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WEK 020222

Java Tutor

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Abstract

This documentation is an exercise submitted to the Faculty of Science Computer and Information Technology (FSCIT), University of Malaya as a report for the final year project and also as a fulfillment to Computer Science Degree Program in University of Malaya.

In this document, it will explain about the Java Tutor project in detail. Java Tutor is a web-based courseware that is developed for anyone who is interested in learning Java programming language.

The Waterfall model with prototyping is used to develop Java Tutor system because it is simple and easy to understand. The programming language, operation system, web server, web browser, database and the development tool that are used when developing this system are ASP.NET, MS IIS Server, Internet Explorer, MS SQL Server, Microsoft Visual Studio .NET and Adobe Photoshop 7.0.

It is hoped that the Java Tutor system will able to promote users interest toward Java programming language, which is a powerful programming language.

Acknowledgement

A large number of people have contributed their ideas, comments and suggestions in producing this report successfully.

Here, I would like to express my deepest appreciation to Pn Zarinah Mohd Kasirun, my project supervisor whom has given me continuous guidance, support and helpful advice throughout the development of Java Tutor.

My deepest gratitude goes to my project moderator, Miss Su Moon Ting, for spending her precious time to moderate my project. Her valuable opinion and constructive comment during my presentation indirectly contribute ideas to my project.

A very big thanks to my fellow course mates who shared their knowledge together during the development of Java Tutor. Beside that, thanks for their support and encouragement to me.

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CHAPTER 1: INTRODUCTION

In this chapter, it will discuss about the project overview, project objectives, project scopes, target user, project motivation, project limitations, project scheduling, expected outcomes and report layout.

1.1 Project Overview

Java Tutor is a web-based computerized system that is created to provide free learning for those people who are interested in learning or to have a look on Java programming language.

This Java Tutor is suitable for those people who want to get start with the Java programming language. User can learn and master the Java programming language up to the average level upon finishing all the lessons, tutorials and examination. Beside that, it also provides a unique opportunity for user to reach the informative FAQ, forum discussion and links to relevant websites.

The contents available 24 hours where users can access this Java Tutor system anywhere and at anytime just with a computer connected to the Internet. This makes the computer as the learning tool.

1.2 Project Objectives

The objectives of the project are stated as below:

- To develop a system where all lessons in the system are arranged from the beginning or basic part so that the users who are non-programmer can easily get understand and be familiar to Java programming language.

- To develop a system where users can test their understanding about Java programming language by providing them with tutorial questions for each lesson and examination.
- To develop a system where user can send feedback on their opinion, suggestion and complaints about the system.
- To develop a system where user can view the frequently asked questions (FAQ) about the lessons in the system.
- To develop a system where the user able to participate in the forum discussion where they can view, post and reply message in the forum.
- To expose user to web-based learning technique.

1.3 Project Scope

The lessons in this system will cover all the basic Java programming language only. It will not include the advance Java programming language like networking, JavaServer Pages (JSP) and so on.

The Java Tutor consists of two modules that are user module an administrator module shown in figure 1.1. Then, the modules are divided into a few sub-modules that will be explained in the next page.

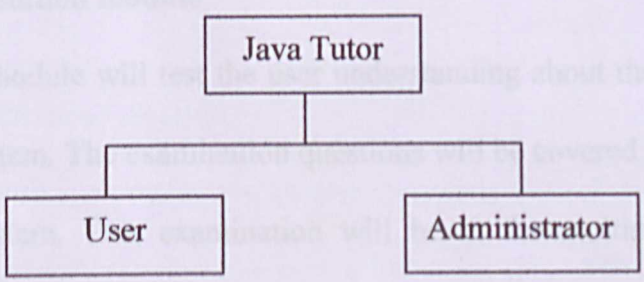

Figure 1.1 Java Tutor module

I. **User module**

The user module, which served as the front-end system, explains what the user can perform or obtain from the system. The user module consist of the below sub-modules.

- **User Authentication**

  This module will need the registered user to login into the system before the user can use the system. User needs to insert his/her username and password for the system to validate from the database.

- **Lesson module**

  This module will teach or deliver information about Java programming to user. All lessons are sorted in sequence so that the user can learn the lessons in a proper way. User can click on the listed list of lesson, which he/she wishes to learn and the system will display the clicked lesson page to the user.

- **Tutorial module**

  This module will able the user to revise back or test their understanding of what they have learn for each lesson.

- **Examination module**

  This module will test the user understanding about the whole lessons in the system. The examination questions will be covered from all lessons in the system. This examination will be in the multiple choices format where user only needs to click on the correct answer. Once finish answering all the questions, the system will show the score to the user.

- **Feedback Module**

  This module will allow user to send their opinions, suggestions and complaints to this system. The feedbacks that sent by user are important because it can be used for future enhancement.

- **Forum module**

  This module will able the user to:

  1. View messages that posted by other user together with its replied messages.
  2. Reply for the posted messages.
  3. Post message for discussion in the forum.

- **FAQ module**

  This module will able the user to view the frequently asked questions (FAQ) about Java programming language together with its explanation for each question.

- **Useful links module**

  This module contains links to others valuable or relevant Java web site. This will provides user with more reference in Java programming language.

II. Administrator module

This module that served as the back-end system, will allow the administrator to manipulate contents in the Java Tutor system. Administrator modules includes:

- **Authorization**

  This module required the administrator to login into the system before he/she can perform maintenance action on the system. This will ensure that only authorized person can manage the system. The administrator also can change his/her password at any time when necessary.

- **Forum Management**

  This module will able the administrator to maintain this forum section by deleting the messages that are sent by user which are outdated or not suitable to be in the forum.

- **Feedback Management**

  The administrator can view the feedbacks that are sent by the users regarding their complaints, opinions and suggestions that related to the system.

- **Useful link Management**

  The administrator can update the useful link by adding new links to the valuable or relevant web site or deleting links that are outdated from the system.

1.4 Target User

This Java Tutor system is created for all people who have interest in learning Java programming language. Because of this Java Tutor is a web-based system; the user must have a computer that is connected to the Internet in order to access the system. That means this system is developed for all Internet users like:

- Students or non-programmers who want to learn or to have a look on Java programming language.
- Programmer who do not know Java programming language.
- Java programmer who wants to polish their Java skill.

Teachers also can use this system as a teaching material to teach students about Java programming language in school.

1.5 Project Motivation

In this 20-century world, Internet services have become one of the most important communication tools and also a repository to store information and knowledge. Using Internet services has become part of daily life for most of the people nowadays like checking email before get start to work. Most of the information for research project is obtained through the Internet. Internet seems to be everything for humans today because of its advantages. The increasing number of users using the Internet service everyday has make Java Tutor to become the better way in providing web based learning for the user to learn Java programming language (etforecasts, 2002). Books seem to be very expensive for students if compare to web-based learning because Internet has become a cheap mean of disseminating information. Web-based learning would totally take over searching materials in the library.

1.6 Project Limitation

There are several limitations in this Java Tutor system and those limitations are listed as below:

- Because of this system is a web-based system, so it depends on the availability of the Internet service. Without the Internet service, nobody can access to the system.
- This system only provides English version. That means user needs to know English language in order to use this system.
- This system only providing basic Java programming language. There is no any advanced Java programming language and this makes the system to be only suitable for those beginners who want to learn about Java programming language.

1.7 Project Scheduling

Project scheduling plays an important role in planning and developing a system. A project schedule describes the software development cycle for a particular project by enumerating the phases or stages of a project and breaking each into discrete tasks or activities that need to be carried out. The schedule also represents the interactions among the activities and estimates the duration that each task or activities will take. With this project schedule, it is hope that the system development will be end within the period of time and reach the objectives.

The schedule for the activities of this Java Tutor project will be shown in figure 1.2 in the next page.

Figure 1.2 Project Schedule for Java Tutor

Figure 1.2 Project Schedule for Java Tutor

1.8 Expected Outcome

The much hope and expected outcome of this project proposal is a complete and fully functional working version of the Java Tutor system. All the project objectives are hope to be achieved at the end of the project, which can provide variety of information about Java programming language to user. It also hopes that user can learn Java programming language through this system easily and efficiently from this system.

1.9 Report Layout

This report layout shows the overview of the major phases, which involved during the development of the project. The report layout is shown as below:

Chapter 1 : Introduction

This chapter gives an overview of the project including the project overview, project objectives, project scopes, project motivation, project schedule, target users and project limitation.

Chapter 2 : Literature Review

This chapter gives brief explanation on studies and research that are related to this project in order to develop the system. The analysis on the existing systems, which are similar to Java Tutor, will be presented as a guideline. The programming languages, web server, web browser, platforms, development tools and databases that considered to be used also will be reviewed in this chapter.

Chapter 3 : Methodology

This chapter will clearly identifies the methodology that been chosen to develop the system together with its phases.

Chapter 4 : System Analysis

This chapter will emphasizes on the analysis of the project's requirements such as the functional requirements and non-functional requirements. It also will discuss about the hardware and software requirement for the system. It also discussed about the chosen programming language, web server, web browser, platform for developing the system, development tools and the database for the system.

Chapter 5 : System Design

This chapter covers all the aspects in designing throughout the project. This consists of system structure chart, context diagram, data flow diagram, database design and the user interface design.

Chapter 6 : System Implementation

This chapter is about system implementation that involves the conversion of system analysis and design into development processes of the system.

Chapter 7 : System Testing

In this chapter, testing strategies and approaches used to evaluate this system are discussed. Testing is important to make-sure that the system fulfills the requirement and specification that have been planed.

Chapter 8 : Evaluation

This chapter concludes this system on its strength and weakness, suggestion for further improvement and future enhancement, which can be added to this system.

Chapter Summary

Chapter 1 summarizes the overview of the proposed project, Java Tutor. It also covers the project's objectives and motivation.

It also explained the scopes of the system that consist of two main modules, which are user module and administrator module together with their sub-modules. This chapter also identified the target user for the system and the project limitation.

Lastly the project schedule is developed to assist in planning the duration taken to accomplish each task of this project from the beginning until end of this project.

In the next chapter, literature review regarding to the proposed project will be discussed.

Chapter 2: Literature Review

In this chapter, it will covers about all information that related to the proposed project in section 2.1 and section 2.2. In section 2.3, the research and analysis that been conducted on the existing system which are similar to the proposed project will be discussed It also will discuss about the programming languages, web server, web browser, development tools, operating system and database that will consider to be used in developing the system from section 2.4 until section 2.9.

2.1 Introduction of Java Programming Language

The Java language is an object-oriented programming language which created by James Gosling and other engineers at Sun Microsystems. It was developed in 1991, as part of the Green Project, and officially announced on May 23, 1995, at SunWorld and released in November. At first, Gosling and friends initially designed Java, which was called Oak, to replace C++. Sun holds a trademark on the Java name (wiki, 2004).

2.1.1 Java Advantages

The advantages of Java are as listed below (Pradnya, 2004):

I. Java is simple

Java is considered to be much simpler and easy to use if compared to C++. Java is modeled after C++, which has replaced the complexity of multiple inheritance in C++ with a simple structure called interface, and Java also doe not have pointer.

The reason that why Java is much simpler than C++ is because Java uses automatic memory allocation and garbage collection where else C++ requires the programmer to allocate memory and to collect garbage. Also, the number of language constructs in Java is

small for such a powerful language. The clean syntax makes Java programs easy to write and read.

II. Java is Object-oriented

With Java, it is object-oriented programming that models the real world. Everything in the world can be modeled as an object. For example, a circle is an object and a person is an object too. An object has its own properties and behaviors. The object's properties are described by using data, and its behaviors are described by using methods. Objects are defined by using classes in Java. Object-oriented programming provides greater flexibility, modularity and reusability. For years, object-oriented technology has been perceived as an elitist, requiring substantial investments in training and infrastructure. Java has helped object-oriented technology enter the mainstream of computing, with its simple and clean structure that allows the programmer to write easy to read and write programs.

III. Java is Distributed

Distributed computing involves several computers on a network, which are working together. The advantage of Java is it was designed to make distributed computing easy with the networking capability that is inherently integrated into it. Writing network programs in Java is like sending and receiving data to and from a file.

IV. Portability: Program once, run anywhere (Platform Independence)

One of the most compelling reasons to move to Java is its platform independence. Java program can be run on most major hardware and software platforms today which including Windows 95 and NT, the Macintosh, and several varieties of UNIX. All Java-compatible browsers support Java applets. If compares to C-based languages, Java source code is a little more portable.

V. Java is Interpreted

Java needs an interpreter in order to run its programs. The programs are compiled into Java Virtual Machine code, which called bytecode. The bytecode is machine independent and able to run on any machine that has Java interpreter. The program needs only to be compiled once, and the bytecode generated by the Java compiler can be run on any platform.

VI. Security

If compared to other programming languages, Java seems to be the first programming languages that consider security as part of its design. The Java language, compiler, interpreter, and runtime environment were each developed with security as essential. The compiler, interpreter, and Java-compatible browsers all contain several levels of security measures that are designed in purpose to reduce the risk of security compromise, loss of data and program integrity, and damage to system users.

VII. Reliability

Java programming language provides high security and reliability. Security measures cannot be implemented with any degree of assurance without a reliable framework for program execution. Java provides multiple levels of reliability measures, beginning with the Java language itself. Its compiler provides several levels of additional checks to identify type mismatches and other inconsistencies. The Java runtime system duplicates many of the checks performed by the compiler and performs additional checks to verify that the executable bytecodes form a valid Java program.

VIII. Multimedia: Images, Sounds and Animation

JAVA also supports MULTIMEDIA such as Sounds, Images, Graphics and Video. Most programming languages do not have built-in multimedia capabilities. JAVA, however

through the packages of classes that are an integral part of the Java programming world, provides extensive multimedia facilities that will enable a programmer to start developing powerful multimedia applications immediately.

IX. Java is Multithreaded

Multithreaded is the capability for a program to perform several tasks simultaneously within a program at the same time. Downloading music file while playing the file would be considered multithreading. In Java, multithreaded programming has been smoothly integrated into it, while in other languages, operating system-specific procedures have to be called in order to enable multithreading. This makes the Java programming language different from others.

X. Java is Dynamic

The Java programming language also was designed where it has the capability to adapt to changing environment. New methods and properties can be added freely in a class without affecting their clients. Java also able to load classes as needed at runtime. As an example, a class called 'Square' and this class has a property to indicate the color of the square, and a method to calculate the area of the square. A new property can be added to the 'Square' class to indicate the length and width of the square, and a new method to calculate the perimeter of the square, and the original client program that uses the 'Square' class remains the same.

All information about Java and its advantages already had been discussed in this section. In the next section, it will focus about the tutor concept where the traditional tutor concept and web based tutor concept will be discussed together with their advantages and disadvantages.

2.2 Tutor Concept

A tutor is an instructor to teach a specific educational subject or skill to an individual student (Tutor, 2004).

2.2.1 Traditional Tutor Concept

Tutor concept in the traditional way means that tutor which is a human in front of the classroom with the teaching materials, delivering knowledge or skills to the students.

The advantages are:

- There are two ways communication between tutor and the student where the student can asks question and tutor can answers the question at the same time using verbal communication.
- Students who learn in educational institution, the interaction among students or tutors during in the class or recreational sports period will allows students to get to know each other.
- Students are trained to be discipline in the education institution. This is because students have to follow the timetable that have been fixed during the learning period. If the students absent or do not attend the class without any reason, the student will be punished.

The disadvantages of traditional tutor concept are stated as below

- Need a tutorial/class room with teaching materials where tutor can use these materials to deliver knowledge and skills.
- Student must attend and participate in the class.

- Student and tutor must be at the same place and at the same time. This means there must have a fixed timetable.
- Class maybe more than one student and tutor have to pay attention to all students. Class teaching process will be slow if there have student that weak in study because tutor will pay more attention to the student.

2.2.2 Web Based Tutor Concept

Web based tutor concept is where computer become the learning tool and information can be gained electronically as the computer connected to the Internet.

The advantages of this tutor concept are:

- Student can learn anywhere and as much as they need without have to travel to education institution. This save a lot of time if a student has to travel for a long journey.
- Learner can study whenever it is convenient for them. There is no longer need for the teacher and learner to fix the timetable and meet at the same time and same place.
- User can gain information through interactive way just with the mouse click from the attractive web site with multimedia supported like animations and sound.
- Learner can develops knowledge of the Internet and computer skills that will help learner to be computer literate and this will them through their carrier.

Disadvantages:

- Student with no fixed timetable to follow and potentially no face-to-face

may 'slip'. Student with low self-disciplined will take this as the chance to relax.

- Student who focusing on the computer for a long period may cause to health problems especially the eyes.
- Learner will feel isolated from instructor and classmate. This can be the drawback of web-based learning as it can reduce the social interaction of the learner.
- Slow Internet connection will make accessing course materials frustrating.
- Web-based learning is delivering information and not teaching the learner. This is because the learner has to find for the information, which are currently available through Internet and sometimes it seems to be time consuming to find what that actually leaner wants.

The research on existing systems that are similar to the propose project will be discussed and analyzed in the next section.

2.3 Research on Existing system

Research had been conducted through some of the Java Tutor web sites that are currently available on the Internet. Many sites that provide learning in Java programming language have been visited and analyzed in purpose to get a better view and understanding on how the Java Tutor system is currently implemented. Besides that, the advantages and disadvantages of that web site are compared as well. These advantages can be applied in the proposed Java Tutor project.

