rchange    F7=Up
 F8=Down       F9=Swap      F10=Left      F11=Right     F12=Cancel
```

Figure 5.9: This coding is a continuation from the Figure 5.8.

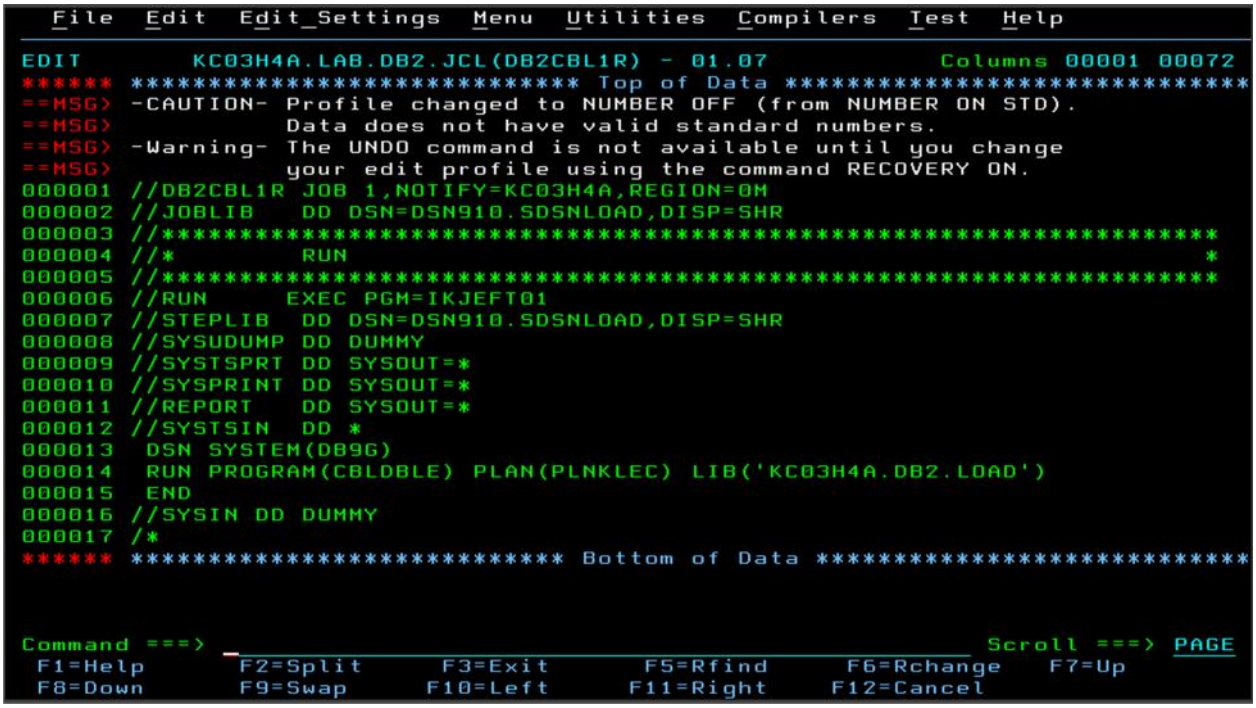


Figure 6.0: This coding is for lecturer (run).

Figure 6.1: This shows that no error in this lecturer part. When enter the command 'SUBMIT', MAXCC-0 will be appeared which mean there is no error and the output will be print at the status part.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Introduction

This chapter will be explains about the result from the system and some discussion from it. It is more describing about the output of the Online Student Performance Evaluation in System-z Mainframe and explanation regarding of each module. The most important thing is to make sure that the objective and the scope of this project is achieved.

This chapter also will discuss about the constraint of the application. It is because in order to enhance or upgrade the system for future improvement, these criteria should be defined clearly so that every preparation and planning can be arranged. All about the output, constraints, assumption and future research about this system will be discussed. Hopefully the discussion in this project can bring benefits and ideas to the future developer to enhance the performance and the functionality of this system.

5.2 Result Analysis

The developed application, Online Student Performance Evaluation in System-z Mainframe have achieved all the objectives of this project, which are to create automated data entry into the database via COBOL, to create a batch type input and output system and to generate a formatted report stored in an independent flat file as output.

5.2.1 z mainframe as the output of the system.

The output of the system is using z mainframe. The z mainframe can help to change the system, make the new system systematically to UMP operator. By using the system, the performance evaluation process will become smoother than before. The result of the student performance evaluation will be released faster. Using this z mainframe also can attract more university to do this similar in their online operator system. Moreover, the record of the students marks more efficiency, easy to be stored and retrieved from the database. The z mainframe is a faster processor and greater memory addressing capability.

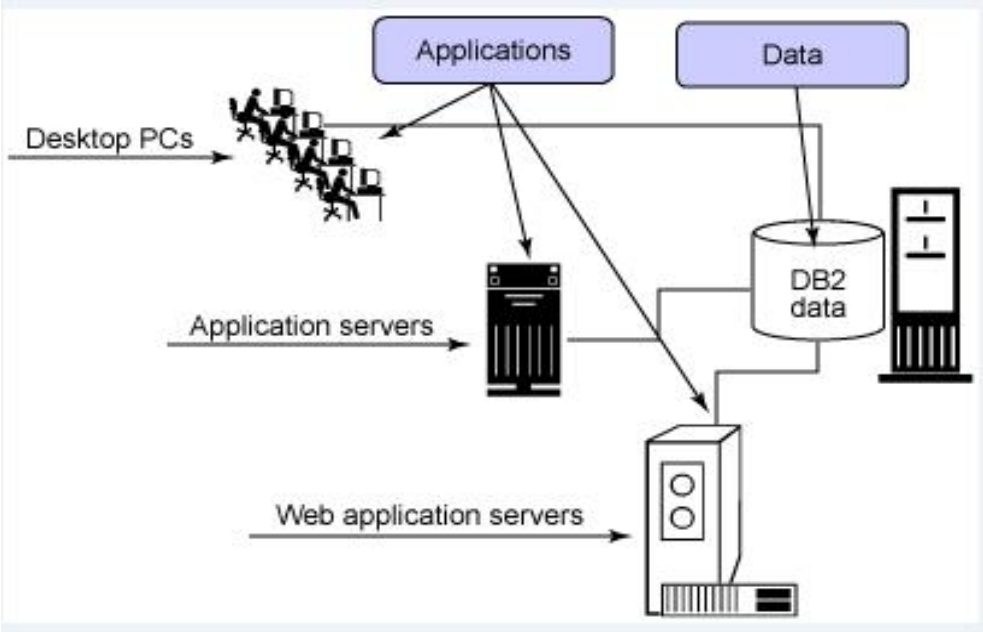


Figure 6.2: z mainframe as the output of the system

5.2.2 Report or output for lecturer, student, coursework and final result

After submit or run all three parts in the Job Control Language (JCL) which are compile, bind and run, these reports or outputs for four modules will appeared. These reports are created in the JCL-run part. Sometimes only the file of reports appears but the data do not appear. This is due to the problem or sensitivity of coding in source COBOL or in JCL-run part. So, in order to solve that problem, check back if there have any mistakes or delete the coding in source COBOL and do it again as well as in the JCL-run part. Figure 6.3 until figure 6.9 shows all report or output in four modules.

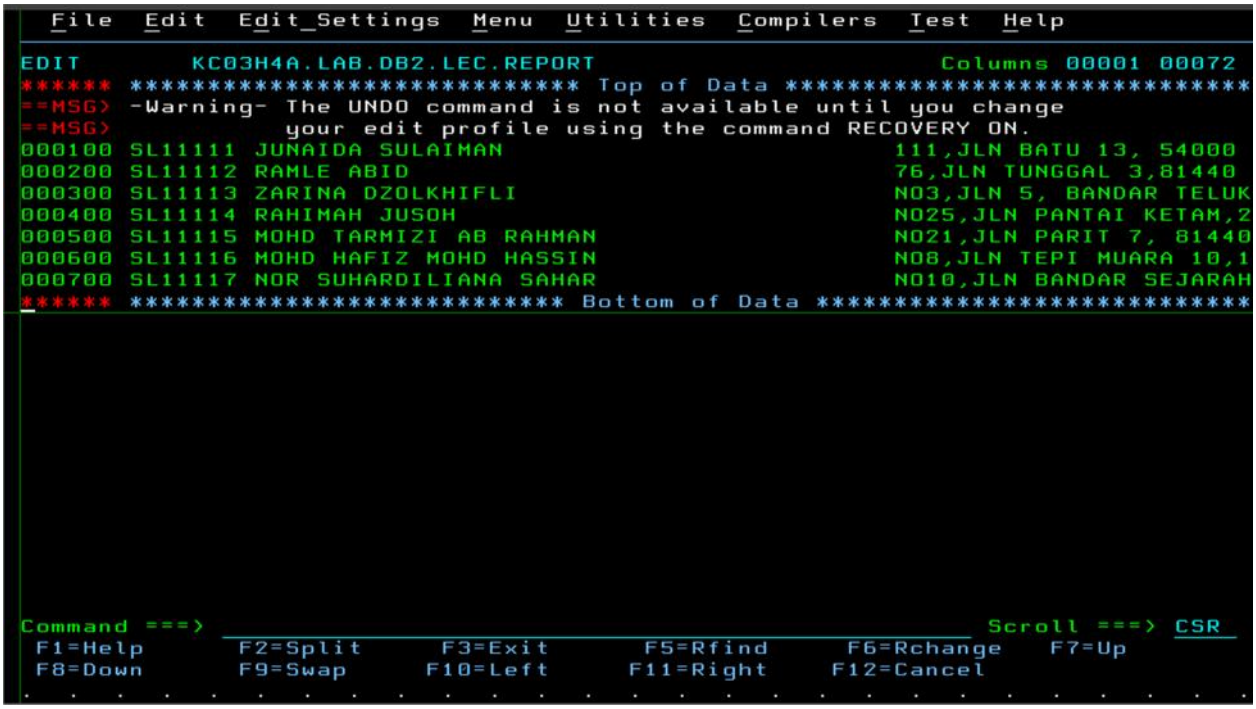


Figure 6.3: The report of lecturer