The web sites that had been visited are:

1. The Java Tutor

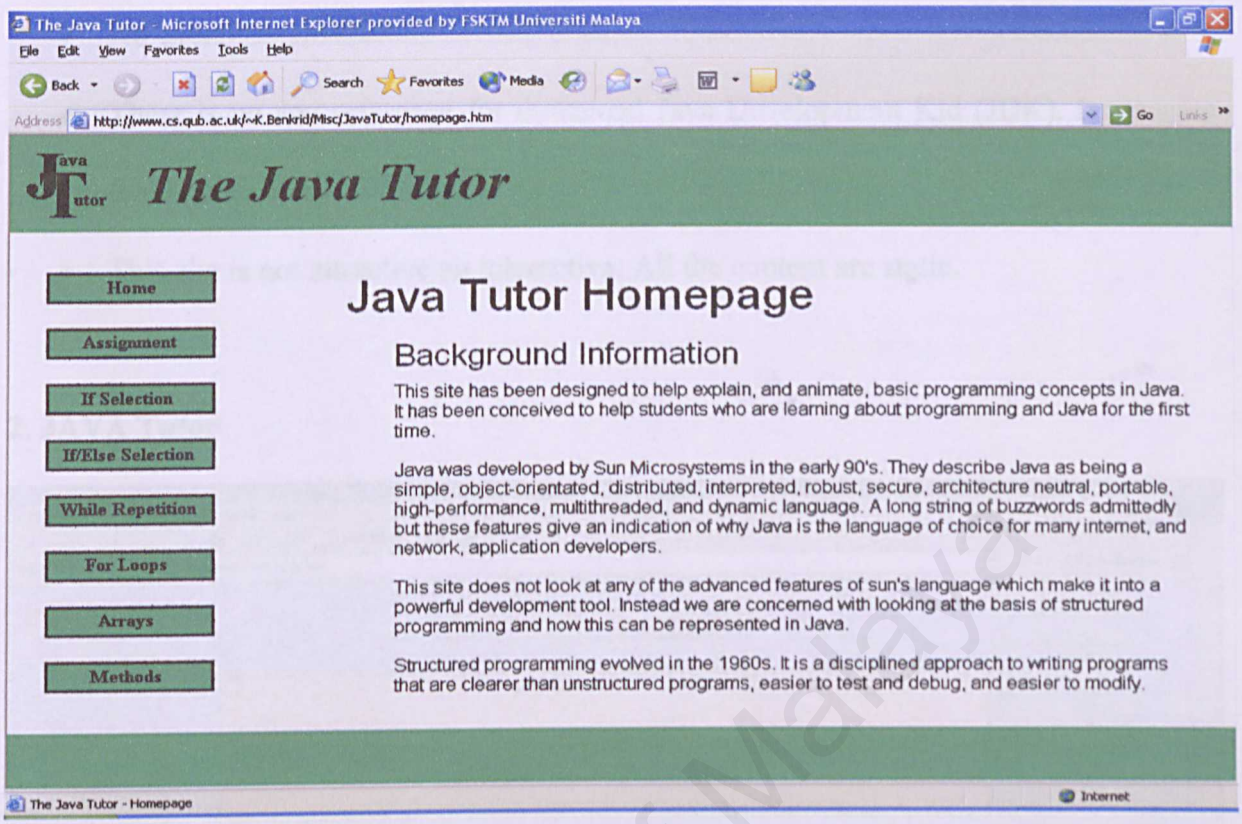

Figure 2.1 The Java Tutor (Benkrid, 2004)

This is a web based free learning courseware site that provides learning on Basic Java programming language. This site is suitable for those beginners who want to get start with Java programming language because it did not includes advanced Java programming language. It also covers only the selected chapters of Java programming language.

Advantages:

- This site provides lessons and assignments
- It provides examples of questions with step-by-step explanation.
- It provides sample source code.
- It is easy to navigate through the site just with the moue click.

Critics:

- It uses only green and white colors for the whole pages.
- There is no any animation in this web-site

- Objective for every chapter not provided.
- No exercises provided.
- There is no any reference for download Java Development Kid (JDK). It assumes that learner already has it.
- This site is not attractive an interactive. All the content are static.

2. JAVA Tutor

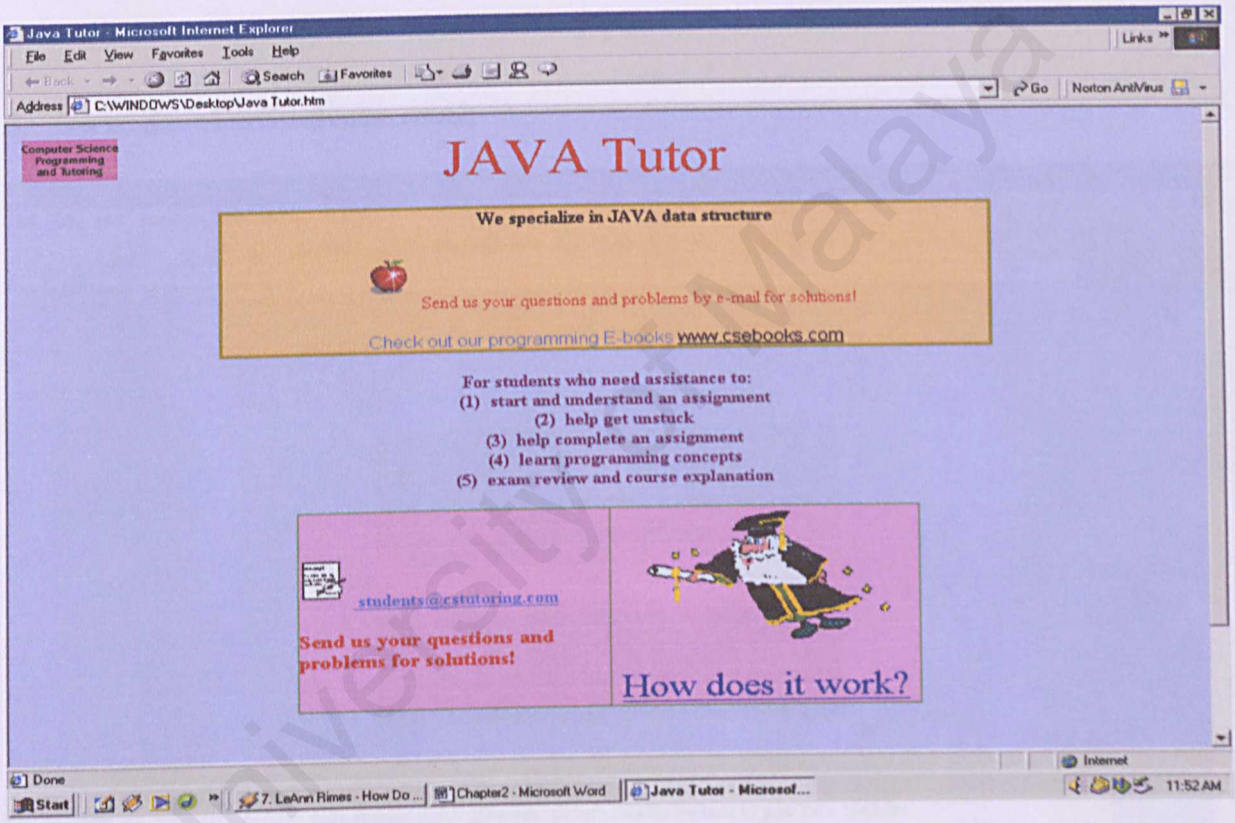

Figure 2.2 JAVA Tutor (java, 2004)

This JAVA Tutor web site is not a free web site where learner has to pay in order to learn the courses. It provides a free trial version for leaner for the first chapter to assess the course. In this site, it has 14 lessons in the PDF format and a project for learner. For every lesson, it provides questions and exercises.

Advantages:

- It has animation and very attractive.

- It provides exercises and assignments.
- It has link to download Java Development Kid (JDK).
- User can send e-mail for suggestion and ask for solution.
- It has e-book for Java programming language.

Critics:

- It uses the PDF file format for the lesson and this will take times to open this type of file.

3. www. JavaForStudents .co.uk

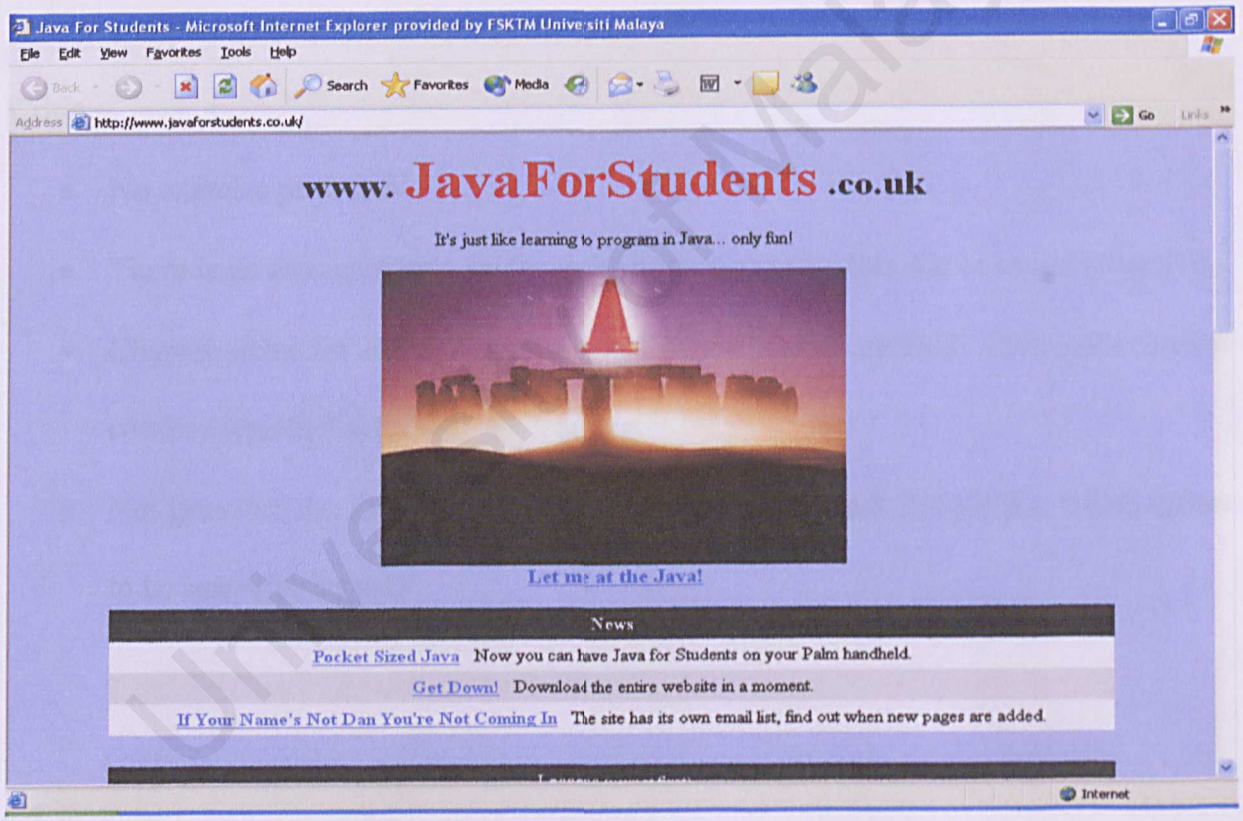

Figure 2.3 www. JavaForStudents .co.uk (Golding, 2004)

It is a good web site for delivering lesson on Java programming language, which is free for all. It teaches Java from the basis lesson and it suitable for beginner. This site make user feel comfortable and confidence because it use informal language in delivering the lessons.

Advantages:

- User can download the contents package of this web site, which is provided for free and user can use it for study offline. This method can reduce the Internet access cost.
- It also provides pocket-sized Java where user can learn Java through Palm handheld.
- It guides user from the beginning lesson until the latest lessons and it also using supportive informal language.
- It also provides feedback function where user can send their suggestion or complaint about the lessons or the site.

Critic:

- No exercise provided.
- There is no any animation on the web site, which make this site to be not attractive.
- Chapter titles for each chapter are not in the formal method. This make learner confuse which chapter they are learning.
- Not provides the link to download the Java Development Kid (JDK), which seems to be essential for user.

4. Introduction to Computer Science using Java

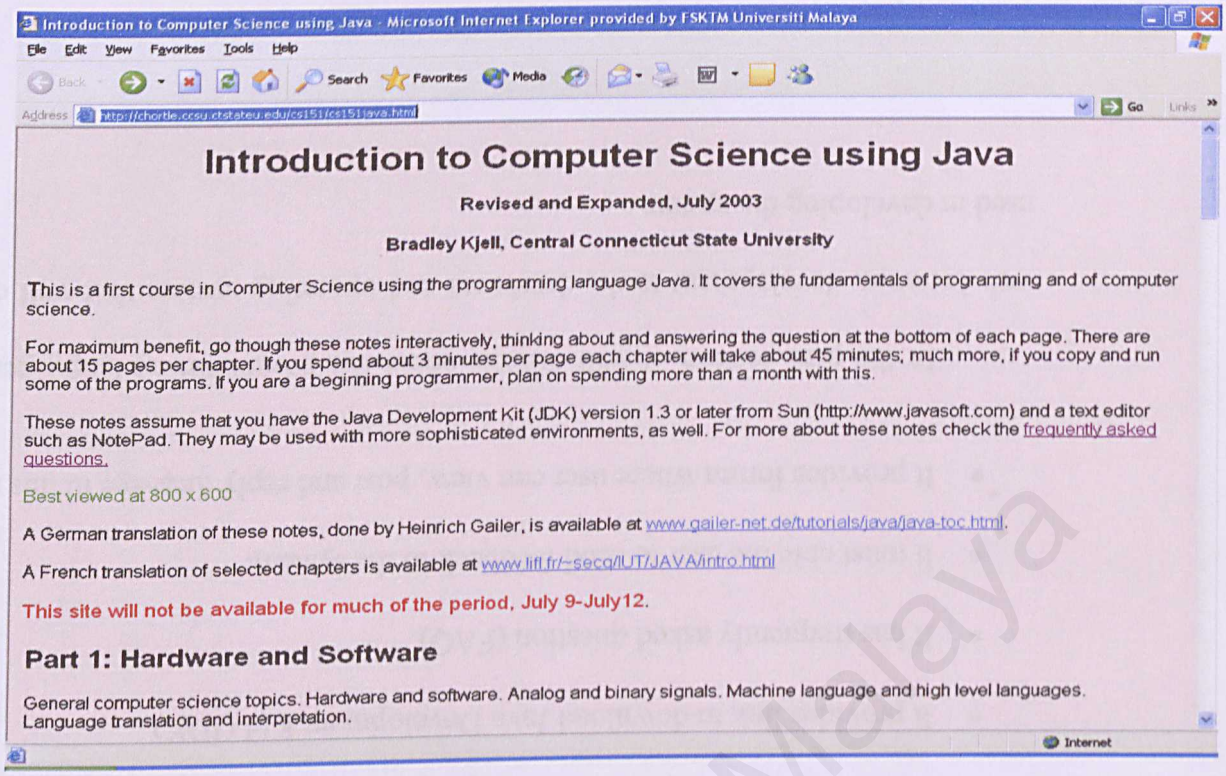

Figure 2.4 Introduction to Computer Science using Java (Kjell, 2004)

This web site was developed by Bradley Kjell. It provides free learning for Java programming language, which is very suitable for those people who are interested in learning this programming language. This site covers almost all the chapters of Java programming language.

Advantages:

- It has German and French language version.
- User can download the Java lessons through this site.
- It contains java lessons, quiz and programming exercises.
- It has frequently asked question (FAQ).
- It has search function.
- It provides the site address to get the Java Development Kid (JDK).

Table 2.1 Comparison among existing system

	The Java Tutor	JAVA Tutor	JavaForStudents	Introduction to Computer Science Using Java	Java Tutor (Proposed project)
Provide tutorial for every lesson	YES	YES	YES	YES	YES
Provide link to download Java Development Kid (JDK)	NO	YES	NO	YES	YES
Able user the to send feedback	NO	YES	YES	NO	YES
Has (Frequently Asked Question) FAQ	NO	NO	NO	YES	YES
Provides Forum	NO	NO	NO	NO	YES

2.4 Programming Language

2.4.1 Hypertext Markup Language (HTML)

Hypertext Markup Language, the authoring language that is used to create documents on the World Wide Web (WWW) (HTML, 2004). HTML document are also called Web pages; a page is displayed within a browser. Each web site, whether on the Internet or on an intranet, is composed of multiple related pages on a particular server and each page can be linked using hyperlinks. The collection of public HTML pages out there makes up the WWW.

A web page is basically made up of two things; tags and text. Text that contains the message to be displayed and reference to other elements such as images, sound, and of course, other documents. Tags are codes that mark the way words will be displayed. HTML pages can create a text editor such as Notepad or MS FrontPage 2000. The browser displays this text file on the client computer by interpreting part of the text as instructions and presenting the rest as content.

2.4.2 Extensible Hypertext Markup Language (XHTML)

XHTML is the markup language that specifies the format of the text that is displayed in a web browser. It is the markup language that replaces HTML. The reasons are because XHTML are more robust, richer, and extensible features than HTML. The features in XHTML make the markup language more dynamic and interactive. This markup language can create beautiful design and mixed with suitable colors. The XHTML can be used to design the web site so that it will make the web site more attractive like creating dynamic button link with combination of picture file from certain directory.

2.4.3 Extensible Markup Language (XML)

The XML is widely supported by open technology for data exchange. The XML is basically used to display the data and information. The XML document contains only the data, not the formatting instruction. That is why the application that process XML document must decide how to display the data for certain documents.

The important of XML is to describe specific types of data, including mathematical formulas, chemical molecular structures and others. The XML elements describe the data contained in those elements, so XML processing program can search, sort, manipulate and render XML document using technology like Extensible Style Sheet Language (XSL). Processing XML document requires a software program called XML parser or XML processor. The parser will check an XML document's syntax and enable software program to process mark-up data. When the parser read the schema and the XML document conform the schema, then XML document is valid.

2.4.4 Active Server Pages (ASP)

Active Server Pages or ASP, is a technology that enables developer to make dynamic and interactive web pages (ASP, 2004). Active Server Pages is a server technology dynamically builds documents in response to client's request. The ASP is processed by an Active-X component called scripting engine. It is very useful for using in the real time situation. The extension for ASP is .asp, which contains XHTML tags and scripting code. The default scripting language used for writing ASP is VBScript, although developer can use other scripting languages like Jscript. The ASP can be used to response to the client's response via the Hypertext Transfer Protocol (HTTP) protocol of the World Wide Web (WWW). When the server receives client's HTTP requests, the server then

loads the document requested by client, including XHTML. The ASP processes the request and returns the result to the clients in any format like XHTML, document, images or binary. When the client requests an ASP document, the document is loaded into the memory and passed by a scripting engine.

2.4.5 ASP.NET

ASP.NET is the next generation of Microsoft's ASP, a feature of their Internet Information Server (IIS) (ASP.NET, 2004). ASP.NET is use for creating and implementing a more dynamic, database-driven web site. ASP.NET represents a radical departure from the previous version of ASP. The ASP.NET can be used to get a better dynamic web site as it has more features that ASP do not has. The new feature help the users to create the more advanced and secured web site. The ASP.NET technologies are more secure as it has some built-in function that make the web-site cannot be easily to be hacked by unauthorized people. At the same time, ASP.NET is very useful for creating the web site that is dealing with security part like transaction. The applications that use ASP.NET are more easily to be implemented, as it only requires calling the specific built classes.

2.4.6 Visual Basic.NET (VB.NET)

VB.NET is the newest implementation of the very popular Visual Basic language and is part of the emerging Microsoft .NET platform. The VB.NET provides features that are important like object-oriented programming, string, graphic, graphic user interface components, exception handling, multithread, multimedia, file processing, prepackage data structure, database processing, Internet and World Wide Web client and server networking and distributed computing.

2.4.7 Java

Java is the programming language that created by Sun Microsystems. This programming language allows people to create web pages with dynamic and interactive content, to develop large-scale enterprise applications.

Java is certain to become the large of choice for implementing software for devices to communicate over the networks. The advantage of Java is that it is open source programming language and users are able to view the source code for free.

2.4.8 JavaScript

JavaScript is a scripting language that was developed by Netscape to enable web authors to design interactive sites. JavaScript is different from Java language. Although it shares many of the features and structures of the full Java language, it was developed independently. JavaScript can be embedded into HTML source code and it has the capabilities for the web authors to enhance their sites with interactive and dynamic content. JavaScript is endorsed by a number of software companies and is an open language that anyone can use without purchasing a license. Recent browsers from Netscape and Microsoft support JavaScript, though Internet Explorer supports only a subset, which Microsoft calls Jscript.

2.5 Web Server

A web server serves web page to client upon request across the Internet. The web server host the pages, scripts, program and multimedia files and serves them using HTTP, a protocol designed to send files to web browsers. Every web server has an Internet Protocol (IP) address and a possibly a domain name. Web servers run under a variety of operating system, have varying levels of power and complexity, and the range in price from

rather expensive to free. Studies on several web servers will be carried out: Microsoft Internet information Server (IIS) and Apache and Personal Web Server (PWS).

2.5.1 Microsoft Internet information Server (IIS)

IIS is the best web server, which is available for Windows NT. This version comes exclusively as a part of Windows XP Professional operation system, contains many new features along with performance and reliability enhancements.

The ideal computer to run IIS is on at least a 200 MHz Pentium with 128 MB of RAM. Organization that intended to run Advance Server's clustering, SQL or Transaction services on the same machine as the web server should plan on doubling the RAM and CPU speed.

2.5.2 Apache

Apache server is a high-end enterprise-level server developed by a loosely knit group of programmers. The original version of Apache was written for UNIX, but now there are new version that runs under O/2, Window and other platforms.

Apache is a fantastic product. It is fast, reliable an inexpensive. The keys to Apache's to Apache's attractiveness and popularity lie instead in the qualities listed above and its extensibility, its freely distributed source code, and active user support for the server.

2.5.3 Personal Web Server (PWS)

PWS is entry-level/mid-range server for Window 9x/NT platforms. It is a scaled-down version of the commercial Information Internet Service (IIS) included with the Server

edition of Microsoft Windows NT. PWS is a great entry-level web server that makes it easy to publish personal home page, serve small web sites, and share documents via a local intranet.

PWS is suited for developing, testing and staging web applications, as well as peer-to-peer publishing with its support for sharing files over HTTP and FTP protocols. PWS is one of the best servers available for helping to get users up and run quickly. Wizards are included to guide users through the process of setting up home page and sharing files, and the PWS administrator reduces the complexity of running the web server itself. User can also use the familiar Explorer interface or PWS's Personal Web Manager to share directories, start and stop the server, and vie web sit statistics.

2.6 Web Browser

A web browser is a software that allow Internet user to locate, display and use web documents. For the web browser consideration, Microsoft Internet Explorer and Netscape Navigator will be discussed in the next sub section.

2.6.1 Microsoft Internet Explorer

Internet Explorer is the most widely used World Wide Web browser. It comes with Microsoft Operating System and also can be downloaded from Microsoft web site. Internet Explorer is the graphical WWW browser that is provide by the Microsoft 95, 98, 2000, NT 5.0, ME and XP. Internet Explorer includes the industry primer Internet client and basic collaboration solution or end user, developers and also IT managers.

2.6.2 Netscape Navigator

Netscape Navigator is called as Navigator and is included in suite software called Communicator. Navigator was develop in 1995 by a team led by Marc Andreeson, who created Mosaic, the first web browser that has graphical user interface at University of Illinois's National Center for supercomputer application in 1997. Netscape Navigator supports JavaScript but not VB Script.

2.7 Development tools

2.7.1 Microsoft.Net Framework

The Microsoft .NET Framework is an important new component of the Microsoft Windows family of operating systems (framework, 2003). Microsoft.NET framework is one of the software products that support the web-based application. The software is combining some types of programming language and makes it into single framework. All the programming language can be combined to make the application that is going to be built more flexible. The languages that are in the NET framework are like ASP.NET, VB.NET, C++ and C#. These kinds of programming languages can be combined with the Visual Basic to create a dynamic and more secure application. The software has been upgrade to make it easier to use for those who wants to build the web-based application. The features in this software are like more automatically design features like creating button by dragging the icon into the template provided. Beside these, the user is able to combine the Common Style Sheet (CSS) to let the user to design the web page. All in all, there are more advanced features that are being provided in the NET framework software.

2.7.2 Microsoft FrontPage

Microsoft FrontPage is software that is used to create and design the web site. The Microsoft FrontPage is specially designed to assist the interface development of web site application. For example, the Microsoft FrontPage is used to create a table by inserting the number of row and column and the table will appear exactly like number of rows and columns that been inserted by user. The Microsoft FrontPage created site can be viewed in any browser. Microsoft FrontPage also offers cross-browser support for Dynamic Hypertext Markup Language (DHTML).

2.7.3 Macromedia Dreamweaver MX

Dreamweaver MX is the most dynamic HTML editor available off the shelf (Dreameawer, 2004). It can be used for designing, coding, and developing websites, web pages, and web. It gives developers the productivity of a visual web page layout tool, the control of an HTML text, editor and support for new web technologies.

Developers can use it to create web site visually, with confidences that HTML being generated is concise and editable. It includes advanced features that take advantage of the latest innovations on the web, such as dynamic HTML and CSS, while still ensuring that web pages work well in a variety of web browsers. All of the code generated by it is carefully created to work as many platforms and browsers as possible.

Other features include easy integration of Active-X components, Java applets, Plug-in for improved web page interactively. It also integrates seamlessly with other components of Macromedia, such as Flash movie, shockwave and firework, which are essential fir the dev. of interactive web pages.

2.7.4 Adobe Photoshop

Adobe Photoshop is the most popular image editing available for Macintosh and Windows based computer. It can be used for drawing, painting and designing purpose. User can retouch an image, adjust color balance, apply special effects, swap details between photos, introduce text and logo and even add color to a grayscale scan. All these functions are included under a set of user-friendly editing tool in Adobe Photoshop. It contains graphical icon to represent every function of each button.

2.8 Database

Database is a collection of information that is organized so that the information can easily be accessed, managed, and updated.

2.8.1 Microsoft Access (MS Access)

MS Access is a relational database management system that could be used on Windows Server. The database is the popular version of database that also used in the web-based application. The database connection using MS Access is either using OLE DB or Open Database Connectivity (ODBC). The MS Access is usually not suitable used for storing large amount of data. There are not many functions in MS Access to integrate with the web application software like .NET framework. For example, the full-text search, which allows the program to search the text typed by user cannot be implemented by using MS Access.

2.8.2 Microsoft SQL Server (MS SQL)

MS SQL Server scalability, reliability makes SQL Server 2000 the best choice for the agile enterprise (mssql, 2004). MS SQL Server has a unique advantage over its

competitor like IBM's 9B2 Universal database; Informix Dynamic Server and Sybase SQL Server as it provide tight integration with Windows and window-based applications helping to reduce the cost and complexity of deploying sophisticated applications. MS SQL Server is an ideal database for powering the web sites. Through tight integration with Internet Information Services (IIS), MS SQL Server can be queried and updated via popular web browsers. MS SQL Server's native ODBC lets it inter-operate smoothly with the Internet database Connector Interface included with Internet Information Services

2.8.3 MySQL

MySQL is the most popular Open Source SQL database that is developed by MySQL AB. MySQL AB is a commercial company that builds its business providing service around the MySQL database. MySQL is a multi-user and multithread relational database management system (RDBMS) server that uses SQL to interact with and manipulate data. MySQL support multithreading capability that enables the database to perform multiple tasks concurrently. It also supports various programming languages like C, C++, Java and others. The one of the advantages of MySQL is it can be implemented in any platform like Windows, Linux and Unix. MySQL also used for powering the world's most popular websites, including Yahoo!, Slashdot, Hoover's, Google, and others (mysql, 2004).

2.8.4 Oracle9i

The Oracle9i is designed to support and leverage the capabilities of the Internet. It provides extensive functionality to support business running on the World Wide Web, as well as traditional mission critical OLTP and Data Warehousing application. It supports the

high scalability requirements of the most demanding Internet-based and traditional mission critical applications, as well as the highest availability requirements. It is capable of handling all types of information for all types of application and provides outstanding, across-the-board, and transparent scalability from low-end uniprocessor to high-end symmetric multi-processor systems and multi-node clustered configurations.

2.9 Operating System (OS)

Operating system is the most important program that runs on a computer and also known as the heart of the computer. Operating system performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers (TERM, 2004). In this sub-section, it will discuss about two Windows operating system, which are Windows XP Professional and Windows 2000 Professional.

2.9.1 Windows XP Professional

Windows XP Professional is Microsoft's latest version of popular Windows NT Operating System. Windows XP Professional has big improvement over Windows NT 4.0 and Windows 2000. The changes, both fundamental and cosmetic, have made Windows XP faster, more reliable, heavier duty, and easier to use.

Its integrated Web capabilities and broad support for mobile computers and hardware devices makes it the easy way for business users to connect to the Internet anywhere and anytime. And its rock-solid reliability and improved manageability simplify desktop management for IT professionals.

The combined features of Windows XP Professional create the mainstream

operating system for desktop and notebook computing in all organizations. It has the best business features of Windows 98 Plug and Play, easy-to-use user interface, and power management and made them better. It's also integrated the strengths of Windows NT standards-based security, manageability and reliability. Whether deploy Windows XP Professional on a single computer or via a worldwide network, Windows XP Professional increases the computing power while lowering the total cost of desktop ownership.

2.9.2 Windows 2000 Professional

Windows 2000 professional is the Windows operating system built based on Windows NT Kernel and it is sometimes referred as Windows NT 5.0. Windows 2000 professional is used to run software application, access files, access network resource and connect to Internet an intranet. Windows 2000 professional contains more than 29 million lines of code mostly written in C++, 8 millions of those lines are written for drivers (win2000, 2004).

Chapter Summary

In this chapter, it had discussed about all information that related to the proposed system. The analysis about the current similar system also been conducted. It also discussed about the programming languages, platforms, development tools and the databases that will be used to develop the system.

In the next chapter, it will discuss about the methodology that will be used in developing the system.

Chapter 3: Methodology

A methodology is a collection of procedures, techniques, tools and documentation aids which helps system developers in their task of implementing a new information system. In this chapter, it will discuss about chosen methodology for Java Tutor system development, which is Waterfall model with prototyping together with its phases and the reasons of choosing this methodology.

3.1 Waterfall Model with Prototyping

Waterfall model with prototyping is a software development process model that combines the features of Waterfall model and Prototyping model. All the advantages from the both model are acquired and then replace each other's drawbacks in order to develop a more useful software process model. If only using waterfall model, it will cause a problem where the product did not meet the client's needs because client can only see the working product after the entire product has been coded. It seems not suitable to choose spiral model as methodology for the proposed project because it only suitable for large-scale project.

In the Waterfall model, each development stage has to be completed before proceeding to the next stage. For example, in the first stage of development phase the system requirement are elicited, analyzed and documented before designing the system. With the additional of Prototyping model as the sub-process, certain aspect of the system can be reviewed as tested to check its functionality and whether it meets the system specific requirement. This is because users do not know exactly what they want until they have the chance to see and demonstrate with the system or part of the system.

The reasons of using Waterfall model with Prototyping are:

- It is widely used, easily to understand and implemented in a system development process.
- It supports good process visibility as each activity produces some kind of deliverable. These deliverables may prove to be useful when the system evolves in the future.
- It enforces disciplined approach to develop a system as documents prepared after each stage will have to be checked and approved.
- It enables maintenance to be carried out at each stage due to its interactive nature. Changes can be done any of the stage by returning to the previous stage. This iteration process may be carried out as many times as needed and this will help in producing a fine and high quality system that meets user's requirement.

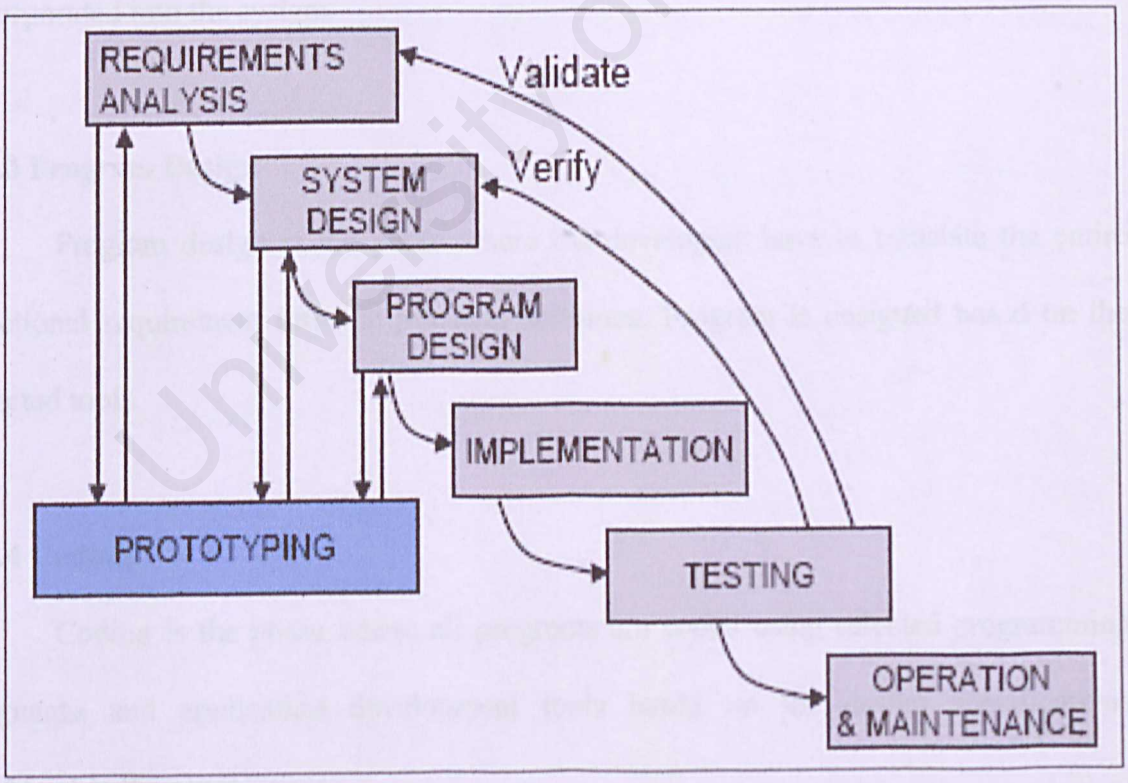

Figure 3.1 Waterfall model with prototyping (Crnkovic, 2003)

In the next sub section, it will discuss about the phases that involve in the Waterfall model with Prototyping.

3.1.1 Requirement Analysis

The system services, constraints and goals are established with the system users. They are then defined in detail and serve as a system specification. Major activities that involve are requirement studies, data gathering and data analysis. For example, system developers must have a well understanding on the customer's requirements by studying and observing their existing system, and analyze on the collected data. The important outcome s will be an accurate system requirement specification.

3.1.2 System Design

System design is process of transferring the problem into a solution, which then incorporated into the system.

3.1.3 Program Design

Program design is the phase where the developers have to translate the entire functional requirement into the practical solutions. Program is designed based on the selected tools.

3.1.4 Coding

Coding is the phase where all programs are coded using selected programming languages and application development tools based on the design specifications produced in the second phase.

3.1.5 Prototyping

Prototyping is the process of continuous development of a quick and rough version of a desired or part of the system. This stage is important in order to develop a suitable user interface that meet the user requirement.