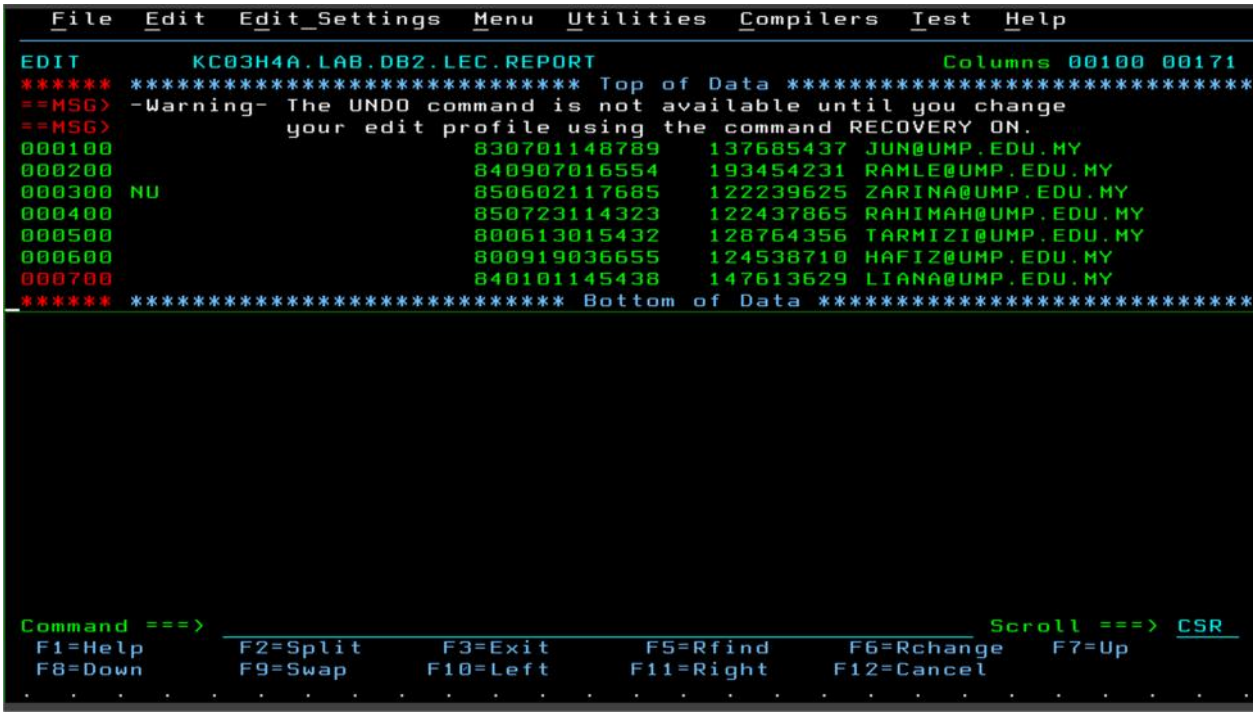


Figure 6.4: The continuation report of lecturer

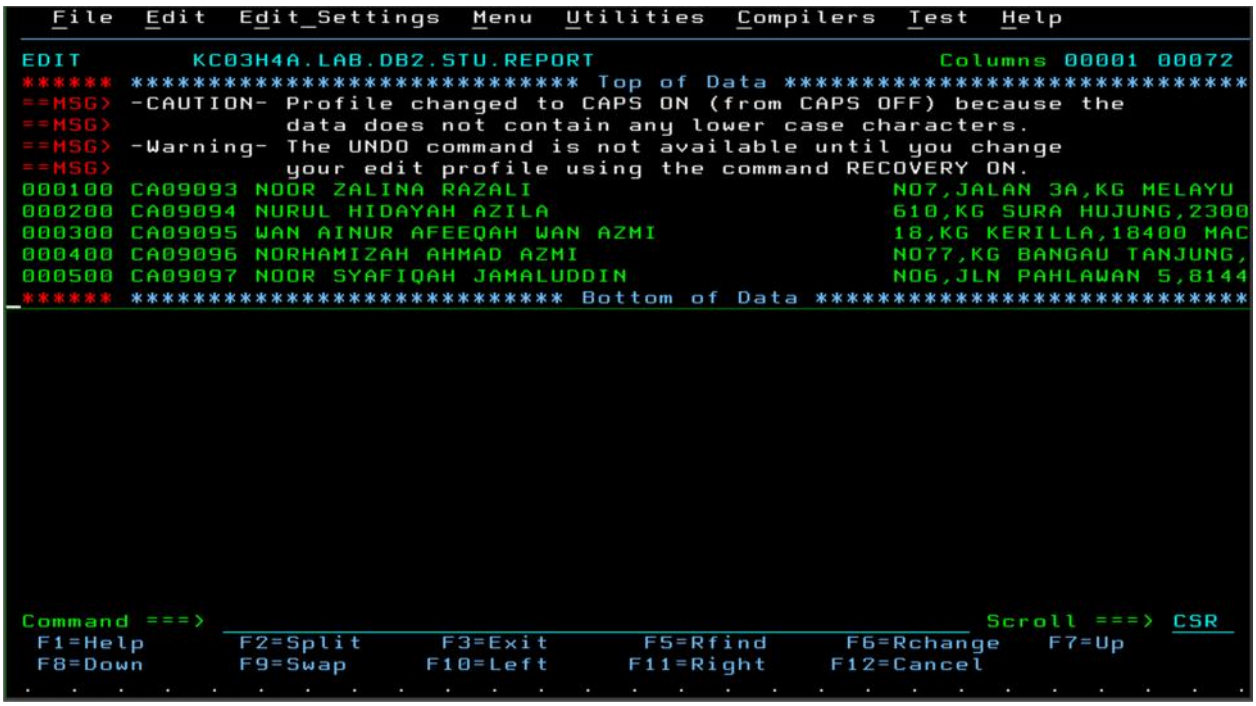


Figure 6.5: The report of student

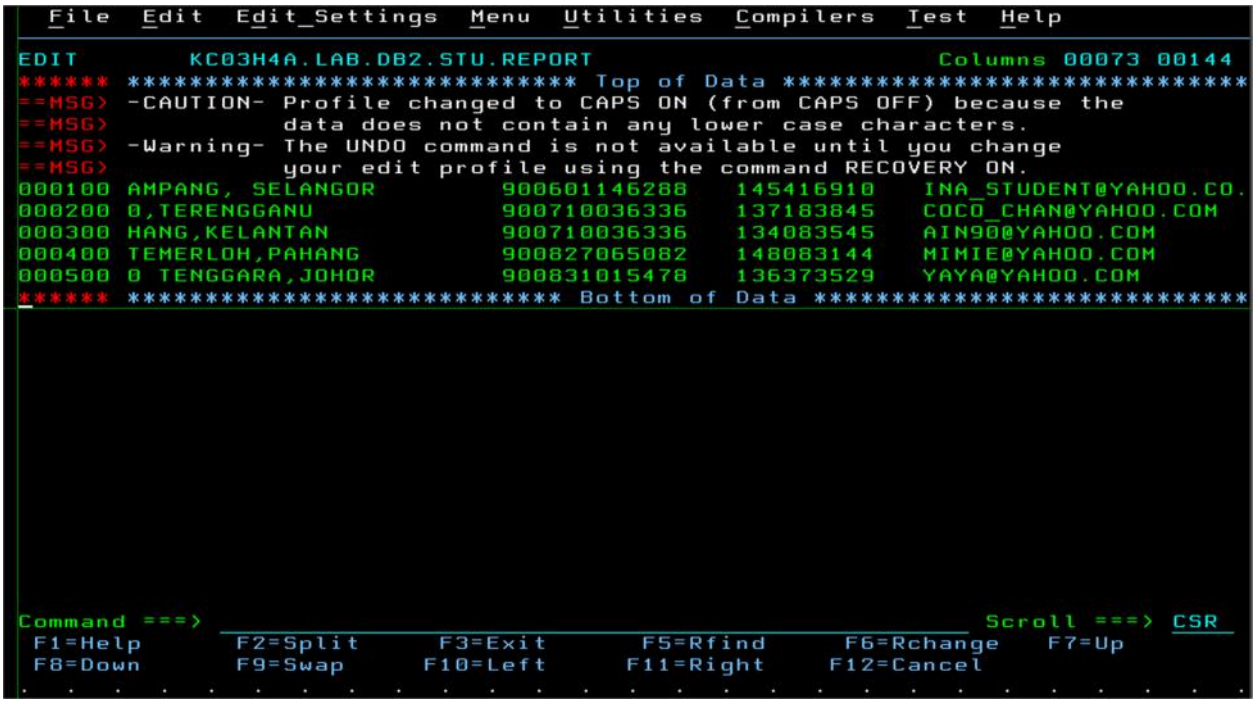


Figure 6.6: The continuation report of student

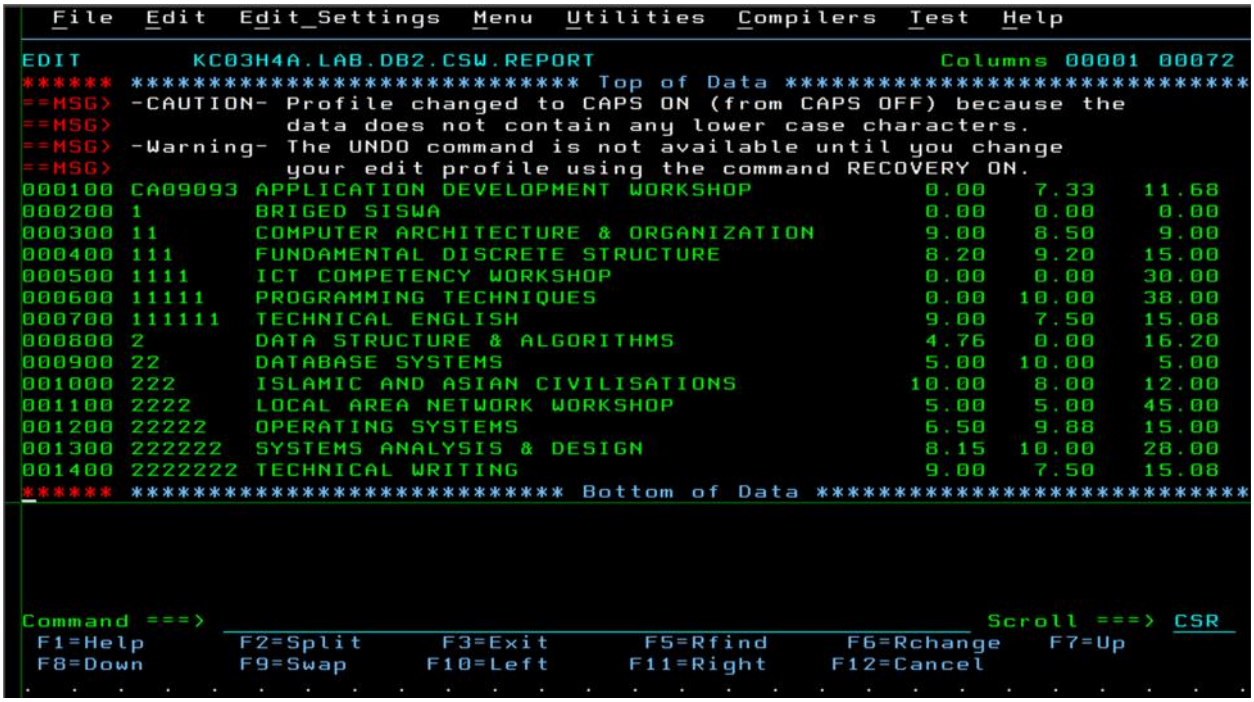


Figure 6.7: The report of coursework of one student in every semester

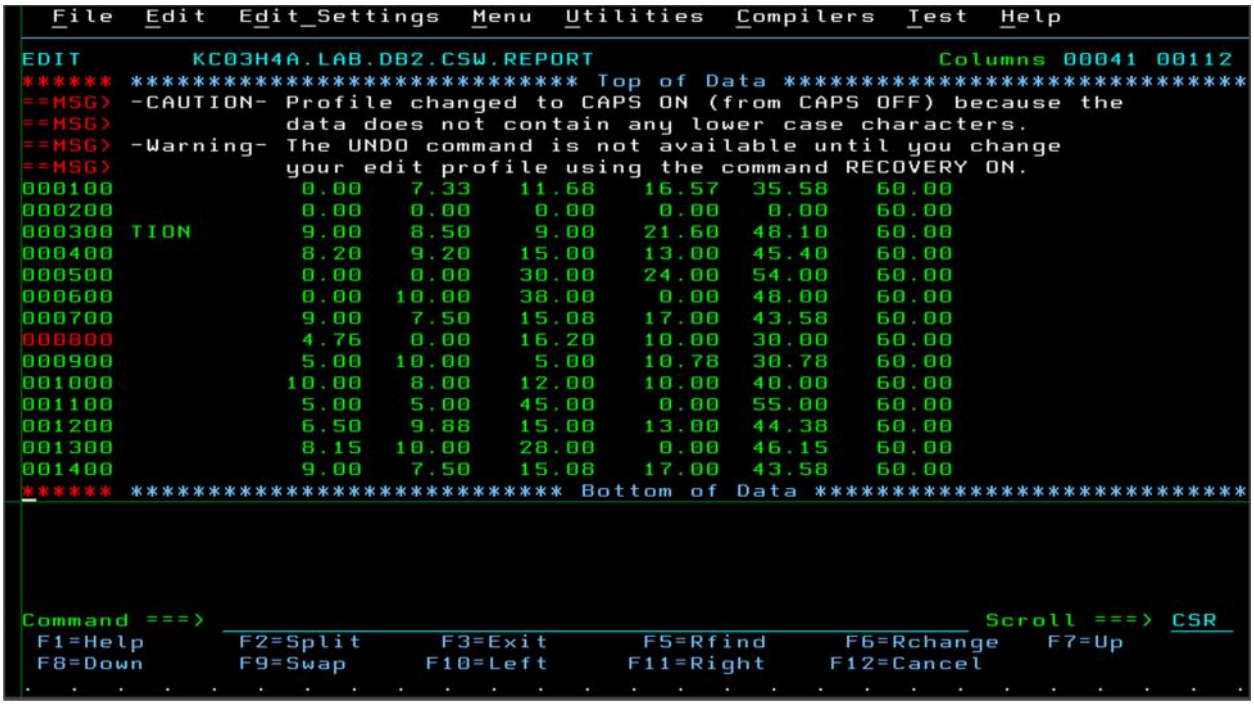


Figure 6.8: The continuation of report student

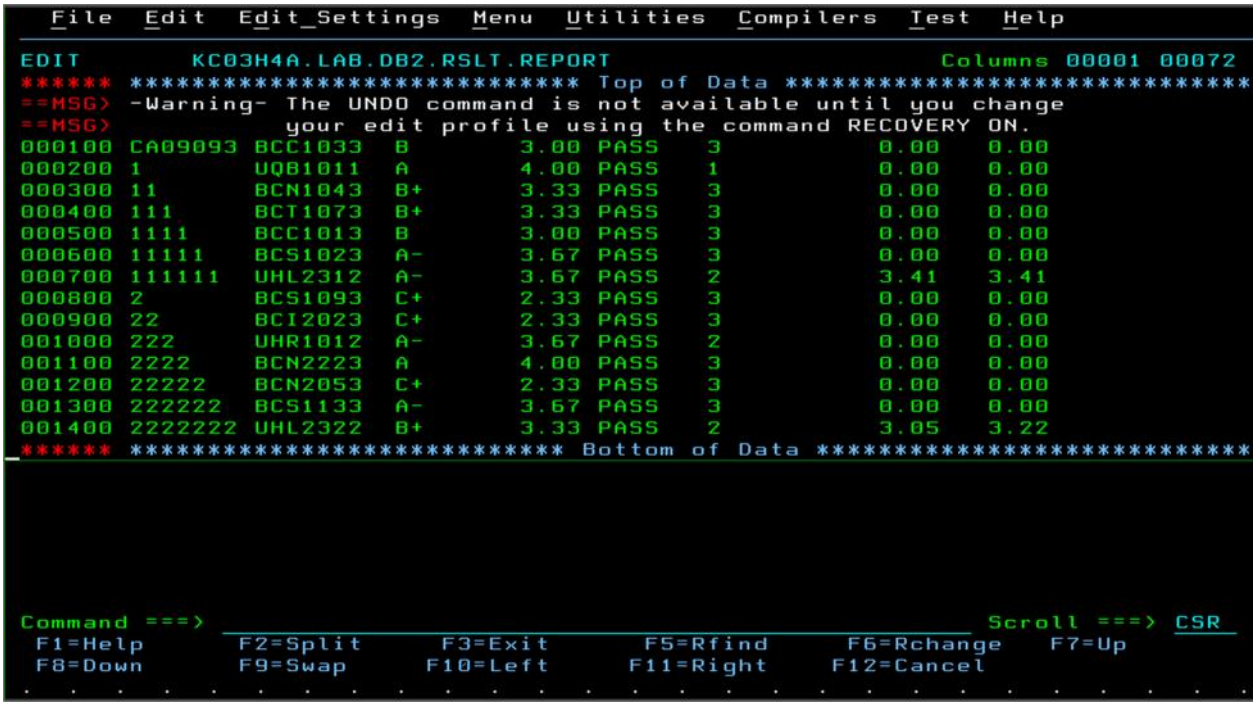


Figure 6.9: The report of final result of one student in every semester

Every student has their tables. In their tables includes the coursework and final result in every semester. This make easier for take a look of their result. Primary key does not have a same value. So in order to solve this problem, just put ‘1’ or ‘11’ in the primary key. This also shows that it is in semester one. Same goes for ‘2’ or ‘22’ in the primary key. These values show that it is in semester two. According to this method, it is easier for operator to manage their coursework and final result.

5.3 Discussion

"Online Student Performance Evaluation in System-z Mainframe" consists of two layers interface which are database and business logic layer. In this project, there is no presentation layer because this system is only for UMP operator. There is no use to make the interface layer because it have already interface layer with the z/OS interface which are ISPF and SDSF using terminal emulator. Furthermore it can save user bandwidth.

This system is only for operator because in the UMP operator now, there have manual entry into database, single entry at a time and unformatted data. So in order to make the system better, develop the new system for UMP operator is the best result. Only operator or administrator can manage this system. Operator or administrator is a user for this system and have a unique user id and password to access the system.

5.4 Testing Result

Online student performance evaluation in system-z mainframe will be run and tested in COBOL part which is in z/OS interface (ISPF, SDSF) using terminal emulator. This COBOL part will be support by Marist Server for database (DB2). The system was successful run without any error for each modules and additional function. The testing gives correct result and correct output that were expected.

5.5 Constraints

Constraint is a limitation or restriction while develop the system. Constraint in Online Student Performance Evaluation in System-z Mainframe can be dividing into two types which are development constraint and system constraint. The future description of these constraints will be discussed below.

5.5.1 Development Constraint

The development constraints discuss the problem that occurred during development of Online Student Performance Evaluation in System-z Mainframe. There are several problems have faced such as technical knowledge, limitations of reference and so on.

In developing the Online Student Performance Evaluation in System-z Mainframe, the lack of knowledge using COBOL language is a one of main problem. It is most difficult if the developer does not have enough study the language before developing the system. For example, all modules in this project need to develop by COBOL language because there have two expert instructors from IBM India which can guide my friends and I to do the project in system-z mainframe.