3.1.6 Unit and Integration Testing

Unit and integration testing address the correctness of the program and verify the program design. The system developer will do testing to ensure that the programs are free of errors and run correctly. Programs unit that are completely tested will be integrated into the system.

3.1.7 System Testing and Integration

All the modules are combined to form the whole system and then it is tested in its actual or similar environment when the system is implemented.

The system has to be validated and verified during the state of system design. The verification is to make sure that the function in the Java Tutor works correctly and to check the quality of the implementation. The validation is to ensure that the Java Tutor ha implemented all the requirements in the specification.

3.1.8 Acceptance Testing

During this stage, the actual user is given the opportunity to use the system. The purpose of this activity is to enable the user to determine is the system really meets their needs and expectations.

3.1.9 Operation and maintenances

The system is ready to be implemented. This includes training of the user that will use the system, system maintenance and enhancement to meet new requirement. Maintenance on the system includes fixing bugs that are discovered. Maintenance is crucial to ensure that the system remain useful.

Chapter Summary

This chapter discussed about the methodology used to develop Java Tutor, which is the Waterfall model with Prototyping.

In the next chapter, it will discuss about system analysis, which include the functional and non-functional requirements as well as hardware and software requirements. It also will discuss about the chosen programming language, web server, web browser, database, operating system and the development tools that will be used in developing the Java Tutor system.

Chapter 4: System Analysis

In this chapter, it will discuss about the functional requirement together with the use case diagram and non-functional requirement of the proposed system respectively in section 4.1 and section 4.2. The hardware and software requirement for server and client computer also will be addressed in section 4.3. Section 4.4 until section 4.6 will discuss about chosen programming language that will be used to develop Java Tutor, the chosen development platform, and the database for the system. The data collection method also will be discussed in section 4.7.

4.1 Functional Requirement

The functional requirements are the description of activities or services the system should provide (SAD, 2004). For the proposed system, the functional requirements have been identified and listed as below:

1. **Authentication an Authorization module**
   - The registered user and administrator need to login into the system by key in the username and password.
   - For user, once login, the system will display the Java Tutor homepage where user can choose the option by clicking on the menu option
   - For administrator, after login, the system will display the maintenance page.

2. Lesson Module

- User should able to learn the lessons by clicking on the listed list of lessons which the user wish to learn and the system will display the clicked lesson page to the user.

3. Tutorial Module

- User should able to do tutorial to test their understanding about the lessons by clicking on the tutorial, which the user wishes to do.

4. Exam Module

- User should able to do the examination to test their understanding of the whole lessons provided in the system. The examination questions will be covered from all lessons in the system. This examination will be in the multiple choices format where user only needs to click on the correct answer. Once finish answering all the questions, the system will show the score to the user.

5. FAQ Module

- User should able user to view all the existing FAQs about Java programming language together with its explanation for each question.

6. Feedback Module

- User should able to send their opinion, suggestion and compliant to this Java Tutor web site.

- Administrator should able to view the feedback that sent by the user regarding their opinion, suggestion and compliant about this system that can be used for future enhancement.

7. Forum Module

- User should able to view the message in the forum by selecting a subject title from the message subject listing to see the more detailed content.
- After viewing any message in the forum section, user also should able to make response on certain issues posted by posting a reply message to the forum.
- User should able to post message for discussion in the forum section.
- Administrator can delete messages in the forum section, which are not suitable or outdated.

8. Useful link module

- User should able to use this link to view other valuable or relevant web sites.
- Administrator can update this link section by adding or deleting links in this section.

All the functional requirements in section 4.1 will be shown in the use case diagram in figure 4.1.

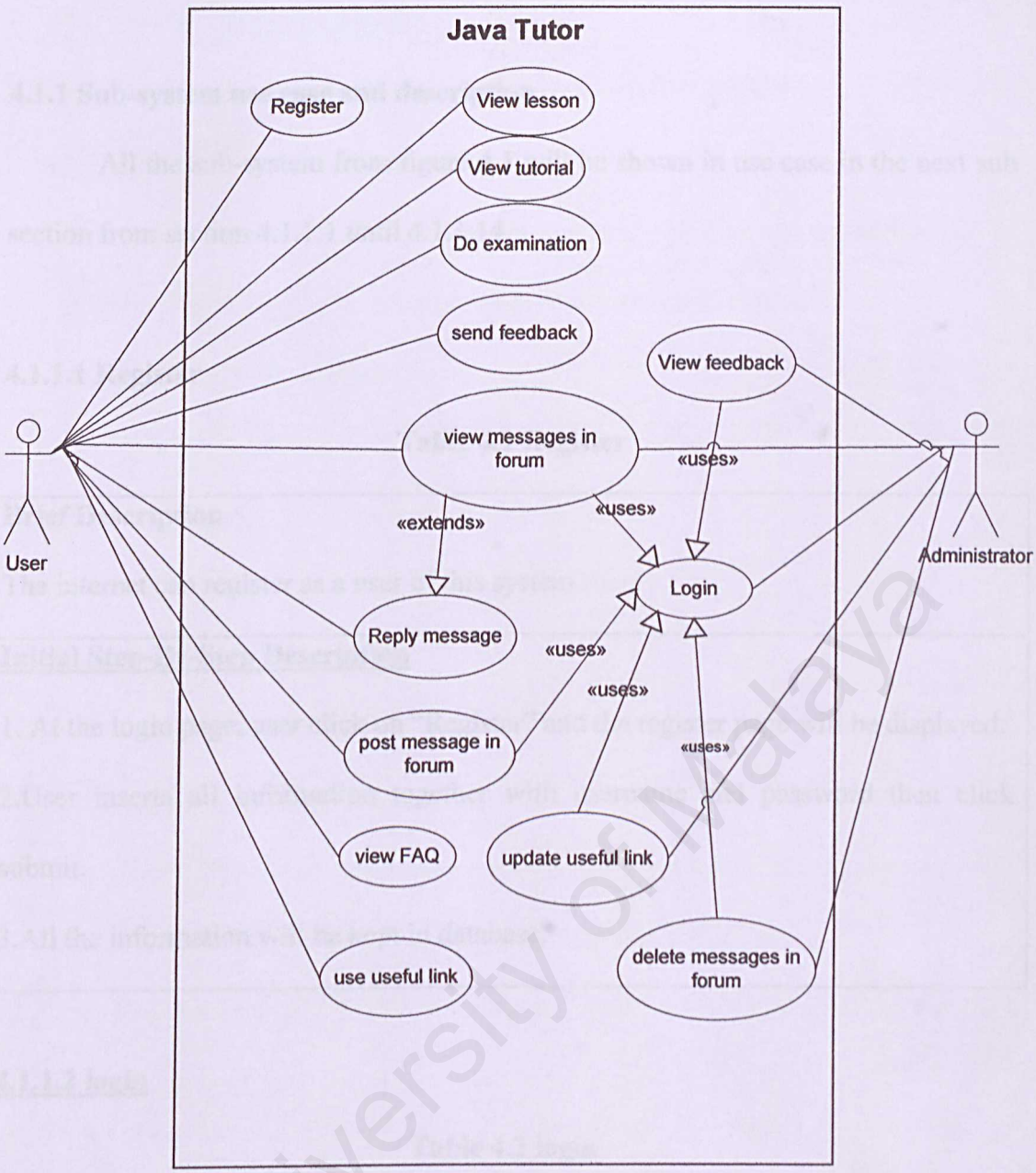

Figure 4.1: Functional requirement use case diagram

Next subsections will give in detail the step-by-step description for each use case.

4.1.1 Sub-system use case and description

All the sub-system from figure 4.1 will be shown in use case in the next sub section from section 4.1.1.1 until 4.1.1.14.

4.1.1.1 Register

Table 4.1 Register

Brief Description
The internet can register as a user of this system
Initial Step-By-Step Description
1. At the login page, user click on "Register" and the register page will be displayed. 2.User inserts all information together with username and password then click submit. 3.All the information will be kept in database.

4.1.1.2 login

Table 4.2 login

Brief Description
The Login Page is the initial page for the Java Tutor. This page asks the user to log in as a user or administrator.

Initial Step-By-Step Description
1. User or administrator inputs his/her username and the password. 2. The system validates the username and the password and if the password is belong to user, the system redirects the user to the Home Page and if the password is belonging to administrator, the system will redirects the administrator to the Admin page.

4.1.1.3 View Lesson

Table 4.3 View lesson

Brief Description:
User can view the lecture notes.
Initial Step-By-Step Description
1. From Home Page, user can clicks on the menu for Lesson and the Lesson Page will be shown with a listings of Lesson files and descriptions. 2. A click on the specific file link from the listings will enable the users to view the file.

4.1.1.4 View tutorial

Table 4.4 View Tutorials

Brief Description:
User can view the tutorial questions on the website.

Initial Step-By-Step Description
1. From Home Page, user can clicks on the menu for Tutorial and the Tutorial Page will be shown with a listings of Tutorial files and descriptions. 2. A click on the specific file link from the listings will enable the users to view the tutorial file.

4.1.1.5 Do examination

Table 4.5 Do Examination

Brief Description: User can do examination on the website.
Initial Step-By-Step Description 1. At the Home Page, user clicks on the menu for Examination and the Examination page will be shown. 2. Users can view the examination page and do the examination. 3. Once finish, user click on Submit button, the system will calculate the score and display to user.

4.1.1.6 Send feedback

Table 4.6 Send Feedback

Brief Description User should able to send their opinion, suggestion and compliant to this Java Tutor web site

Initial Step –By-Step Description
1. At the home page, user clicks on menu for Feedback and the feedback page will be shown. 2. User types the message and click SUBMIT button.

4.1.1.7 View feedback

Table 4.7 View Feedback

Brief Description
Administrator can view the feedback that sent by user regarding their opinion, suggestion and compliant to this Java Tutor web site. Administrator is required to login into the system before can view the feedbacks.
Initial Step –By-Step Description
1. At the Maintenance page, Administrator selects the title Feedback from module titles list and the system then directs user to Feedback Page that list down all the Feedback 2. Administrator can view each feedback by clicking on the subject view hyperlink.

4.1.1.8 View message in forum

Table 4.8 View Message in Forum

Brief Description
Users or administrator can view message by selecting a subject title from the

message subject listing to see the more detailed content and replies. (Administrator will be consider as user)
Initial Step-By-Step Description 1. At the Homepage, user can clicks on the menu for Forum and the Forum Page will be shown. 2. User clicks on a subject title from the message subject listings in Forum Page. 3. Detailed message along with replies are extracted from database and being shown.

4.1.1.9 Reply message in forum

Table 4.9 Reply Message in Forum

Brief Description: While viewing a message in the forum, user or administrator can choose to make response on certain issues posted by posting a reply to the forum. (Administrator will be consider as user)

Initial Step-By-Step Description
1. User clicks on REPLY button after viewing message. 2. The system prompt user for key in the reply message. 3. User key in the message and then clicks SUBMIT button. 4. The reply message is then stored in database and will be shown when user clicks to view the details about the subject.

4.1.1.10 Post message in forum

Table 4.10 Post Message in Forum

Brief Description:
User can post their message to be discussed in the forum, by providing subject title and content of the message.
Initial Step-By-Step Description
1. User clicks the button POST MESSAGE in Forum Page 2. The system prompt user to key in their message subject and its content. 3. User key in their message subject title and content then clicks SUBMIT button. 4. Message record stored in database and added into message listings.

4.1.1.11 Deleting message in forum

Table 4.11 Deleting message in forum

Brief Description:
Administrator filters messages in the forum, which might not relevant, consist of abuse elements, outdated, and etc. Administrator must login first before perform

this action.
Initial Step-By-Step Description 1. At the Maintenance, Administrator then selects the title Forum from module titles list and the system then directs administrator to Forum Maintenance Page that lists down all the messages with replies (without content). 2. Administrator may select message(s) to be deleted then click DELETE button. 3. The system removes the selected records from database and from the listings.

4.1.1.12 View FAQ

Table 4.12 View FAQ

Brief Description: Users can view FAQ contents when they have some questions or problem to be asked.
Initial Step-By-Step Description 1. From the Home Page, user clicks on FAQ from menu 2. System will directs user to FAQ Page that list all the FAQ content. 3. User views the FAQ contents.

4.1.1.13 Useful link

Table 4.13 Useful Link

Brief Description: User can use link to access the relevant website's links in the system

Initial Step-By-Step Description
1. The user selects Links from the Home Page menu.
2. The system directs user to the Links Page with all links available in the system
3. The user clicks on any website's links that they wish to access
3. The system shows/links to the relevant website

4.1.1.14 Update useful link

Table 4.14 Update useful link

Brief Description:
Administrator can update this useful link by adding new link or deleting link in the system. Administrator is required to login first before can perform this action.
Initial Step-By-Step Description
1. At the Maintenance Page, administrator then selects the title Links from module titles list and the system then directs user to Links Maintenance Page that list down all the Links.
2. To add new link, administrator key in link information to be added and clicks ADD button.
3. Then, the system adds the record into the system and the listing.
4. To delete existing link, administrator selects link to be deleted and clicks DELETE button.
5. The link record has been removed from database and listings.

4.3 Non-functional Requirement

Non-functional requirements are a description of other features, characteristic, attributes of the system as well as constraints that may limit the boundaries of a system.

1. **User-friendly interface**

   The user should able to browse through the site without any problems. It is important to make sure that the user are comfortable and do not encounter difficulties while using the system.

2. **Reliability**

   The system should be reliable so that the programmed task can be executed effectively and functioning as intended.

3. **Usability**

   The system that are being built should be simplify in order to make the user easy to get understand and easy to use.

4. **Maintenance**

   The system should be design in such way that it can be easily understood and corrected, as well as adapted and allow enhancement in the future. It is not worthwhile to develop a system that has no potential for improvement.

5. **Efficiency**

   The system shall be able to provide a good response time to all user requests.

6. **Security**

   The system should have the security feature to prevent unauthorized access, alteration or destruction o the system.

The hardware and software requirement for the proposed project will be addressed in the next section.

4.4 Hardware and Software requirement

In order for the system to function properly, there a few certain requirements that have to be met which are hardware and software requirements.

4.4.1 Hardware and Software Requirement for Server Computer

Table 4.14 Hardware requirements for server computer

Hardware	Requirement
Processor	Pentium 1.6 GHz or higher
Memory (RAM)	Minimum of 256 MB
Hardisk space	Minimum of 10MB

Table 4.15 Software requirements for server computer

Software	Requirement
Operating System (OS)	Microsoft Windows XP Professional
Web Server	Microsoft IIS Server
Web Database	Microsoft SQL Server 2000
Web development tools	Microsoft Visual Studio .Net, Adobe Photoshop 7.0
Web Browser	Microsoft Internet Explorer 6.0

4.4.2 Hardware and Software Requirement for Client Computer

Table 4.16 Hardware requirements for client computer

Hardware	Requirement
Processor	266 MHz or higher Pentium
Memory (RAM)	Minimum of 64 MB
Hardisk space	Minimum of 2MB

Table 4.17 Hardware requirements for client computer

Software	Requirement
Operating System (OS)	Microsoft Windows XP Professional
Browser	Microsoft Internet Explorer 6.0

After all the technologies have been reviewed and analyzed in chapter 2, the most suitable and appropriate tools for developing the system are identified and selected in the next following section.

4.5 Chosen Programming Language

The chosen programming language in developing the system is ASP.NET. ASP.NET is chosen because of the advantages listed as below (Brilliance, 2003):

- **Memory leak and crash protection**

  ASP.Net automatically recovers from memory leaks and errors to make sure that the website always be available to user.

- Better language support

  Programmers can write coding in more than 25 .Net languages (including VB.Net, C#, and JScript.Net). This allows programmers to develop the web

site in the language that the programmer knows best.

- **Powerful database-driven functionality**

  ASP.Net allows programmers to develop web applications that will interface with a database.

4.6 Chosen Web Server

The chosen web server for Java Tutor is the Microsoft Internet Information Service (IIS) because it is fully supported by Windows XP. It is also one of the best web servers on the market and it is a high-end enterprise-level server. This IIS also is easy to install and user-friendly rather than Apache which have complex configuration. Therefore, the time that needs to configure and manages IIS is shorter than Apache.

The advantages of Internet Information Server are:

- Well-integrated server administration tools.
- Easy to configure.
- Indexing, performance and security enhancements.
- Common used and more reliable.
- Allows for hosting multiple sites.
- Good as both a first-time web server for those familiar and comfortable with windows operating system.
- Integrating with existing industry-standard database and other ODBC-complaint databases.

4.7 Chosen Operating System

Review has been done in purpose of choosing a suitable platform/operating system for this project. After all the consideration, Microsoft Windows XP Professional is chosen as the most suitable operating system for the development process. The advantages of Windows XP Professional are:

- Windows File Protection

Protecting core system files from being overwritten by application installs. In the event a file is overwritten, Windows File Protection will replace that file with the correct version.

- Driver certification

Provides safeguards to assure that device drivers have not been tampered with and reducing the risk of installing non-certified drivers.

- Full 32-bit operating system

Minimizing the chance of application failures and unplanned reboots.

- Microsoft Installer

Works with the Windows Installer Service, helping users install, configure, track, upgrade and remove software programs correctly, minimizing the risk of user error and possible loss of productivity.

- Reduced Reboot Scenarios

Eliminating the scenarios that forced user to reboot in Windows NT 4.0 and Windows 9x. Many software installations also will never require reboots.

4.8 Chosen Database

The chosen database for the system is Microsoft SQL Server because it contains all the user-friendly features, works more efficiently and has the ability of handling large transactions simultaneously without affecting performance. Microsoft SQL Server advantages are:

- Provides powerful and scalable support for large database and complex queries.
- Features provided by Microsoft SQL Server ensure easy-to-use for database administrators in building, managing and deploying business applications.

The data transformation services make it easy to import, export and transform heterogeneous data using OLE Database, Open Database Connectivity (ODBC) or text-only files.

4.9 Chosen development tool

The chosen development tool for developing the Java Tutor is the Microsoft Visual Studio.NET because it provides the programming model for building, deploying, and running Web-based applications, smart client applications, and XML Web services. The Microsoft Visual Studio.NET delivers business value with faster time to market, improved systems flexibility, and reduced costs.

The advantages of .Net Framework:

- **Improved Reliability** - Advanced ways of monitoring the health of running applications, and isolating applications.

- **Increased Performance** - Advanced compilation and caching techniques and results a significant increase in speed.
- **Developer Productivity** - The intuitiveness of the programming model, the amount of code already provided in the class libraries, and the amount of work handled behind the scenes has enabled developers to reap huge productivity gains.
- **Powerful, Granular Security** - The .NET Framework runtime environment combines all evidence with administrator-set.
- **Integration with Existing Systems** - Applications connect with existing systems and packaged applications-regardless of their underlying platform.
- **Ease of Deployment** - simply by copying the application directory to the target machine-no registration is required.
- **Mobility Support** - provides one unified programming model for developing smart client and Web applications for both personal computers (PCs) and mobile devices.
- **Native XML Web Service Support** - XML Web services can be used to integrate applications running on different platforms, or to offer software as a service.
- **Support for over 20 Programming Languages** - enabling the right programming language selection for the task at hand.
- **Flexible Data Access** - Using ADO.NET technology to data access frees up database connections and results in significantly greater scalability.

4.10 Data Collection Method

There are many techniques in obtaining information likes Internet surfing, interview, using questionnaires, books and reference. In this project, several techniques have been used to seek for information.

The techniques are listed are:

1. **Internet Surfing**

Through the Internet, ideas from the system that similar to proposed project can be gained and used it as a reference in developing my system.

2. **Analyzing pass year thesis**

Several pass year thesis reports that are related to the topic of research have been analyzed in order to gain some ideas and knowledge in developing the proposed system. The format on how to do a complete report also can be found from the previous thesis documentations.

3. **Discussion With Friends and Supervisor**

Useful advises and guidance that been given by supervisor, during the consultation time also helps in getting better overview about the proposed system. Discussion among friends and course mate also produce a lot of information.

Chapter Summary

In this chapter, the functional and non-functional requirements of the proposed system have been discussed in detail. It also discussed about the hardware and software requirement of the server and client computer.

In the next chapter, it will discuss about the system design for the proposed project.

Chapter 5: System Design

System design is a process of converting the conceptual ideas from the requirement specification which was discussed in chapter 4, into technical specification. In this chapter, the system structure chart, context diagram and data flow diagram for the Java Tutor will be shown respectively in section 5.2, 5.3 and 5.4. In section 5.5, it will discuss about the data dictionary for each table of the database. Next, in the last section, the user interface for the proposed system will be shown.

5.1 System Structure Chart

System structure charts are used to depict high-level abstraction of a specified system. The chart describes the interaction between independent modules.

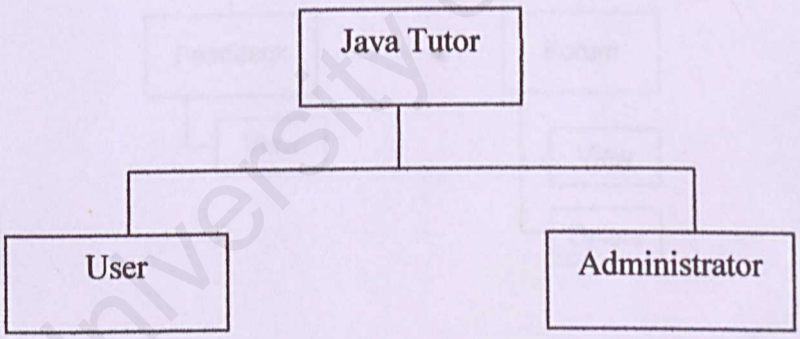

Figure 5.1 Java Tutor modules

Figure 5.1 shows that the Java Tutor has two main modules, which are the user module and administrator module. From these two main modules, it will be broken into sub-components that shown in figure 5.2 for the user module and figure 5.3 for the administrator.

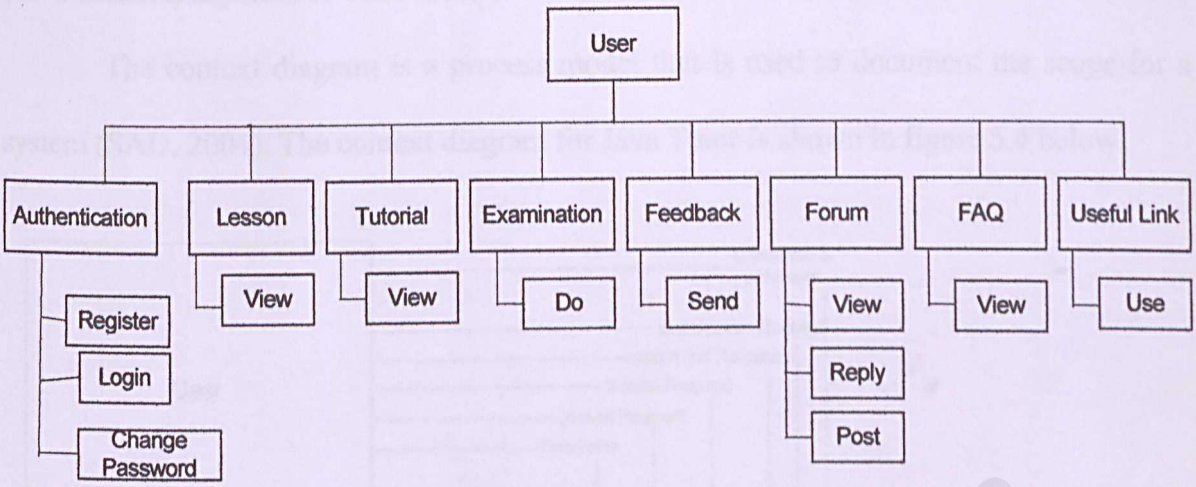

Figure 5.2 User module

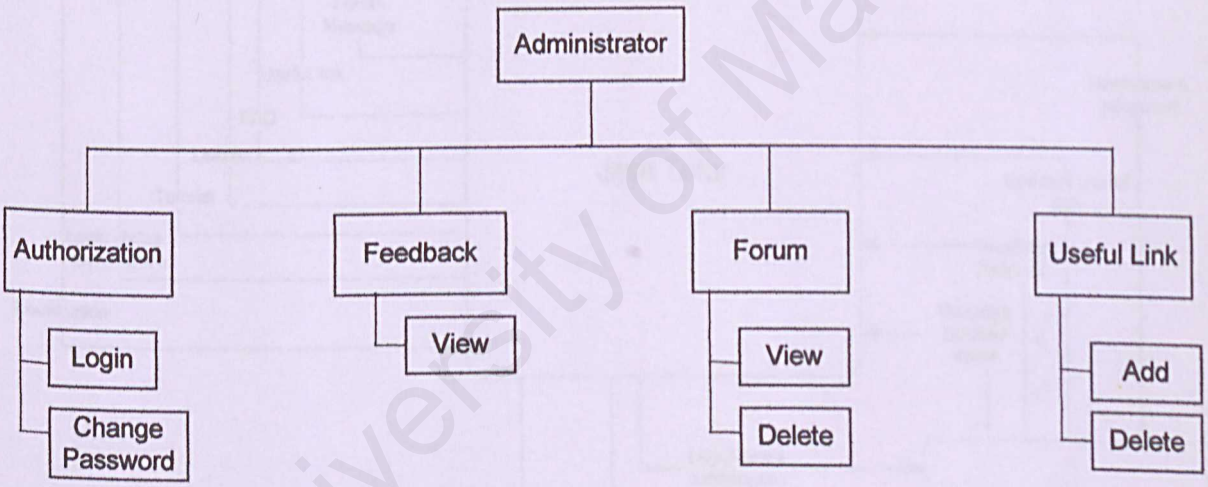

Figure 5.3 Administrator module

From the figure 5.2 and figure 5.3 above, it shows that for each module, it has its own sub-modules or components. For example, the user module has seven sub-modules and the administrator module has four sub-modules. For each sub-module, it has its own task or function.

5.2 Context Diagram for Java Tutor

The context diagram is a process model that is used to document the scope for a system (SAD, 2004). The context diagram for Java Tutor is shown in figure 5.4 below.

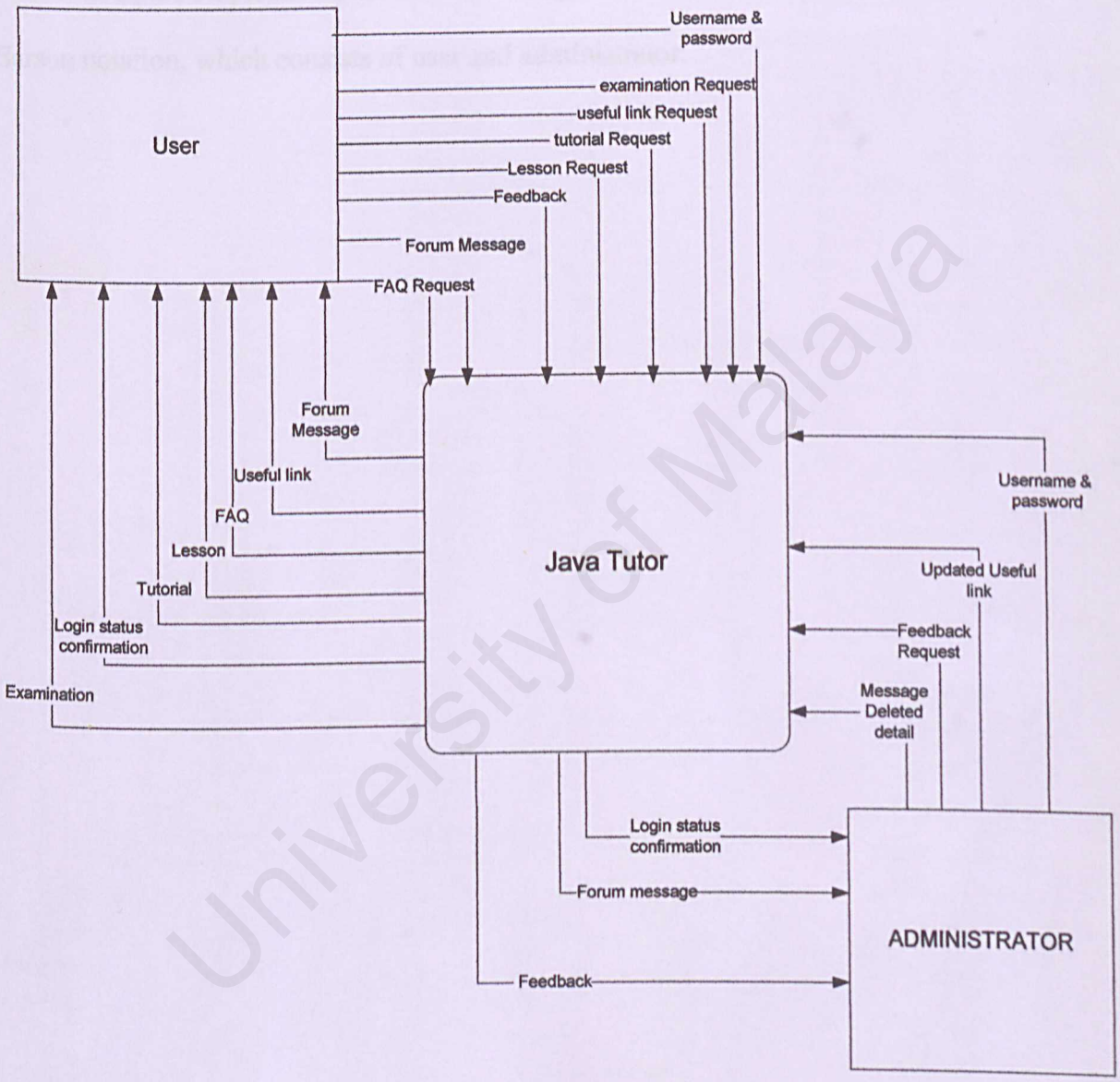

Figure 5.4 Context Diagram for Java Tutor

Once the context diagram for Java Tutor has been created, the next step is to draw the data flow diagram, which will be illustrated in the next section.

5.3 Data Flow Diagram (DFD)

Data flow diagram is a process model used to depict the flow of data through a system and the work or processing performed by the system (SAD, 2004). It consists of entity, process, data flow and data store.

In figure 5.5, it shows the data flow diagram level 0 for Java Tutor using Gane-Sarson notation, which consists of user and administrator.

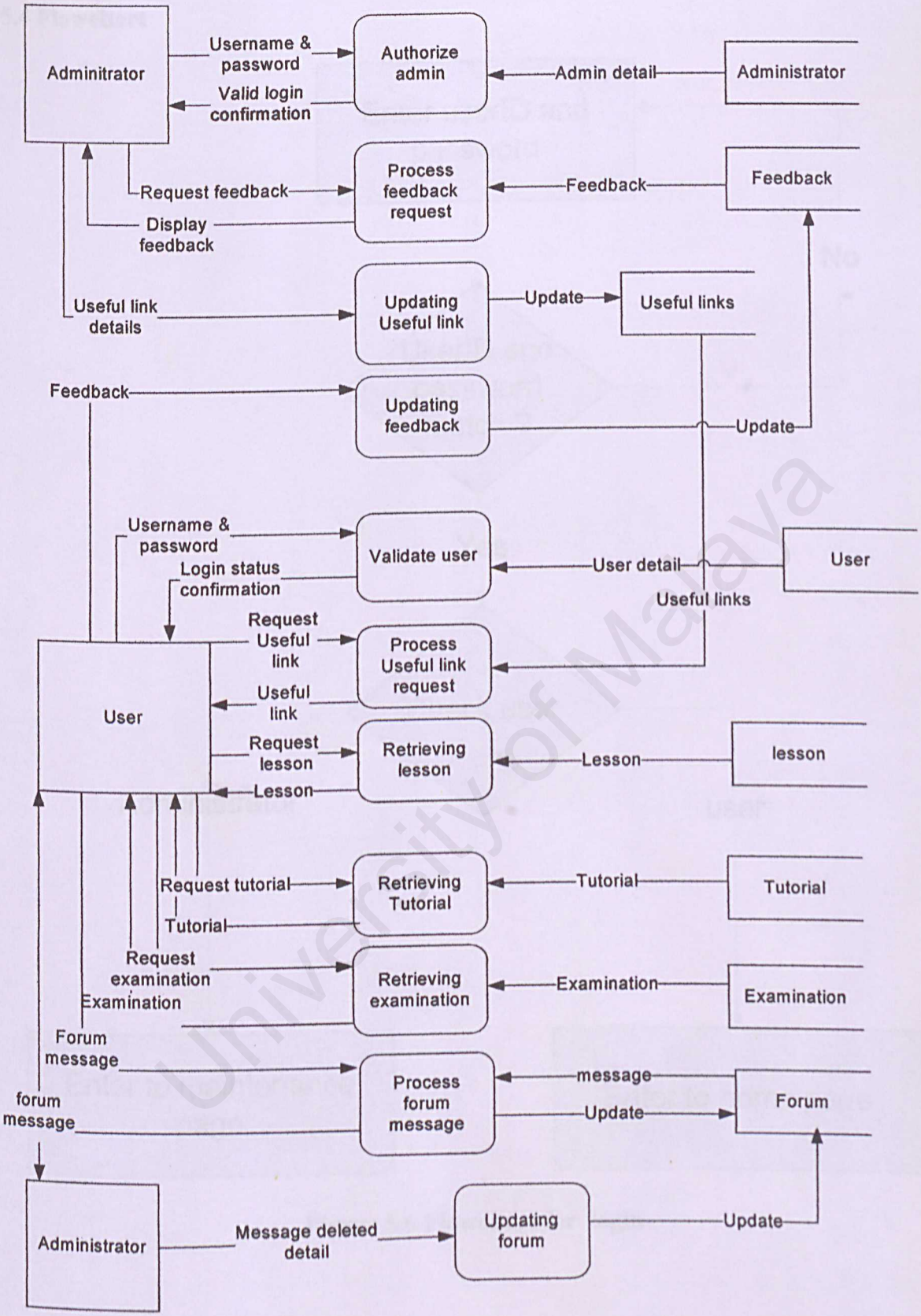

Figure 5.5 Data Flow Diagram level 0 for Java Tutor

In the next section, it will show about the flowchart of the process in the Java Tutor.