So it is easier for me to finish up this project when there have an expert one in COBOL language. When there have any problem faced, just do ask the instructors and they will guide me in order to solve that problem.

Limitation of resources is also a constraint in Online Student Performance Evaluation in System-z Mainframe. The developer need to study more details about previous study that are much related to the Online Student Performance Evaluation in System-z Mainframe. These studies will help or give the developer an image about each function and how the function works in Online Student Performance Evaluation in System-z Mainframe and automatically will support the technical knowledge of the developer.

5.5.2 System Constraint

The system constraint for Online Student Performance Evaluation in System-z Mainframe can be occurred if there are errors using the COBOL language to insert, update, or delete the data from the database (DB2). The value that required from the application may be different from the database hence give an error to the application.

5.6 Advantages and Disadvantages

Every project must have their advantages and disadvantages. Same with this project, there have some advantages and disadvantages.

5.6.1 Advantages of the systems

It was admitted that the scope of this system is smaller than the similar application. This system still has its own advantages as follow:

(i) Easy and manageable

All data about student, lecturer details, coursework and final result will be stored in one database (DB2) on z mainframe and is more appropriate approach compared to the standard database that used now at UMP. The data is also more secure and more manageable.

(ii) Reduce wasting of time

This system seems like others system but the advantage is help the UMP operator to save the time which can manage the database (DB2) efficiently without having any difficult to insert the data as well as see the report of the data.

(iii) z mainframe as a result of application

A mainframe is the central data repository, or hub, in a corporation's data processing center, linked to users through less powerful devices such as workstations or terminals. All the data that operator key in through the system will save in the z mainframe database. Using z mainframe, all records more efficiency, easy to be stored and retrieved from the database.

5.6.2 Disadvantages of this system

Although the system has a lot of advantages, it also has disadvantages. This system still has its own disadvantages as follow:

(i) As a simulation

This system is not real but just as a prototype, but it is has been proved that it can use the z mainframe as a server in order to access quickly and smoothly. Although this system is more database application it still needs the provider contribution in order to success on z mainframe database.

(ii) High cost

The main problem from using z mainframe is the cost of it is very expensive and straight rules and procedure need to follow.