5.4 Flowchart

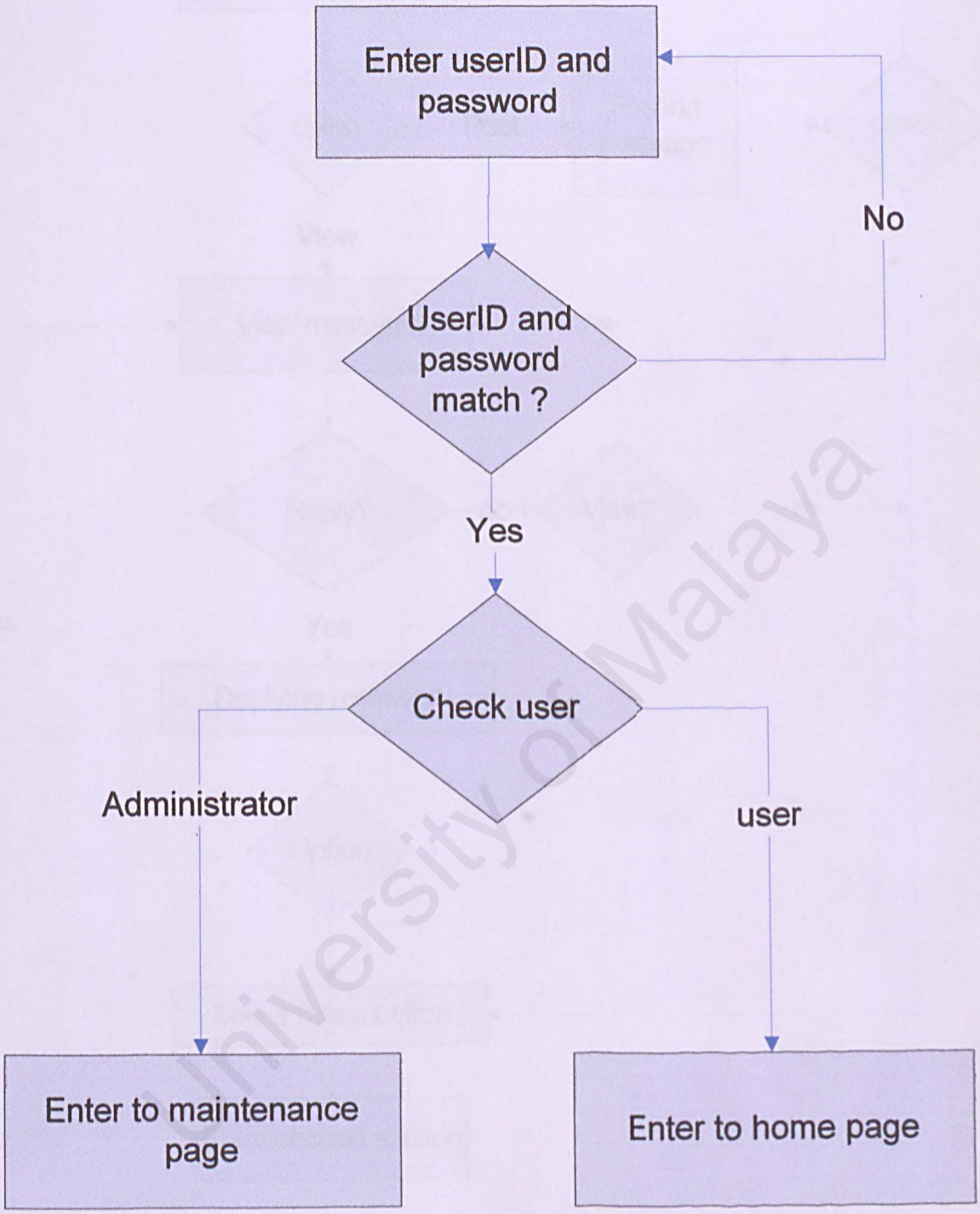

Figure 5.6 Flowchart for login

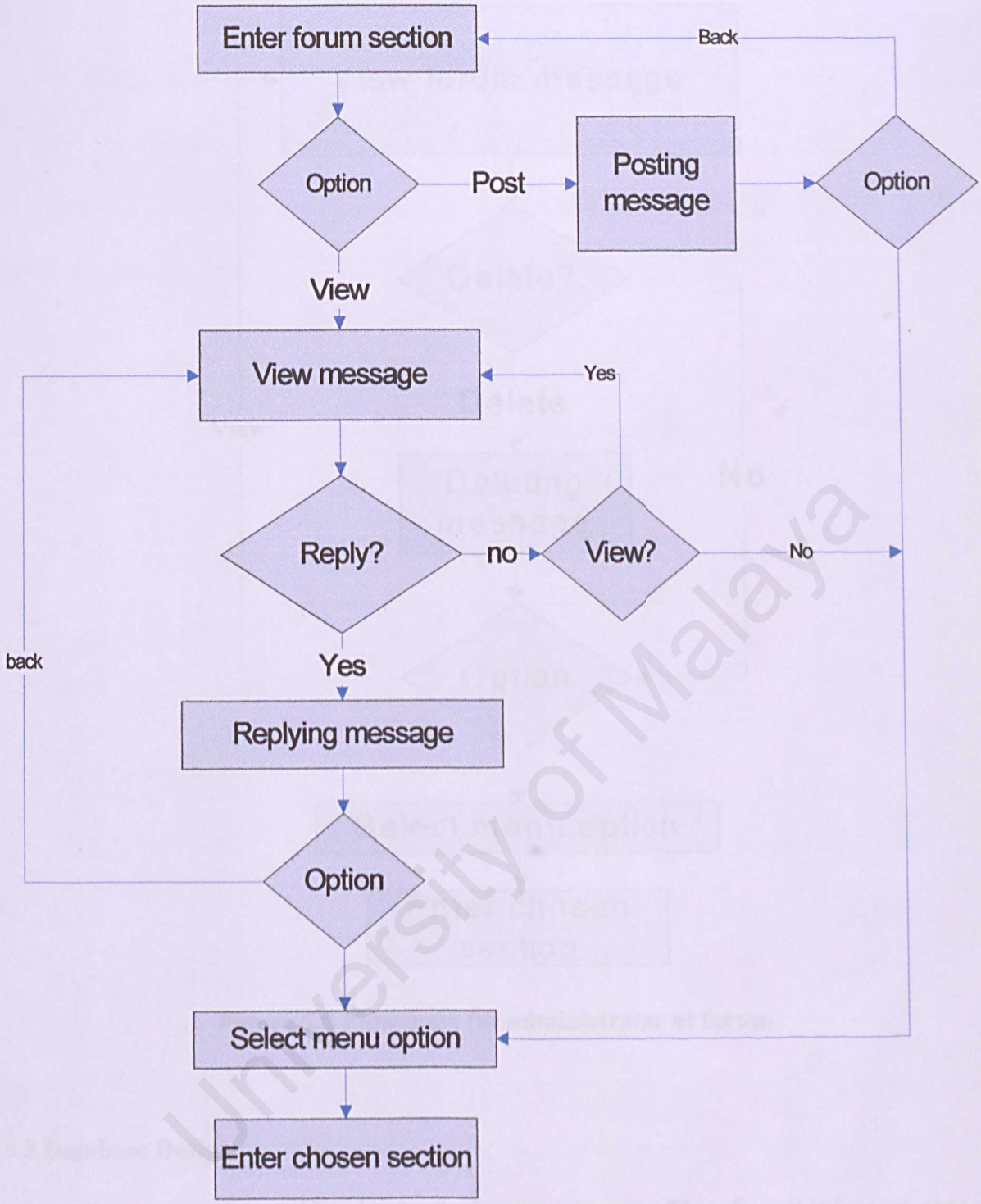

Figure 5.7 Flowchart for user at forum

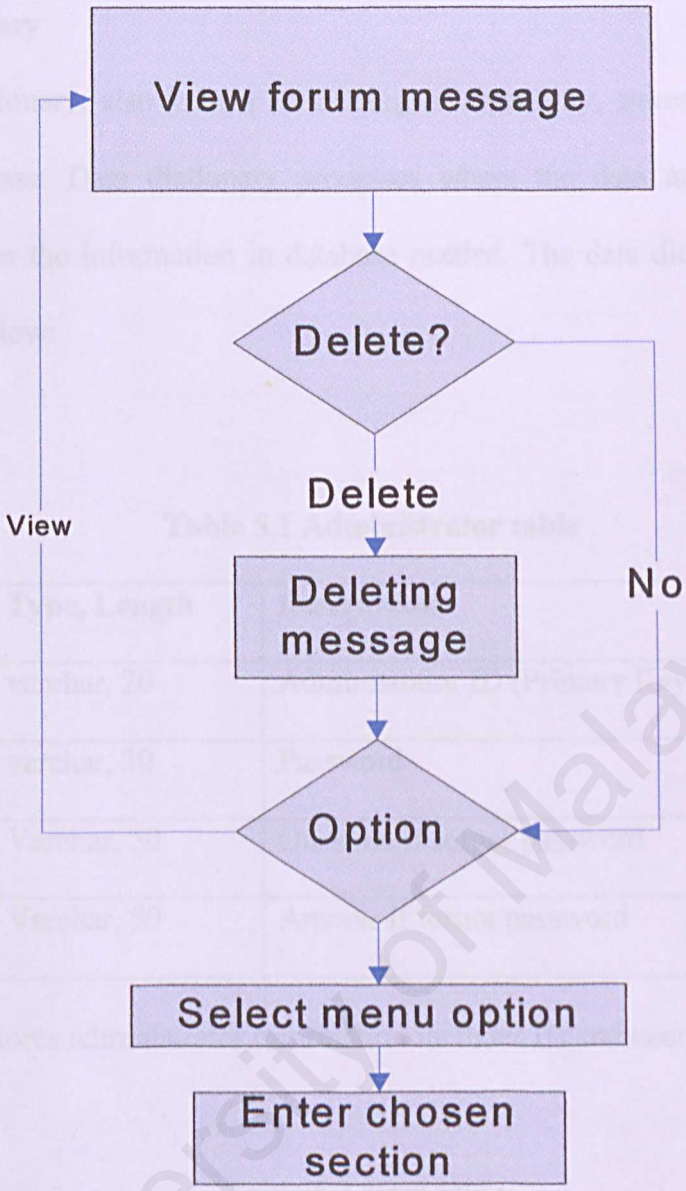

Figure 5.8 Flowchart for administrator at forum

5.5 Database Design

Data storage is considered to be the heart of a system. Therefore, it is important to design the database to ensure the data are handled efficiently and systematically.

The database that will be used in the Java Tutor is a relational database model. Microsoft SQL Server 2000 is selected for the system because of its powerful database application.

5.5.1 Data Dictionary

A data dictionary, also known as Catalog or repository, stores the metadata of a system with database. Data dictionary processes where the data are used and where immediate access to the information in database needed. The data dictionary of the Java Tutor are shown below:

I. Administrator

Table 5.1 Administrator table

Field	Type, Length	Description
AdminID	varchar, 20	Administrator ID (Primary Key)
Pwd	varchar, 30	Password
Question	Varchar, 50	Question if forgot password
Answer	Varchar, 50	Answer if forgot password

This table stores administrator information includes ID and encrypted password.

II. Users

Table 5.2 User table

Field	Type, Length	Description
UserName	varchar, 50	User ID (Primary Key)
Password	varchar, 30	Password
Question	varchar, 50	Question if forgot password
Answer	varchar, 50	Answer if forgot password

This table stores user information includes ID, encrypted password and email.

III. UserMark

Table 5.3 UserMark table

Field	Type, Length	Description
UserName	varchar, 50	User ID (Primary Key)
Tutorial1	Int, 4	Mark for tutorial 1
Tutorial2	Int, 4	Mark for tutorial 2
Tutorial3	Int, 4	Mark for tutorial 3
Tutorial4	Int, 4	Mark for tutorial 4
Tutorial5	Int, 4	Mark for tutorial 5
Tutorial6	Int, 4	Mark for tutorial 6
Tutorial7	Int, 4	Mark for tutorial 7
Exam	Int, 4	Mark for exam
Exam2	Int, 4	Mark for exam coding

This table use to store user mark for tutorial and examination.

IV. ForumPost

Table 5.4 ForumPost table

Field	Type, Length	Description
MID	int, 4	Message's ID for a subject title (Auto Increment Primary Key)
subjectTitle	varchar, 100	Subject title for a message
content	varchar, 1000	Content of a message
UserName	varchar, 50	User's name who posted the message.

parentID	int, 3	If current record is for a reply, it will have a parentID, which is the original message's ID.
postalDate	Datetime, 8	The date when user posted the message.
replyCount	Int, 4	Count the reply message

This table stores forum messages information include ID, subject title, content, parent ID, user name, and date posted. Only replies will have parentID, which refer to original message.

V. **ForumReply**

Table 5.5 ForumReply table

Field	Type, Length	Description
CMID	int, 4	Message's ID for a subject title (Auto Increment Primary Key)
subjectTitle	varchar, 100	Subject title for a message
content	varchar, 1000	Content of a message
parentID	int, 4	If current record is for a reply, it will have a parentID, which is the original message's ID.
UserName	varchar, 50	User's name who posted the message.
postalDate	Datetime, 8	The date when user posted the message.

This table stores forum messages information include ID, subject title, content, parent ID, user name, and date posted. Only replies will have parentID, which refer to original message.

VI. Feedback

Table 5.6 Feedback table

Field	Type, Length	Description
FID	int, 4	Feedback's ID (Auto Increment Primary Key)
SubjectTitle	varchar, 100	Subject title for a message
content	varchar, 1000	Content of a feedback
userName	varchar, 50	Username who posted the message.
postalDate	Datetime, 8	The date when user posted the feedback.

This table will store all record of the feedback message that been sent by user.

VII. Links

Table 5.7 Links table

Field	Type, Length	Description
LID	int,4	Link's ID (Auto Increment Primary Key)
Description	varchar, 50	Description of relevant reference link
URL	varchar, 100	Address of reference link

This table stores Links information include ID, questions and answers.

5.6 User Interface Design

Interface design is the communication gateway between the user and the system. A good, ease-to-use and user-friendly interface will make the user feel comfortable and has confident to use the system. User interface design must take into account the need and the experience of the user.

A good interface will reduce the complexity for the user. Today, the graphical user interface already substitute the text-based interface to act as the main interface design. Graphical user interface will provide the user friendly and easy to use environment without need to memorized the command. Figure 5.10 shows the user interface for the Java Tutor.

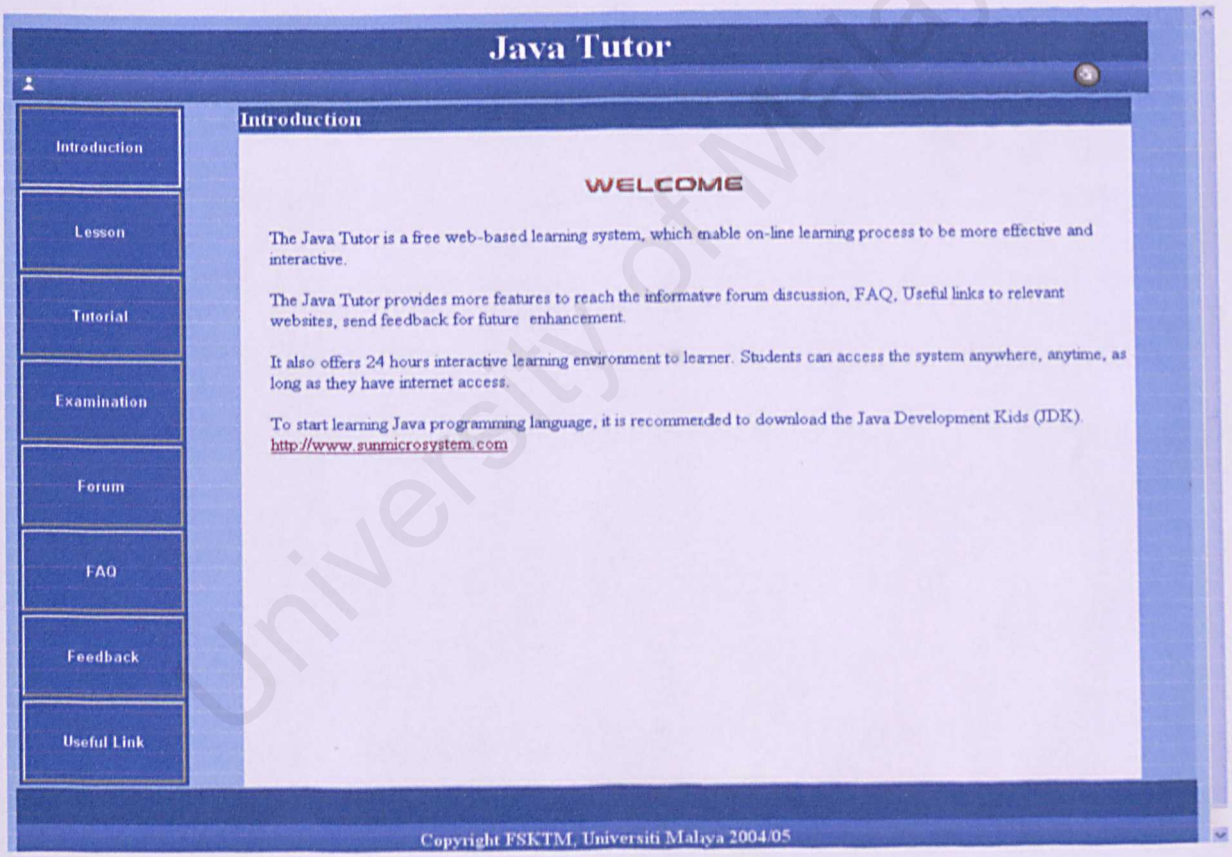

Figure 5.9 Java Tutor User Interface Design

Chapter Summary

In this chapter, the Java Tutor structured chart, context diagram, data flow diagram (DFD) have been shown and discussed. It also discussed about the database design, which is the data dictionary for Java Tutor. In the last section of this chapter, it also discussed about the user interface design together with the Java Tutor interface.

The system implementation for Java Tutor will be discussed in the part two of Java Tutor system specifications.

Chapter 6: System Implementation

System implementation is the phase that reviews the design specification of the system that had been discussed in chapter 5 and then transforms it into an operational system through coding.

In this chapter, it will discuss about the development environment for Java Tutor, which consist of hardware and software configuration. The database development and system coding which consist of coding methodology and coding principles also will be covered in this chapter.

6.1 Development Environment

The initial step of system implementation includes configuration of development environment. Development environment consists of hardware and software configurations. Using the appropriate hardware and software has some impacts to the implementation of the system and is an important factor in determining the successfulness of a project. The tools that are used to develop Java Tutor are listed as below.

6.1.1 Hardware Configuration

1	Intel Pentium IV 1.6 GHz processor
2	256 SD RAM
3	10 GB Hard Disk

Table 6.1: Hardware Configuration of Java Tutor

6.1.2 Software Configuration

1	Microsoft Windows XP Professional Operating System
2	Microsoft Internet Information Server (IIS)
3	Microsoft SQL Server 2000 Database Server
4	Microsoft Visual Studio.NET
5	Microsoft Internet Explorer 6.0

Table 6.2: Software Configuration of Java Tutor

6.2 Database Development

As mentioned before in Chapter 4, MS SQL Server 2000 database was used as database server for the Java Tutor system. Many of the administrator tasks performed with SQL Server are accomplished using the Enterprise Manager. This tool is used to create the tables of system database. Maintenance tasks, which consist of backup and restoration, are also performed using the Enterprise manager.

The Enterprise Manager tool is used to create the system database named Java. Then, tables are created by specifying the fields for each table and the field property.

6.3 System Coding

System implementation phase involves programming or coding procedures, which converts the system requirements and design specification into program codes that the computer can process. During the coding process, the system has been coded in a way that is understandable not only when revisit for testing, but also easier for future enhancement.

6.3.1 Coding Methodology

The coding methodology applied in this system is the modular development with **Bottom-up approach**. The fundamental idea of this approach involves breaking the programming into well-defined, logical, and manageable modules in order to avoid the chaos of attempting to build up the system all at once. This coding process will continue to progress upward likewise until the overall system is modeled.

6.3.2 Coding Principles

Several coding principles were applied during the development of Java Tutor to ensure good quality and the proper structure in the code generation.

The following practice were applied:

- **Modularity**

  The main purpose of modularity is to reduce the complexity of the system. The project has been divided into several modules before entering the coding phase.

- **Coding Conversion**

  A good meaningful naming technique for the variables, controls and modules provides an easy identification for the programmer

- **Readability**

  Codes should be easy to read and understandable because it is very important when it comes to the enhancement of the system in the future by other people. Adherence to coding conversion and identification contribute to program readability.

- **Maintainability**

  To facilitate maintenance, code should be readable, modular and should be easily to be revised and corrected.

- **Robustness**

  The system should be able to handle unexpected error by proper responses. Error handling should be done to increase the robustness of the system. Appropriate errors message were displayed response to user's input. It should avoid any termination or system failure.

- **Coding comments**

  Coding comments provides the developers with a means of communication with other readers of the source code.

6.3.3 Coding

As mentioned earlier, the design has been translated into the form that can be understood by the machine with coding process. Coding process has made the design became reality. Coding or programming involves a great deal of creativity.

In Java Tutor, VB.Net programming language has been used to in the coding process.

In the next page shows sample of VB.Net and HyperText Markup Language (HTML) coding of Java Tutor system

```
Imports System.Data.SqlClient
Public Class ForumMain
    Inherits System.Web.UI.Page

#Region " Web Form Designer Generated Code "
    'This call is required by the Web Form Designer.
    <System.Diagnostics.DebuggerStepThrough()> Private Sub
InitializeComponent()
    End Sub
    Protected WithEvents tblAdminMain As
System.Web.UI.HtmlControls.HtmlTable
    Protected WithEvents DataGrid1 As
System.Web.UI.WebControls.DataGrid
    Protected WithEvents tblDataImport As
System.Web.UI.HtmlControls.HtmlTable
    Protected WithEvents btnPostUp As
System.Web.UI.WebControls.Button
    Protected WithEvents btnPostDown As
System.Web.UI.WebControls.Button

    'NOTE: The following placeholder declaration is required by the
Web Form Designer.
    'Do not delete or move it.
    Private designerPlaceholderDeclaration As System.Object
    Private Sub Page_Init(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Init
        'CODEGEN: This method call is required by the Web Form
Designer
        'Do not modify it using the code editor.
        InitializeComponent()

    End Sub

#End Region
```

Figure 6.1: ForumMain.aspx.vb

```
Private Sub Page_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load

        'check for user loginID
        If Session("LoginID") = "" Then
            Response.Redirect("Login.aspx")
        End If

        If Not IsPostBack() Then
            BindData()
        End If
    End Sub

    Private Sub btnPostUp_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles btnPostUp.Click
        Response.Redirect("PostMessage.aspx")
    End Sub

    Private Sub btnPostDown_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles btnPostDown.Click
        Response.Redirect("PostMessage.aspx")
    End Sub

    Private Sub BindData()
        Dim ds As New DataSet
        Dim strSql As String
        Dim strConn As New
SqlConnection(ConfigurationSettings.AppSettings("DBConnection"))
        strSql = "Select * from ForumPost" 'to get all the parent
msg

        Dim cmd As New SqlDataAdapter(strSql, strConn)
        cmd.Fill(ds, "ForumPost")

        DataGrid1.DataSource() = ds.Tables("ForumPost")
        DataGrid1.DataBind() 'bind data to the datagrid1
    End Sub

    Private Sub DataGrid1_PageIndexChanged(ByVal source As Object,
ByVal e As System.Web.UI.WebControls.DataGridPageChangedEventArgs)
Handles DataGrid1.PageIndexChanged
        DataGrid1.CurrentPageIndex = e.NewPageIndex  ' to get the
current page when the page changed
        BindData()
    End Sub

End Class
```

Figure 6.2: ForumMain.aspx.vb (Continue)

```
<%@ Page Language="vb" AutoEventWireup="false"
Codebehind="ForumMain.aspx.vb" Inherits="WebApplication1.ForumMain"%>
<%@ Register TagPrefix="uc1" TagName="Footer" Src="../Headers/Footer.ascx"
%>
<%@ Register TagPrefix="uc1" TagName="SearchHeader"
Src="../Headers/SearchHeader.ascx" %>
<%@ Register TagPrefix="uc1" TagName="SideFrame"
Src="../Headers/SideFrame.ascx" %>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
        <HEAD>
                <title>Forum Main Page</title>
                <META http-equiv="Content-Type" content="text/html;
charset=windows-1252">
                <meta content="Microsoft Visual Studio.NET 7.0"
name="GENERATOR">
                <meta content="Visual Basic 7.0" name="CODE_LANGUAGE">
                <meta content="JavaScript" name="vs_defaultClientScript">
                <meta content="http://schemas.microsoft.com/intellisense/ie5"
name="vs_targetSchema">
        </HEAD>
        <body
background="file:///C:\Inetpub\wwwroot\WebApplication1\Image\backg.gif"
MS_POSITIONING="GridLayout">
                <form id="Form1" method="post" runat="server">
                        <uc1:searchheader id="SearchHeader1"
runat="server"></uc1:searchheader>
                        <table height="428" width="152" align="left" style="WIDTH:
152px; HEIGHT: 428px">
                                <tr><TD width="25%" height="100%" style="FONT-
WEIGHT: bold; COLOR: white"><uc1:sideframe id="SideFrame1"
runat="server"></uc1:sideframe> </TD></tr></table>

                        <TABLE class="AdminTable" id="tblAdminMain"
cellSpacing="1" cellPadding="1" width="801"
                                align="center" runat="server" style="WIDTH: 801px;
HEIGHT: 26px"><tr>
                                        <td style="FONT-WEIGHT: bold; WIDTH:
272px; COLOR: white" colSpan="2" bgColor="#000099">
                                                <P style="FONT-WEIGHT: bold;
FONT-SIZE: 14pt; COLOR: #000099"><b style="FONT-WEIGHT: bold; FONT-
SIZE: 14pt; COLOR: white">Forum Main</b>  </P>
```

Figure 6.3: HTML Coding for ForumMain

```
                                        </td></tr>
                        </TABLE>
                        <table class="AdminTable" id="tblDataImport" height="432"
cellSpacing="1" cellPadding="1"
                                width="802" align="center" runat="server"
style="WIDTH: 802px; HEIGHT: 460px">
                                <tr>
                                        <td vAlign="top" colSpan="4">
                                                <P align="right">
                                                        <asp:Button id="btnPostUp"
runat="server" Text="Post Message" Width="114px"></asp:Button></P>
                                                <P align="center">
                                                        <asp:DataGrid id="DataGrid1"
runat="server" Width="775px" AllowPaging="True" AutoGenerateColumns="False"
                                                                BackColor="White"
ForeColor="#000099" Font-Size="Small" BorderColor="#0000CC" CellSpacing="2"
                                                                CellPadding="2"
BackImageUrl="../Image/backg.gif" Height="10px">
                                                                <ItemStyle
BackColor="AliceBlue"></ItemStyle>
                                                                <HeaderStyle Font-
Size="Medium" Font-Bold="True" ForeColor="White"
BackColor="MediumBlue"></HeaderStyle>
                                                                <Columns>

        <asp:BoundColumn Visible="False" DataField="MID"
HeaderText="MID"></asp:BoundColumn>

        <asp:HyperLinkColumn Text="Subject Title" DataNavigateUrlField="MID"
DataNavigateUrlFormatString=" ForumMessage.aspx?value={0}"

        DataTextField="subjectTitle" HeaderText="Subject Title"
NavigateUrl="ForumMessage.aspx">

        <HeaderStyle Width="350px"></HeaderStyle></asp:HyperLinkColumn>

        </asp:HyperLinkColumn>

        <asp:BoundColumn DataField="UserName" HeaderText="Posted By">

        <HeaderStyle Width="150px"></HeaderStyle>
```

Figure 6.4: HTML Coding for ForumMain (Continue 1)

```
        <asp:BoundColumn DataField="UserName" HeaderText="Posted By">
        <HeaderStyle Width="150px"></HeaderStyle></asp:BoundColumn>
        <asp:BoundColumn DataField="postalDate" HeaderText="Postal Date">
        <HeaderStyle Width="100px"></HeaderStyle></asp:BoundColumn>
        <asp:BoundColumn DataField="replyCount" HeaderText="Replies">
        <HeaderStyle Width="2px"></HeaderStyle></asp:BoundColumn>
                                                    </Columns>
                                                    <PagerStyle
BackColor="LightGreen" Mode="NumericPages"></PagerStyle>
                                                </asp:DataGrid></P>
                                            <P align="right">
                                                <asp:Button id="btnPostDown"
runat="server" Text="Post Message"></asp:Button></P>
                                            <P align="right"> </P>
                                        </td>
                                    </tr>
                                </table>
                                </TD></TR></TABLE>
                                <uc1:Footer id="Footer1"
runat="server"></uc1:Footer></form>
        </body>
</HTML>
```

Figure 6.5: HTML Coding for Forum Main (Continue 2)

Chapter Summary

In this chapter, it already discussed about development environment, which consist of hardware and software configuration.

System testing will be discussed in the next chapter. Testing needs to be carried out in order to ensure that the system is error-free and meet the users' requirements.

Chapter 7: SYSTEM TESTING

System testing is one of the important steps in developing system. Precision and accuracy of output data is considered during this process. System testing is focuses on finding fault, and there are many ways to make testing effort more efficiency and effective. In this chapter, unit, module, system testing has been carried out including the examples of the test cases, which already conducted in the Java Tutor system. These testing approaches lead to delivering a quality system to user.

Generally, the purposes of system testing are as follow;

- To detect and verify errors and bugs that exists during the implementation phase
- To make sure that the application can be operated smoothly.
- To correct all the errors and bugs

7.1 Type of Errors and Bugs

During the system testing process, there will be several types of errors that can be detected, which is important for the developer to understand them. The type of errors are listed as below;

- Algorithm error
- Compilation error
- Program run error
- Logic error
- Documentation error

7.1.1 Algorithm Error

Algorithm error happened when the program fail to produce the desire output with the given input because of errors in the programming structure especially when there are many looping inside the program. This usually happened because of mistake made during the program design process and it can be detected easily when going through the steps of the program code.

7.1.2 Compilation Error

Compilation error is due to mistake made during the coding process. This error can be traced during compilation where the bugs caused syntax error can be identified by the compiler and give warning to the developer.

7.1.3 Program Run Error

This error happened during the process of system implementation where the system is trying to run an operation that cannot be implemented by the system. As an example, an object or variable inside the program cannot be executed due to programming or logical error such as repeated looping or variable that was not properly define.

7.1.4 Logic error

Logic error occurred when the program produced an output that is out of expectation because the program cannot execute certain function correctly. It can be detected when the output turn out to be different from original design. The programmer

or the user can detect this kind of error but sometime it is difficult to trace due to lack of understanding of the program.

7.1.5 Documentation Error

Documentation error occurred when the document produced is not compatible with result of the application. Normally the documentation is obtained from the system design process that has prepared a detailed explanation of what the program will do, but sometime the implementation process, the program produced the output that is the opposite.

7.2 Testing Process

Generally, there are four types of test that can be carried out;

- Unit Testing
- Module Testing
- Integration Testing
- System Testing

7.2.1 Unit Testing

Unit testing is to verify the smallest unit of the program that is system module. Each module is tested independently in order to assure their accuracy. In the system, each module may contain sub-modules, which consist of function. These functions individually tested before the entire modules are tested.

There are few examples of unit testing cases that have been carried out. The following sub-section shows the test case in unit testing.

7.2.1.1 Unit Testing for Add and Delete Link

Table 7.1 shows the test case for unit testing on the function adding and deleting link in the Links Maintenance module.

Step	Test Procedure	Expected Output	Test Result
1	Add a new link in the text field and click Add button.	The record is inserted in the Links table and displayed in the datagrid.	The record is successfully inserted to Links table and displayed in the datagrid
2	Click on the Delete hyperlink for the specific link in the datagrid.	The record is deleted from the Links table and removed from the datagrid	The record is successfully deleted from the Links table and removed from the datagrid.

Table 7.1: Unit Testing for Add and Delete Link

7.2.1.2 Unit Testing for Update password

Table 7.2 shows the test case for unit testing on the function of updating user profile in the User Profile Module.

Step	Test Procedure	Expected Outcome	Test Result
1	Insert a new password in the text field of user profile page and click Update button.	The record is updated in Users table and displayed in the User Profile page.	The record is successfully updated in the Users table and displayed in the User Profile page.

Table 7.2: Unit Testing for Update Password

7.2.2 Module Testing

A module is a collection of dependent components. Module testing is enabling each module to be tested independently.

There are few examples of module testing cases that have been carried out. The following sub-section shows test case in module testing

7.2.2.1 Module Testing for Login Module

Table 7.3 shows the test case for module testing of the Login module.

Step	Test Procedure	Expected Outcome	Test Result
1	Enter invalid user ID and password. Click on Login button	An error message is displayed. User need to re-enter user ID and password	An error message is displayed. User need to re-enter user ID and password
2	Enter valid user ID and password. Click on Login button	Access granted and system redirect user to Introduction page	Access granted and system redirect user to Introduction page

Table 7.3: Module Testing for Login Module

7.2.3 Integration Tests

Once individual modules have been tested, they must be integrated to form as a partial or complete system. The purpose of integration testing is to know whether the entire system is able to work as a functional program or not. It will also verify that all modules were able to function together. The approach applied in testing phase for Java Tutor is **Bottom-up** testing. This approach enables each component at the lowest of the

hierarchy to be first tested, then working up the hierarchy of the components until the final component is tested. Figure 7.1 shows the Integration testing.

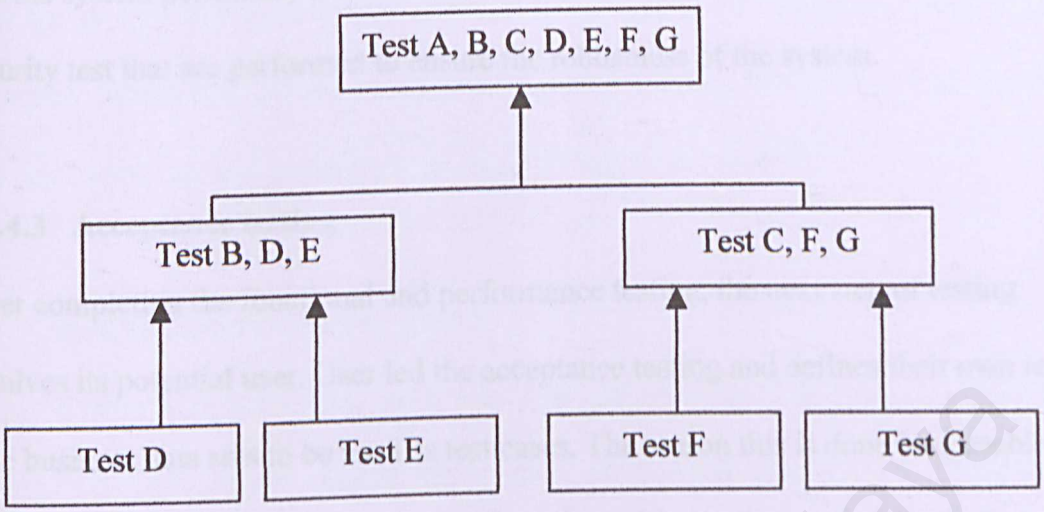

Figure 7.1 Bottom-up Testing

7.2.4 System Testing

System testing is to ensure that the system accomplished the user requirements. The modules are integrated to make up the entire system. The testing process is concern with finding errors that were result from unanticipated interaction between modules and the system components. It is also concern with validating the system meets the functional and non-functional requirements. Three types of testing done at this phase are functional testing, performance testing and acceptance testing.

7.2.4.1 Functional testing

Functional testing relies on the system functional requirement where the testing focuses on function on an application. Functional testing is conducted to ensure that the system behave accordingly to the functional requirements that were stated in chapter 4.

7.2.4.2 Performance testing

Performance testing concentrate on the non-functional requirement after making sure that the system performed the functions as required by the requirement. This include security test that are performed to ensure the robustness of the system.