5.7 Recommendation and Further Research

For further research, there are several recommendations to enhance and improve the system. There are:

(i) Enhance the security in the system

As a double protection, this system should be enhanced with the encrypted username and password in the future in order to avoid unauthorized user from accessing the system. Only the authorized users have the right to view all the data in the system such as operator or administrator.

(ii) Using the real service provider

It still needs the real service provider contribution in order to success on z mainframe database.

(iii) Enhance the system by developing more modules

The enhancement should be done for Online Student Performance Evaluation in System-z Mainframe are adding more modules for the system, change the scopes for uses of other than UMP operator or administrator.

(iv) Make the system better with other method

In order to make the system better use WebSphere, Customer Information Control System (CICS) and Host Access Transformation System (HATS). WebSphere Business Rules for z/OS brings powerful rule application development and execution functionality to mainframe systems, greatly improving policy change management and automated decision. CICS is a transaction server that runs primarily on IBM mainframe systems under z/OS. CICS is a transaction manager designed for rapid, high-volume online processing. HATS is install and configure for creating datasets and so on. The TN3270 screen needs to be integrated with web browser.

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CHAPTER 6

CONCLUSION

6.1 Summary

The Online Student Performance Evaluation using z Mainframe is a system to create automated data entry into the database via COBOL. Besides that, this new system can make the system more systematically and easy to be stored. This system is very simple but useful for UMP operator.

Generally this system has met its objectives which are to create automated data entry into the database via COBOL; to create a batch type input and output system and to generate a formatted report stored in an independent flat file as output. After making a research, analysis, and lastly make a testing to all programs, finally the "Online Student Performance Evaluation using z Mainframe" is successfully developed. This system is assumed to be successful when it can execute all the functions in the system such as can view the data of student, lecturer, coursework and final results of students. It can insert the data into the database and save it, update the data, edit the marks, and lastly it enables the students to view their coursework and final results.

As a result of following all those methodologies phase, the development of this system is being more systematic and well arranged. Although this Online Student Performance Evaluation in System-z Mainframe is completed developed, but this system is not perfect system because its need future enhancement to make this system as a completed management system. This system had achieved their objectives and it hope that this system can help to improve the efficiency of storage data in the database at UMP especially for Faculty Computer Science and Software Engineering (FSKKP).

Finally as a result, this project has been developed in order to implement a dedicated and centralized service for UMP operator. This project can meet the user expectation and can give a better system solution to develop and enhance this project in the future time to help and provide the service for UMP operator and automatically can give a better result for FSKKP student at the same time. It is believed that through the use of this project created, which provides an improvement and more efficient service than the service currently available, UMP operator will benefit.

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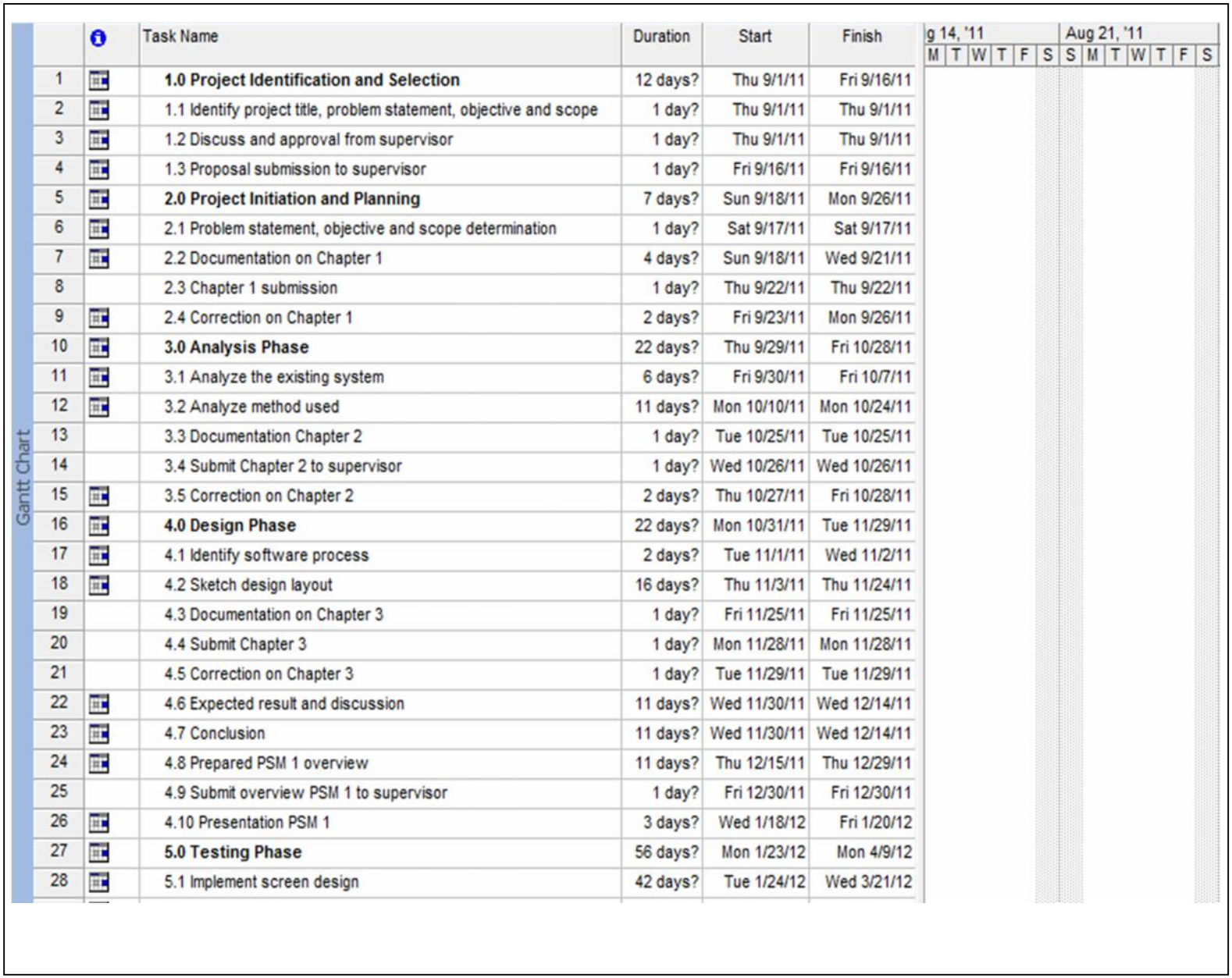
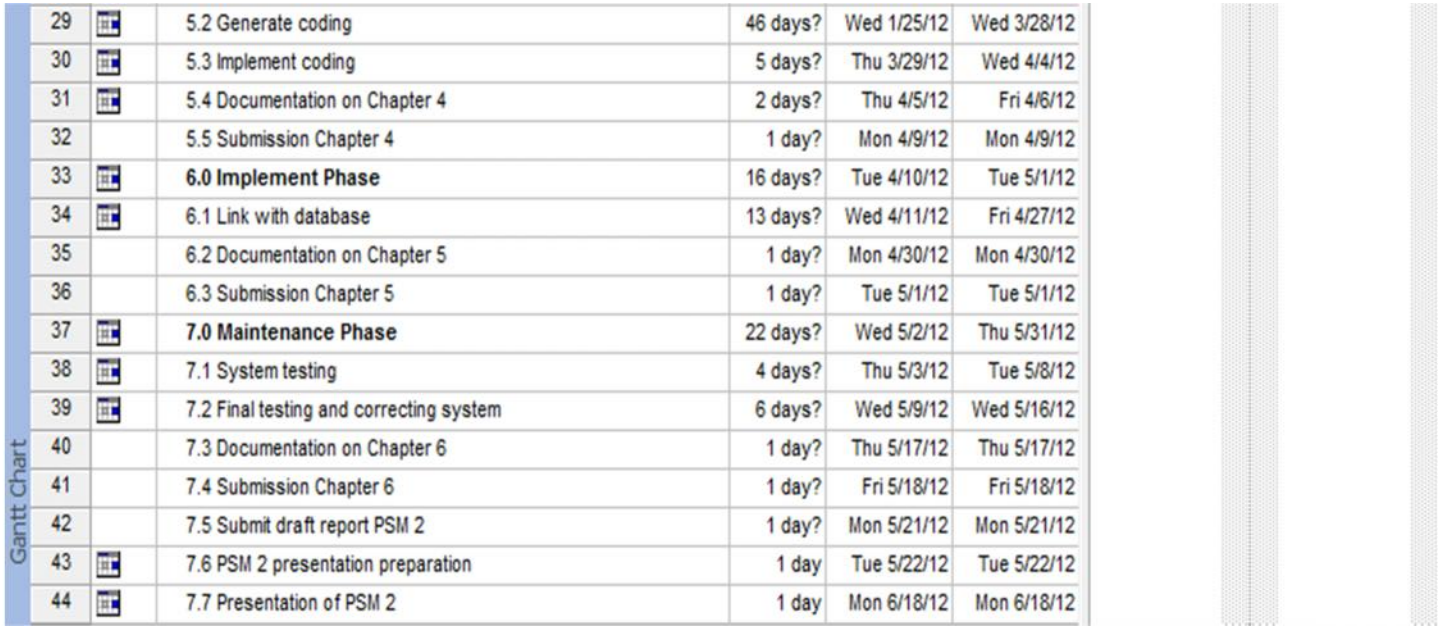
APPENDIX A

(Gantt Chart)



	Task Name	Duration	Start	Finish
1	**1.0 Project Identification and Selection**	12 days?	Thu 9/1/11	Fri 9/16/11
2	1.1 Identify project title, problem statement, objective and scope	1 day?	Thu 9/1/11	Thu 9/1/11
3	1.2 Discuss and approval from supervisor	1 day?	Thu 9/1/11	Thu 9/1/11
4	1.3 Proposal submission to supervisor	1 day?	Fri 9/16/11	Fri 9/16/11
5	**2.0 Project Initiation and Planning**	7 days?	Sun 9/18/11	Mon 9/26/11
6	2.1 Problem statement, objective and scope determination	1 day?	Sat 9/17/11	Sat 9/17/11
7	2.2 Documentation on Chapter 1	4 days?	Sun 9/18/11	Wed 9/21/11
8	2.3 Chapter 1 submission	1 day?	Thu 9/22/11	Thu 9/22/11
9	2.4 Correction on Chapter 1	2 days?	Fri 9/23/11	Mon 9/26/11
10	**3.0 Analysis Phase**	22 days?	Thu 9/29/11	Fri 10/28/11
11	3.1 Analyze the existing system	6 days?	Fri 9/30/11	Fri 10/7/11
12	3.2 Analyze method used	11 days?	Mon 10/10/11	Mon 10/24/11
13	3.3 Documentation Chapter 2	1 day?	Tue 10/25/11	Tue 10/25/11
14	3.4 Submit Chapter 2 to supervisor	1 day?	Wed 10/26/11	Wed 10/26/11
15	3.5 Correction on Chapter 2	2 days?	Thu 10/27/11	Fri 10/28/11
16	**4.0 Design Phase**	22 days?	Mon 10/31/11	Tue 11/29/11
17	4.1 Identify software process	2 days?	Tue 11/1/11	Wed 11/2/11
18	4.2 Sketch design layout	16 days?	Thu 11/3/11	Thu 11/24/11
19	4.3 Documentation on Chapter 3	1 day?	Fri 11/25/11	Fri 11/25/11
20	4.4 Submit Chapter 3	1 day?	Mon 11/28/11	Mon 11/28/11
21	4.5 Correction on Chapter 3	1 day?	Tue 11/29/11	Tue 11/29/11
22	4.6 Expected result and discussion	11 days?	Wed 11/30/11	Wed 12/14/11
23	4.7 Conclusion	11 days?	Wed 11/30/11	Wed 12/14/11
24	4.8 Prepared PSM 1 overview	11 days?	Thu 12/15/11	Thu 12/29/11
25	4.9 Submit overview PSM 1 to supervisor	1 day?	Fri 12/30/11	Fri 12/30/11
26	4.10 Presentation PSM 1	3 days?	Wed 1/18/12	Fri 1/20/12
27	**5.0 Testing Phase**	56 days?	Mon 1/23/12	Mon 4/9/12
28	5.1 Implement screen design	42 days?	Tue 1/24/12	Wed 3/21/12



29		5.2 Generate coding	46 days?	Wed 1/25/12	Wed 3/28/12
30		5.3 Implement coding	5 days?	Thu 3/29/12	Wed 4/4/12
31		5.4 Documentation on Chapter 4	2 days?	Thu 4/5/12	Fri 4/6/12
32		5.5 Submission Chapter 4	1 day?	Mon 4/9/12	Mon 4/9/12
33		**6.0 Implement Phase**	16 days?	Tue 4/10/12	Tue 5/1/12
34		6.1 Link with database	13 days?	Wed 4/11/12	Fri 4/27/12
35		6.2 Documentation on Chapter 5	1 day?	Mon 4/30/12	Mon 4/30/12
36		6.3 Submission Chapter 5	1 day?	Tue 5/1/12	Tue 5/1/12
37		**7.0 Maintenance Phase**	22 days?	Wed 5/2/12	Thu 5/31/12
38		7.1 System testing	4 days?	Thu 5/3/12	Tue 5/8/12
39		7.2 Final testing and correcting system	6 days?	Wed 5/9/12	Wed 5/16/12
40		7.3 Documentation on Chapter 6	1 day?	Thu 5/17/12	Thu 5/17/12
41		7.4 Submission Chapter 6	1 day?	Fri 5/18/12	Fri 5/18/12
42		7.5 Submit draft report PSM 2	1 day?	Mon 5/21/12	Mon 5/21/12
43		7.6 PSM 2 presentation preparation	1 day	Tue 5/22/12	Tue 5/22/12
44		7.7 Presentation of PSM 2	1 day	Mon 6/18/12	Mon 6/18/12

APPENDIX B

(User Manual for UMP Operator)

This section will be discussed about user manual for UMP FSKKP operator. User who wants to access the system must go to the system first and login. For the first time user, need to register into the IBM to get the user ID.

1.0 Install

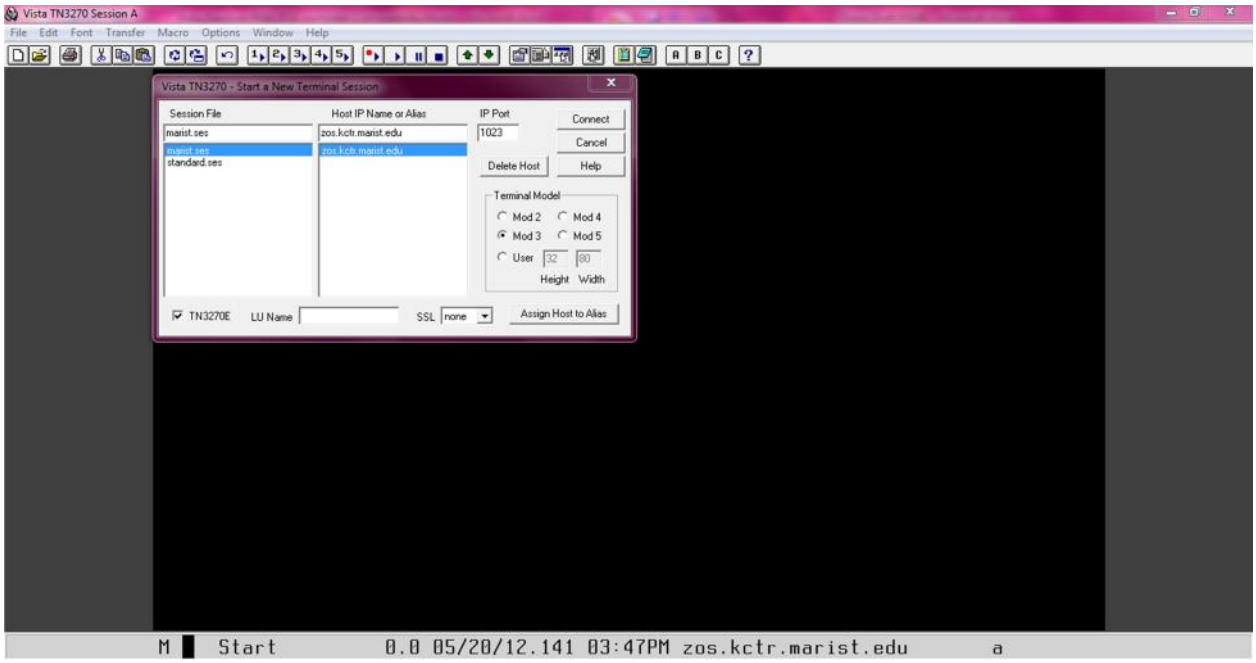


Figure 1: Vista TN3270 interface

1) Installing Vista TN3270
   a. Download Vista TN3270 and save the installation file on your desktop.
   b. Install Vista TN3270 on your machine by following the instructions on your screen.
2) Connecting to Marist server from your TN3270 Emulator
   a. Run the Vista TN3270 on your machine.
   b. On the dialog box, insert the following parameters:
      i. Session File: *marist*
      ii. Host IP Name or Alias: *zos.kctr.marist.edu*
      iii. IP Port: *1023*
      iv. Terminal Model: *Mod 3*
      v. Click ‘Connect’.

2.0 Login

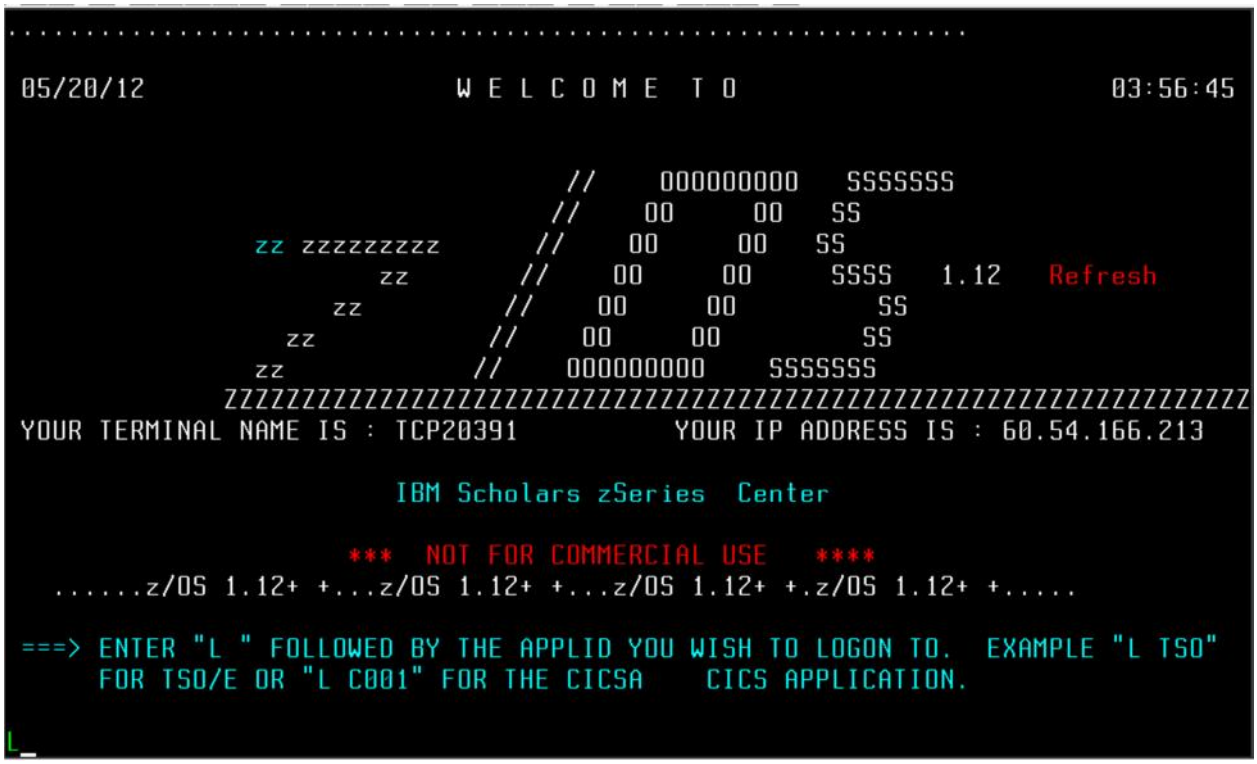


Figure 2: Login interface

1) Logging on to the z/OS terminal
   a. At the welcome screen, enter 'L' followed by the 'Enter' key.
      NOTE: From here on, the 'Enter' key refers to the 'right-Ctrl' key.
   b. When prompted, enter your user ID and press 'Enter'.
   c. Enter your password and press 'Enter'.
   d. You will be required to enter a new password after the first login. Insert your new password and press 'Enter'. You will be prompted to enter your new password again for confirmation.
      NOTE: Every time you see '***' on your screen, it means there are more things to be displayed on your screen. Press 'Enter' to continue.
   e. From your ISPF menu, type 'X' and press 'Enter'. This takes you to the TSO READY prompt. Type 'LOGOFF' and press 'Enter'.
   f. Re-logon to the console using your ID and new password.

3.0 Job Control Language (JCL)

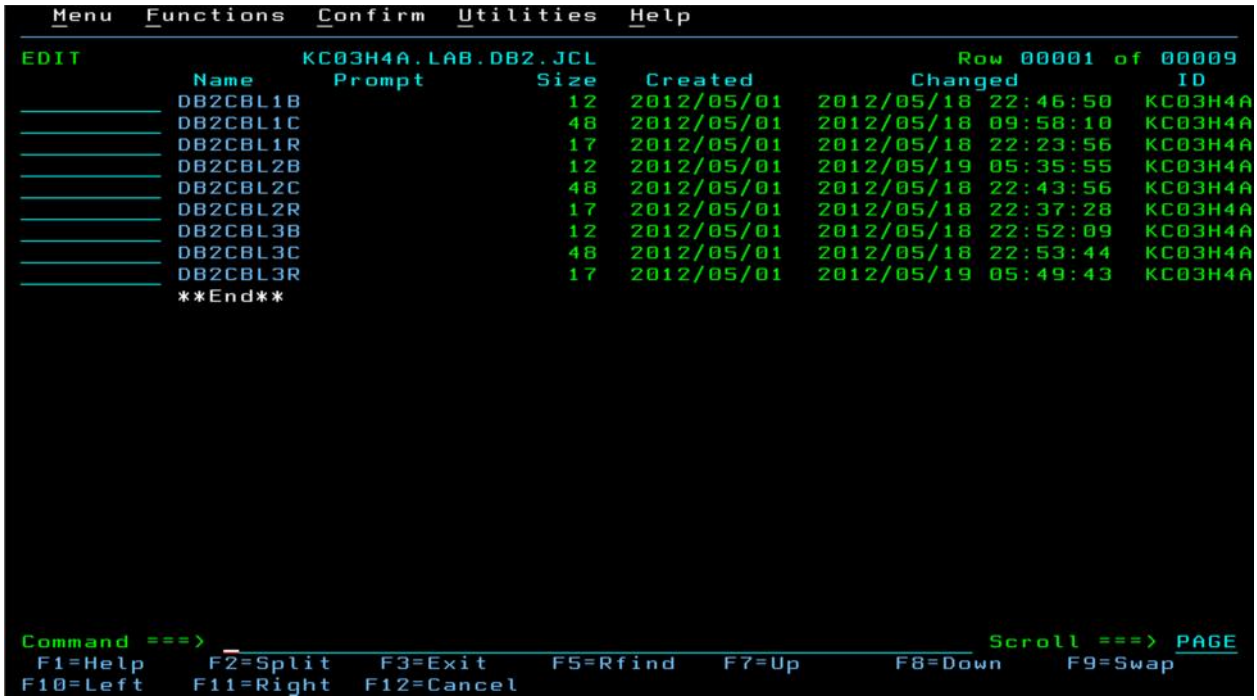


Figure 3: This is JCL part for those modules. Each module will have three parts which are compile, bind and run. This three parts must be submit or run in order to get the output or report.

1) From ISPF menu, key-in option 3 and Press 'Enter'.
2) Key in option 4 in Utility Selection Panel (Dslist) and press 'Enter'.
3) Enter your data set name at Dsname Level i.e *yourid*.JCL and press 'Enter.

4.0 Submit the Job Control Language (JCL)

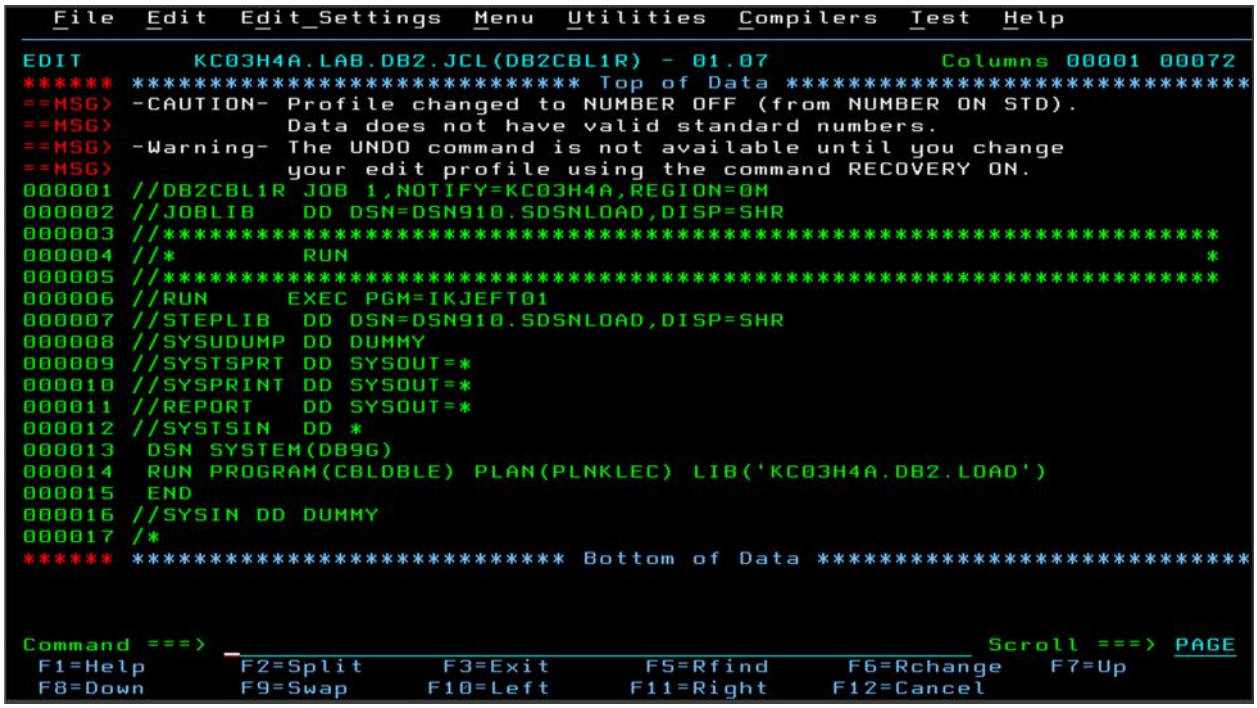


Figure 4: This is how to submit the JCL.

1) At editor command line, enter SUBMIT or SUB.
2) Key in 1 in response to the message as the following:

   IKJ56700A ENTER JOBNAME CHARACTER(S)

   The result will be the message:

   IKJ562501 JOB yourid1 (JOB00037) SUBMITTED

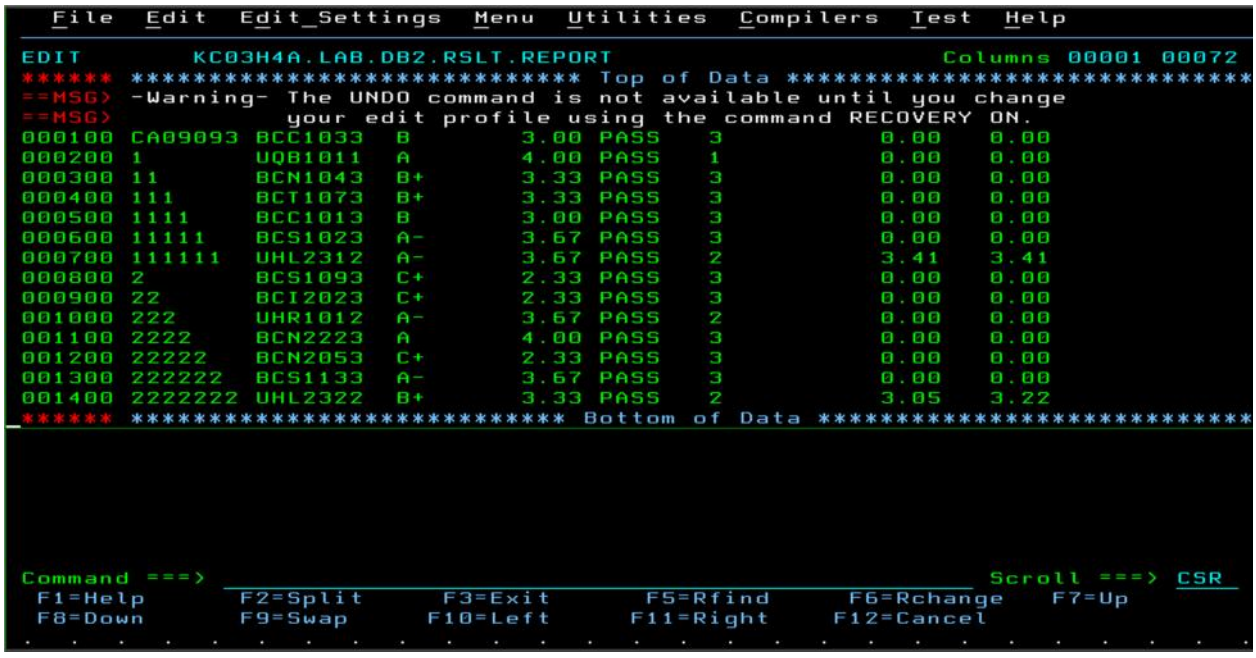
   NOTE: Whenever see three asterisks (***), it means there's more data to see. Press 'Enter' to continue.

   When the job finishes, see the message:

   $HASP165 yourid1 ENDED AT SYS1 MAXCC=0 CN (INTERNAL)

   # MAXCC=4 CN (INTERNAL) also can be accepted.

5.0 Output



1) Return to ISPF Primary Option Menu. Key in 13 at option command line and press 'Enter'.
2) In the SDSF menu, key in PREFIX yourid* at command line and press 'Enter'.
3) Enter ST at a command line and press 'Enter'.
4) Place S (for select) to the left or either job and press 'Enter'.
5) Navigate the messages produced by press PF8 (for page down) and PG7 (for page up).

   NOTE: View the output of this job using SDSF. Notice that you have two jobs with the same jobname. The jobname with the highest JOBID number is the last one that was run.
6) Identify the condition code of the job as shows at the MAX-RC column.

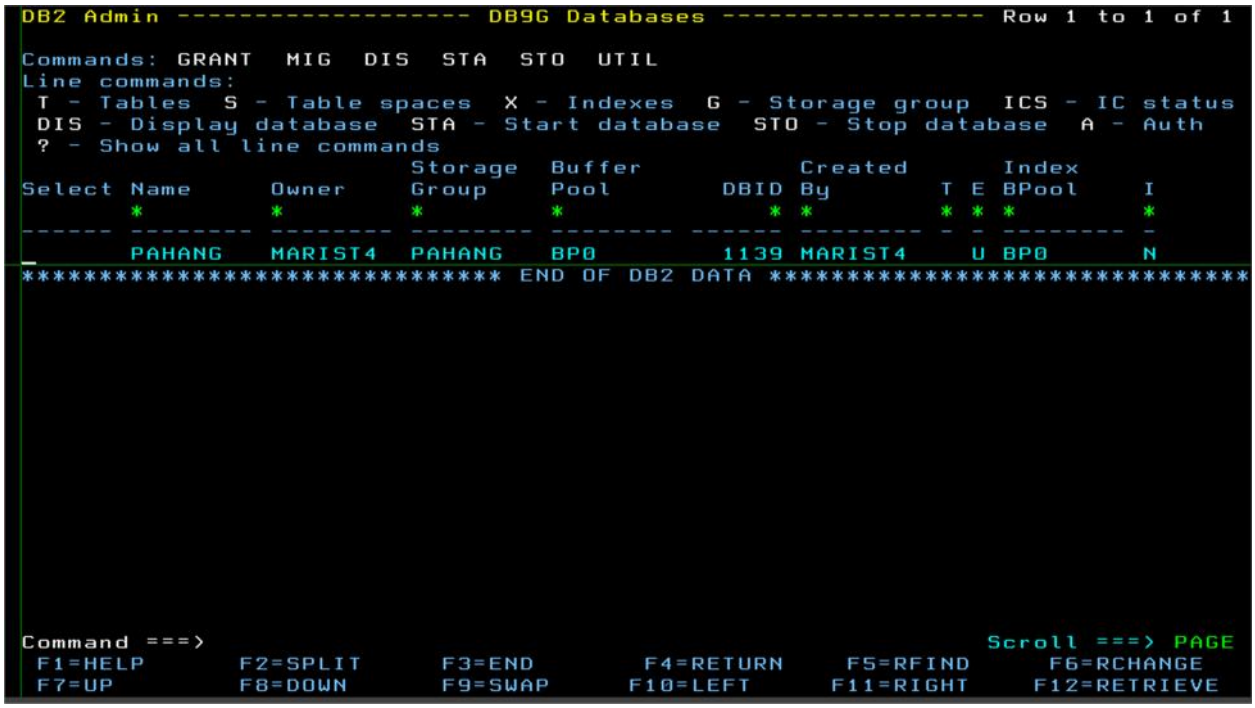
   NOTE: Notice the condition code (CC). The condition code=0000 means the job was successfully executed. If it was greater than 0000 or shows JCL error means that there is an error in the JCL script.
7) Navigate to the Data Set Utility (=3.4) and enter yourid.MYTEST data set name level and press 'Enter'.

8) To identify volume that used to store data set, key-in s (for select) at the most left column and press ‘Enter’.
9) To delete data set, key-in DEL / at the most left column and press ‘Enter’. Press ‘Enter’ to confirm the deletion data set.
10) Press PF3 to exit from SDSF menu.

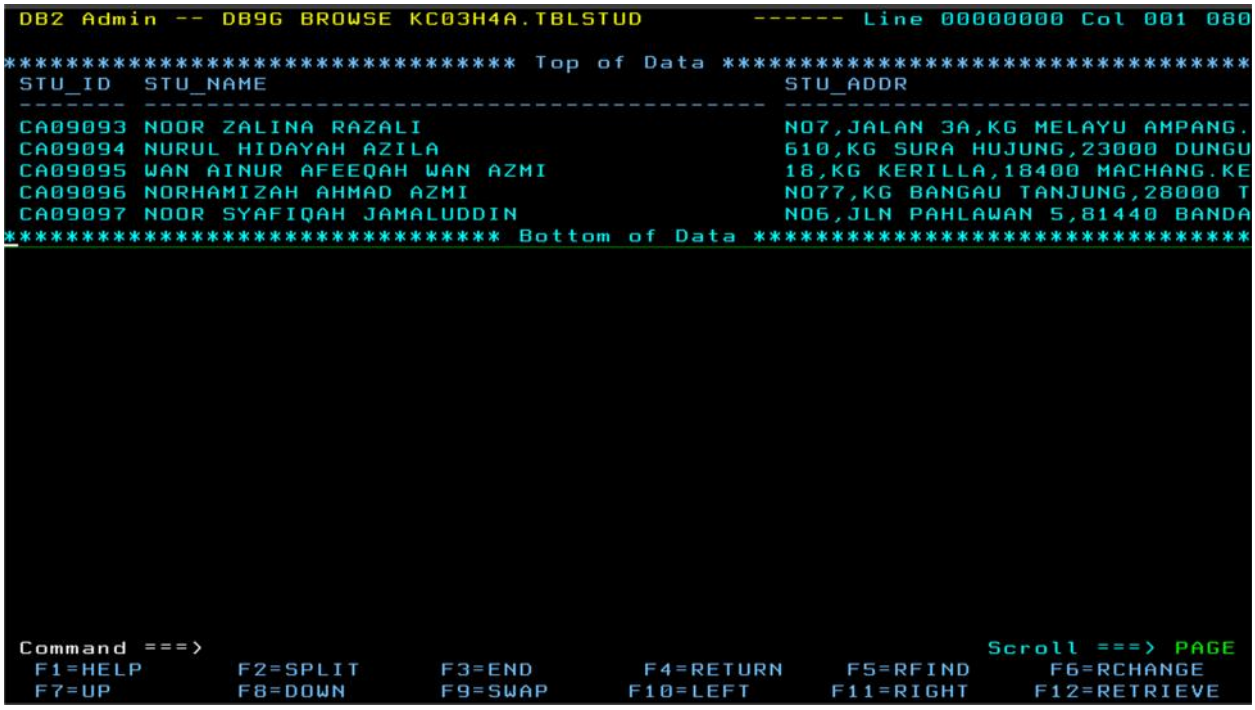
APPENDIX C

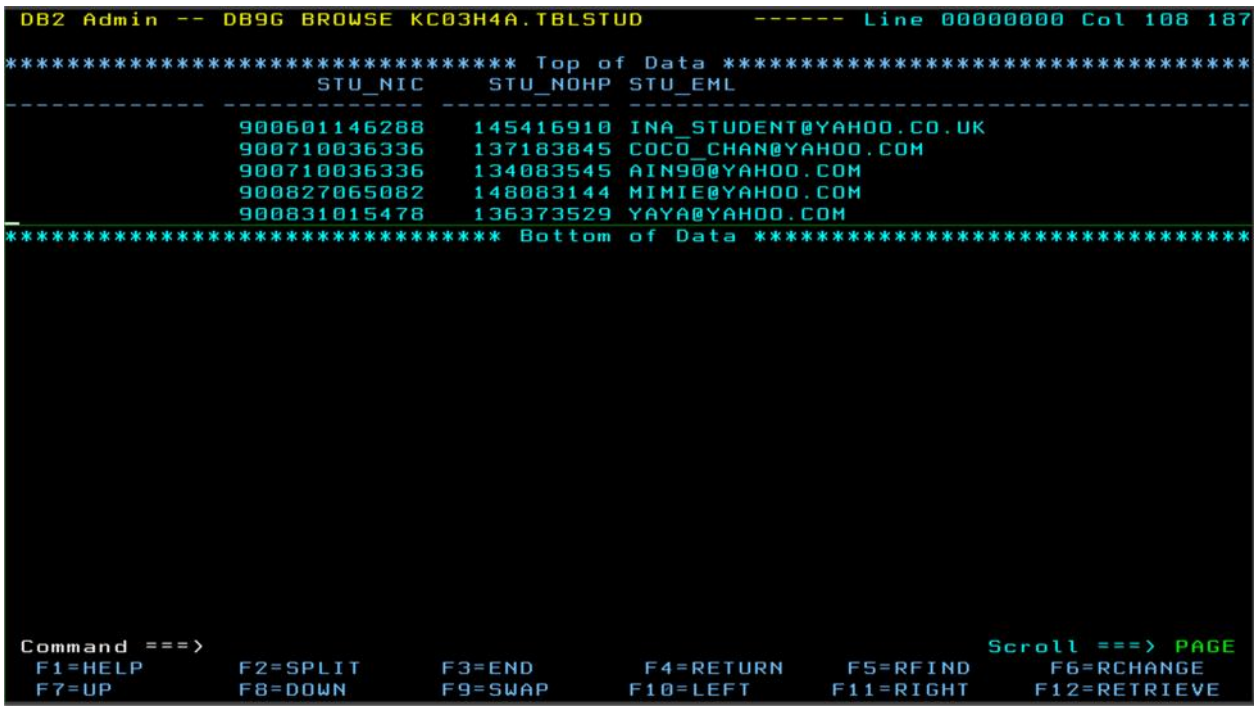
(Database Table)

1. **PAHANG Storage Group**

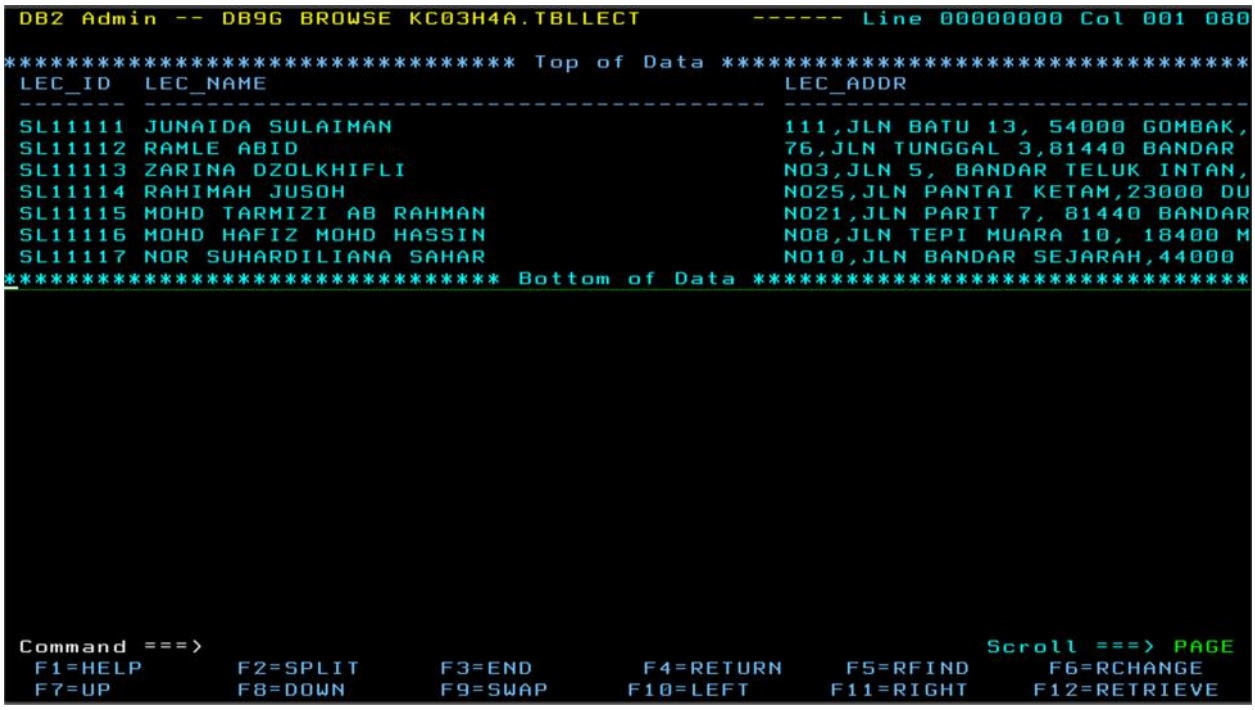


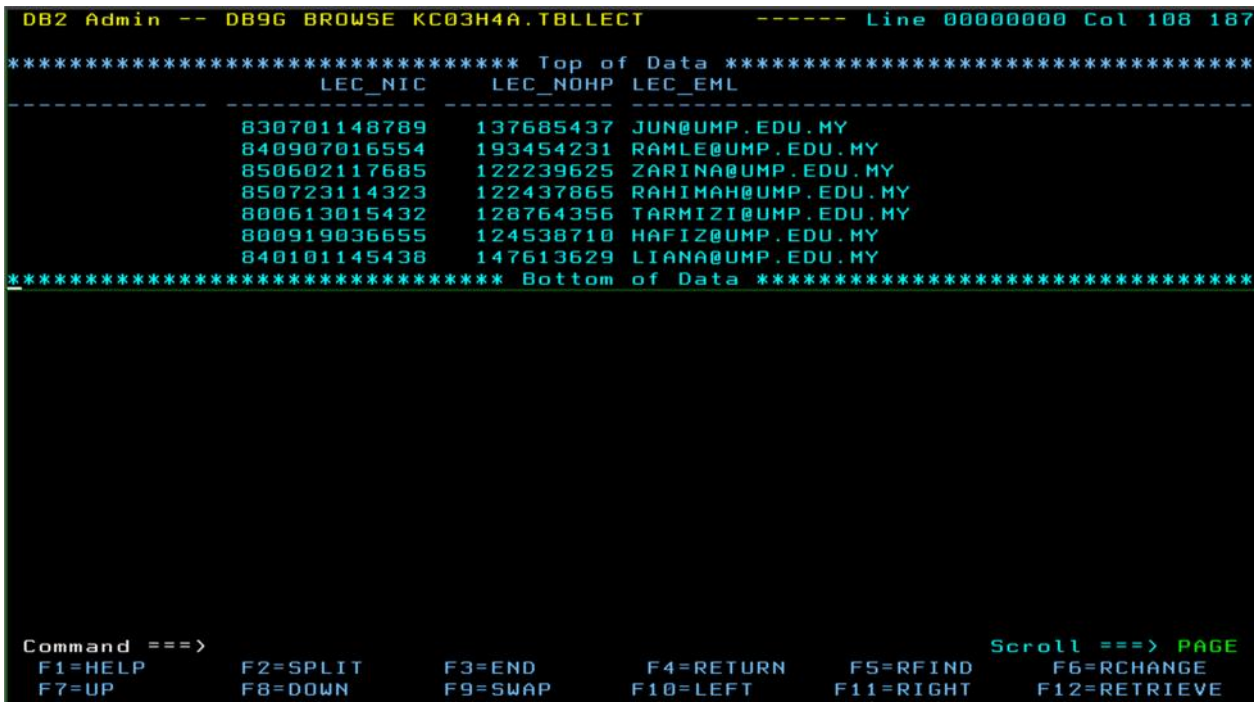
2. **Student Table**



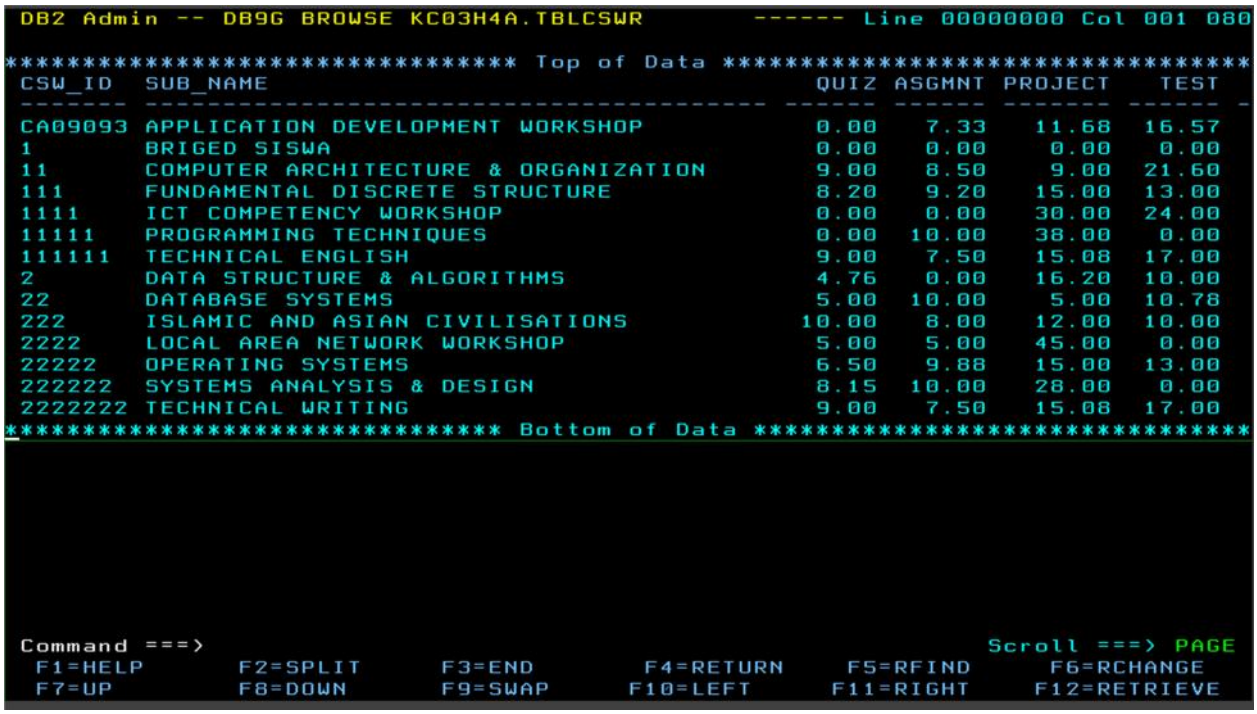


3. Lecturer Table





4. Coursework Table



```
 DB2 Admin -- DB9G BROWSE KC03H4A.TBLCSWR       ------ Line 00000000 Col 014 093

******************************** Top of Data ********************************
NAME                                  QUIZ ASGMNT PROJECT   TEST  FINAL TOT_FNL
------------------------------------ ------ ------ ------- ------ ------ -------
ICATION DEVELOPMENT WORKSHOP          0.00   7.33   11.68  16.57  35.58   60.00
ED SISWA                              0.00   0.00    0.00   0.00   0.00   60.00
UTER ARCHITECTURE & ORGANIZATION      9.00   8.50    9.00  21.60  48.10   60.00
AMENTAL DISCRETE STRUCTURE            8.20   9.20   15.00  13.00  45.40   60.00
COMPETENCY WORKSHOP                   0.00   0.00   30.00  24.00  54.00   60.00
RAMMING TECHNIQUES                    0.00  10.00   38.00   0.00  48.00   60.00
NICAL ENGLISH                         9.00   7.50   15.08  17.00  43.58   60.00
 STRUCTURE & ALGORITHMS               4.76   0.00   16.20  10.00  30.00   60.00
BASE SYSTEMS                          5.00  10.00    5.00  10.78  30.78   60.00
MIC AND ASIAN CIVILISATIONS          10.00   8.00   12.00  10.00  40.00   60.00
L AREA NETWORK WORKSHOP               5.00   5.00   45.00   0.00  55.00   60.00
ATING SYSTEMS                         6.50   9.88   15.00  13.00  44.38   60.00
EMS ANALYSIS & DESIGN                 8.15  10.00   28.00   0.00  46.15   60.00
NICAL WRITING                         9.00   7.50   15.08  17.00  43.58   60.00
******************************** Bottom of Data ********************************

 Command ===>                                                 Scroll ===> PAGE
  F1=HELP       F2=SPLIT      F3=END        F4=RETURN     F5=RFIND      F6=RCHANGE
  F7=UP         F8=DOWN       F9=SWAP      F10=LEFT      F11=RIGHT     F12=RETRIEVE
```

5. Final Result Table

```
 DB2 Admin -- DB9G BROWSE KC03H4A.TBLRSLT       ------ Line 00000000 Col 001 060

******************************** Top of Data ********************************
 RSLT_ID  SUB_CODE  GRADE  POINTS  STATUS  CRDT_HRS     GPA     CPA
 -------  --------  -----  ------  ------  --------  ------  ------
 CA09093  BCC1033   B        3.00  PASS    3           0.00    0.00
 1        UQB1011   A        4.00  PASS    1           0.00    0.00
 11       BCN1043   B+       3.33  PASS    3           0.00    0.00
 111      BCT1073   B+       3.33  PASS    3           0.00    0.00
 1111     BCC1013   B        3.00  PASS    3           0.00    0.00
 11111    BCS1023   A-       3.67  PASS    3           0.00    0.00
 111111   UHL2312   A-       3.67  PASS    2           3.41    3.41
 2        BCS1093   C+       2.33  PASS    3           0.00    0.00
 22       BCI2023   C+       2.33  PASS    3           0.00    0.00
 222      UHR1012   A-       3.67  PASS    2           0.00    0.00
 2222     BCN2223   A        4.00  PASS    3           0.00    0.00
 22222    BCN2053   C+       2.33  PASS    3           0.00    0.00
 222222   BCS1133   A-       3.67  PASS    3           0.00    0.00
 2222222  UHL2322   B+       3.33  PASS    2           3.05    3.22
******************************** Bottom of Data ********************************

 Command ===>                                                 Scroll ===> PAGE
  F1=HELP       F2=SPLIT      F3=END        F4=RETURN     F5=RFIND      F6=RCHANGE
  F7=UP         F8=DOWN       F9=SWAP      F10=LEFT      F11=RIGHT     F12=RETRIEVE
```