7.2.4.3 Acceptance testing

After completing the functional and performance testing, the next step of testing involves its potential user. User led the acceptance testing and defines their own real-time business data sets to be used as test cases. The reason this is done is to enable user to determine if this project is really usable and capable at meeting their performance expectation and their needs.

Chapter Summary

This chapter, it already discuss about the important of testing activity, which should carry out by every developer to determined wheatear the system is working correctly or not. Besides unit, module, integration, and validation also been discussed which is important in determining the effectiveness of the developed system and the acceptance level of the user.

System evaluation, which consists of system strength, limitation and future enhancement, will be discussed in the next chapter.

Chapter 8: System Evaluations and Conclusion

System evaluation is a process where system developer evaluates the system after the system has been fully developed. This chapter will highlight about the system strengths, limitations, future enhancements, the problems encountered and the solution and the knowledge and experience gained throughout the project.

8.1 Analysis On the Survey Result

Due to time constraint, there were five students helped to evaluate the Java Tutor system. The table below shows the number of students who choose "Yes" or "No" answer regarding the question in the questionnaire (Refer Appendix B).

Question	Yes	No
Is the system interface attractive?	3	2
Is the instruction in the system understandable?	5	0
Is the system user friendly to use?	4	1
Are the functions in the system useful?	4	1
Learning through this system is more interesting than classroom learning	3	2

Table 8.1: Survey Result

From the result in Table 8.1, it shows that more users tend to choose "Yes" answer rather than "No" for all questions in the questionnaire. This means that the system is able to provide more advantages to the users. More users found that the system is attractive, understandable, easy-to-use, useful and more interesting than classroom learning.

8.2 System Strengths

The Java Tutor is built with several strength. The following are the strengths of Java Tutor:

- **Easy to use Graphic User Interface**

  The interface is easy to be used. Simple navigation and command buttons are provided to facilitate users. Navigation around the system is direct and not misleading and thus it is easy to navigate from page to page. So, the users will easily get familiar with this system in a very short period.

- **Authorization and Authentication**

  Only registered user can access to the system. There are two types of user; learner and administrator. User will be redirected to the main page and administrator will be redirected to the admin page only if the login id and password are correctly inserted. This is important to ensure that there is indeed security in the system.

- **Easy Management and Maintenance**

  Administrator can add, delete the data in the database just by clicking on the appropriate button or link. This has eliminated any need of writing and running any SQL statement in order to update the data in the database.

- **Validation on Data Input**

  Data validation is to validate every input data that is to be inserted to the database. All the fields in the form will be checked for null value or invalid data type. With this feature, error when inserting record into the database will not

occur. Error message also will be prompted to the user if important field is not filled.

8.3 System Limitation

There are some limitations in Java Tutor due to time constraint, facilities constraint, limitation of skill and the project scope.

- **No timer for Examination**

  The system doesn't have a timer in the examination page to keep track of the user progression when the user doing the examination.

- **Lessons and tutorials are fixed**

  User can only learn the existing basic Java programming language lesson and tutorials, as there will no any new lessons or tutorials that will be updated in the system.

8.4 Future Enhancement

Enhancements are important for improving the current Java Tutor system, which will provide more benefit to the user and makes the system more reliable. Below are some of the futures enhancements suggested for Java Tutor:

- **Provide timer for the examination**

  The system shall come with timer where the user needs to answer the examination within the time given. When the time-up, the user will not be allowed to answer the questions anymore.

- **Lessons and Tutorials Updates**

  As part of enhancement, the administrator shall be able to upload new lessons or tutorials for the user to learn and understand more about Java programming language.

8.5 Problems Encountered and Solutions

The following are the major problems encountered from the beginning of the project through the end of the system development process;

- **Difficulty in Determining Development Tools.**

  Each development tool has its own strength and limitation. In determining the appropriate tools for the system, several factors have to be considered carefully. One of the most important factors is to determine the feasibility of the development tools. There are some tools that are suitable for the system development, but the complexity of using the tools make it unadvisable to choose them.

  Solutions: seek advise from senior and course mate to obtain more relevant information that helped in determining the most suitable development tools

- **Database Connection Problem**

  It is important to build a database for data retrieval and storing. However, due to the lack of knowledge and the complexity of the SQL statement, it was difficult in building the database connection and to retrieve and store the data to the database.

Solutions: Discussing with course mate who using the same database and development tools as well as finding online solutions that related to SQL statement and database.

- **Lack of Programming Skill**

  Lack of programming skills caused a lot of problems during the system-coding phase. ASP. NET is a new programming language and it provides many powerful new features such as: datagrid, input validator, autopostback and etc. All these features have their own syntax, semantic and functionalities, which have to be learned.

  Solutions: Learn these features' syntax, semantic and functionalities one by one in order to mastering them. Besides, a lot of useful information about programming can be found at Internet.

- **Time Constraints**

  The lack of time to learn and develop the Java Tutor concurrently was one of the largest problems faced. Due to this constraint, it was hardly enough for any extra or advance features to be included in Java Tutor.

  Solutions: Some reference and function code from the Internet were explored and used to decrease the time needed for the development process.

8.6 Knowledge and Experience Gained

Knowledge gained throughout the development of Java Tutor is undoubtedly valuable. The knowledge and experience gained will sure be proven useful in the future.

Following are the knowledge and experiences that had been gained throughout the project;

- **Development Tools and Programming knowledge**

  During the system coding and implementation, a lot of knowledge and techniques are gained from the software tools for example like MS SQL Server 2000, Microsoft Information Server (IIS) and the mastering VB.Net programming language at the same time.

- **Project Planning Skill**

  Proper project planning skills also can be obtained by developing Java Tutor. Schedule planning from the beginning until the system is finished developed must be planned. A good project planning and management can make sure the system delivered on time and within budget. Besides, a good project planning can minimize the risk of project failure.

Chapter Summary

In this chapter, it mentioned about the survey that have been conducted on system potential system user. Besides, the system strength, limitation and future enhancement of the system also been discussed in detail.

The problems encountered during the development of the system together with the solution that have been taken also been discussed in this chapter. In the last section of this chapter, it mentioned about the knowledge and experiences that are gained throughout the development of Java Tutor.

Conclusion

Overall, **Java Tutor** has been developed successfully. It fulfills all the objectives together with its functional requirements and non-functional requirements that have been specified in chapter 4. A lot of time was consumed to make this project successful.

After considering the time constraint, only the most important function and features that were needed in Java Tutor was proposed. Although there were several limitations, with future enhancement, it is hope that this system will be more reliable.

Much experience has been gained, new knowledge of programming language, time planning and management and so on.

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Appendix A

User Manual

Content

List of Figure

Appendix A: User Manual

This user manual will provide step-by-step instruction, which will guide and facilitate the user effectively in order to use this system. This user manual for the Java Tutor is divided into two parts for the use of users, and administrator.

User Manual For user

1. Login

1. Insert username and password at the Login page as shown below in figure A1.
2. Below the Login button, choose the User option.
3. Click the Login button. The system will validates the username and the password and if the password is correct, for user, the Introduction or main page will be shown (see Figure A3). If the password is not correct, error message will be shown.

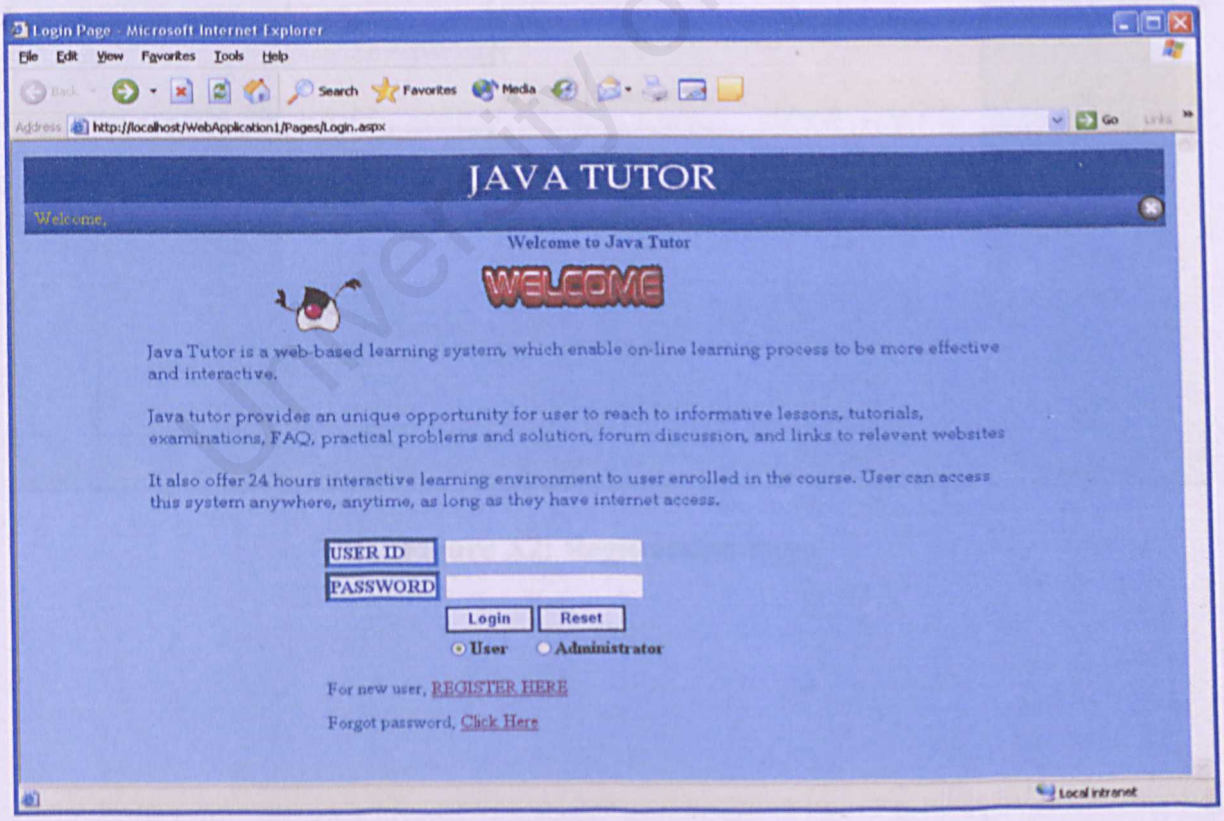

Figure A1: Login Page

2. Register As User

1. At the Login page (see figure A1), click on "REGISTER HERE" link. The register page will be displayed as shown in Figure A2.
2. Inserts all information in the text fields. For the IF FORGOT PASSWORD part, the question that you inserted will be prompted to you when you forgot the password.
3. Click Submit button. Welcome to Java Tutor Message will appear if the registration success.

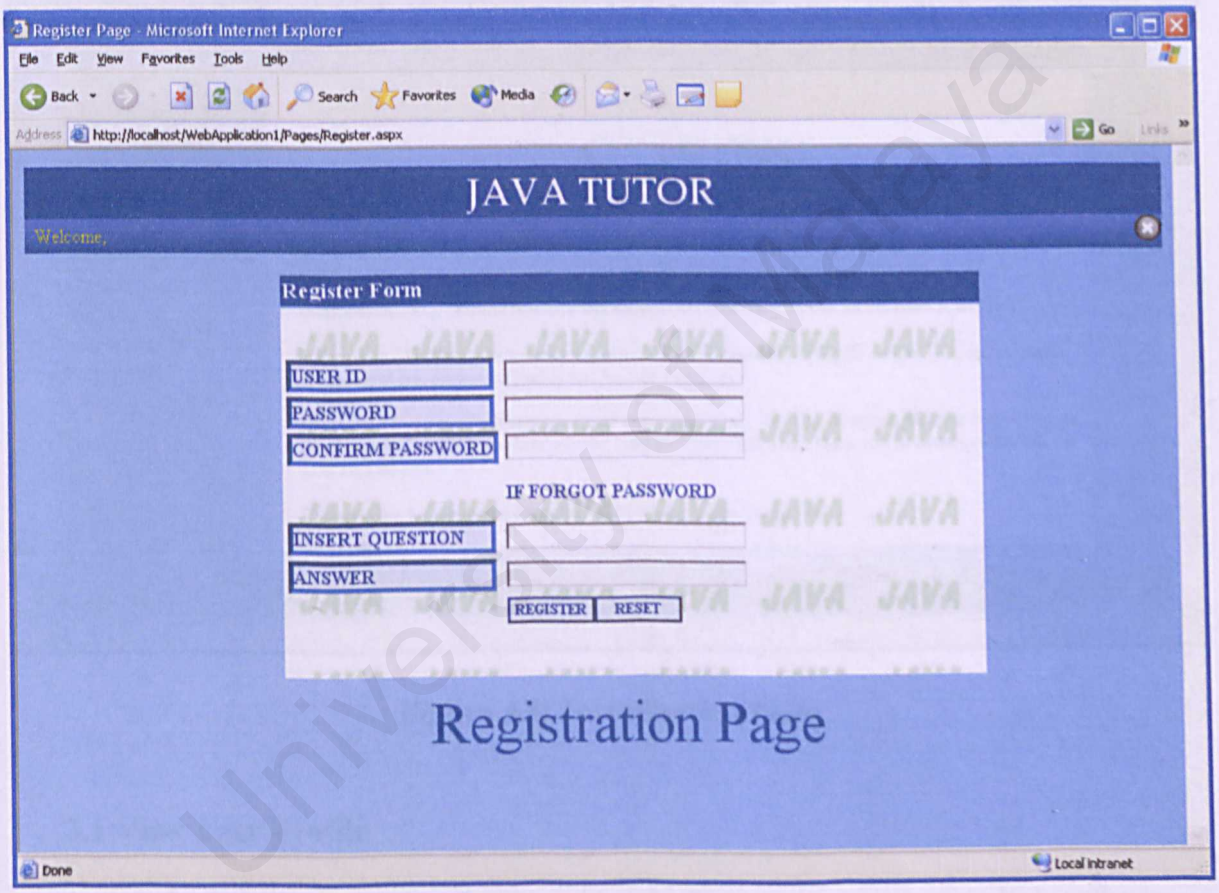

Figure A2: Registration Page

3. User Profile Page

This page will show the user's username, password, question and answer if the user forgot password. User can change all the information in this page. This page also shows user's tutorial and examination marks.

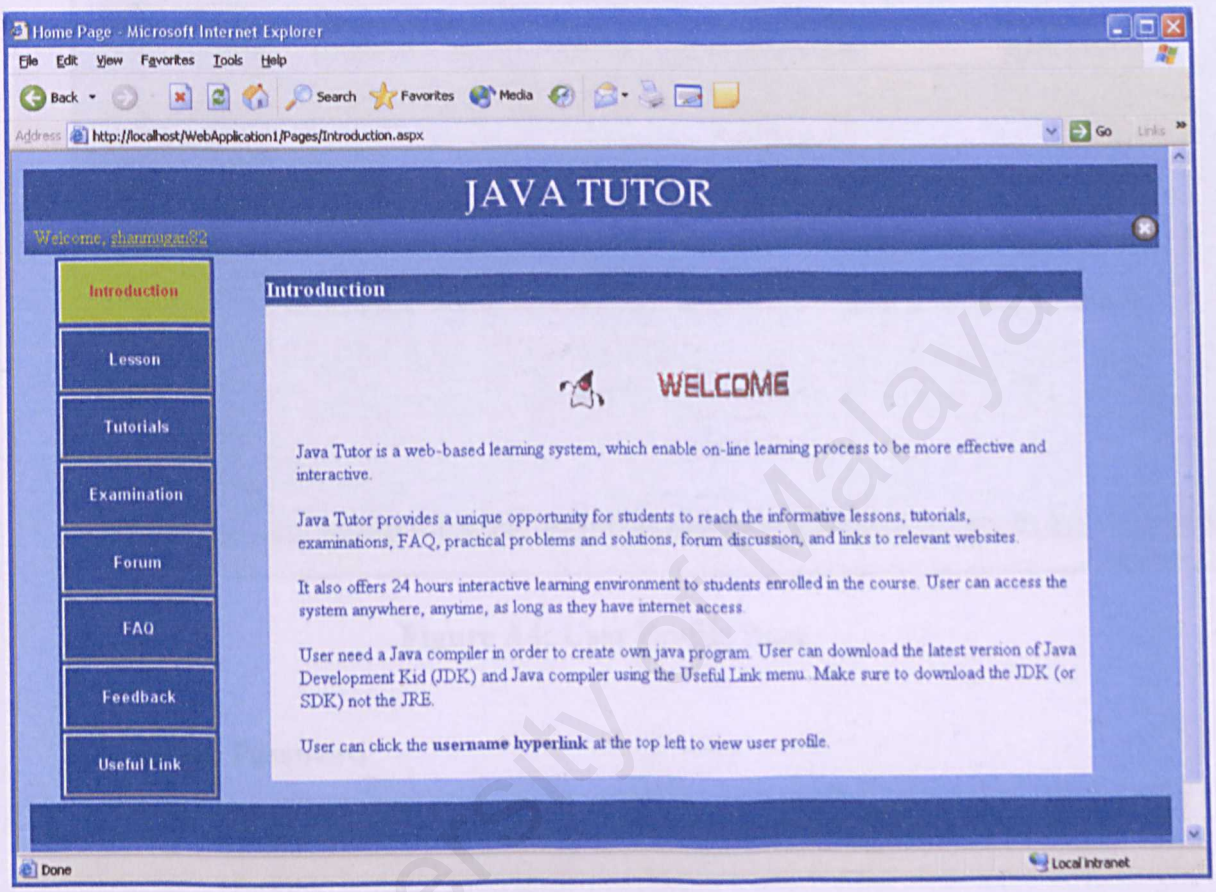

Figure A3: Introduction Page

3.1 View User Profile

1. At the Introduction page shown as above, click on your username link at the top left of the page to view your profile. The User Profile page will be shown (see Figure A4).

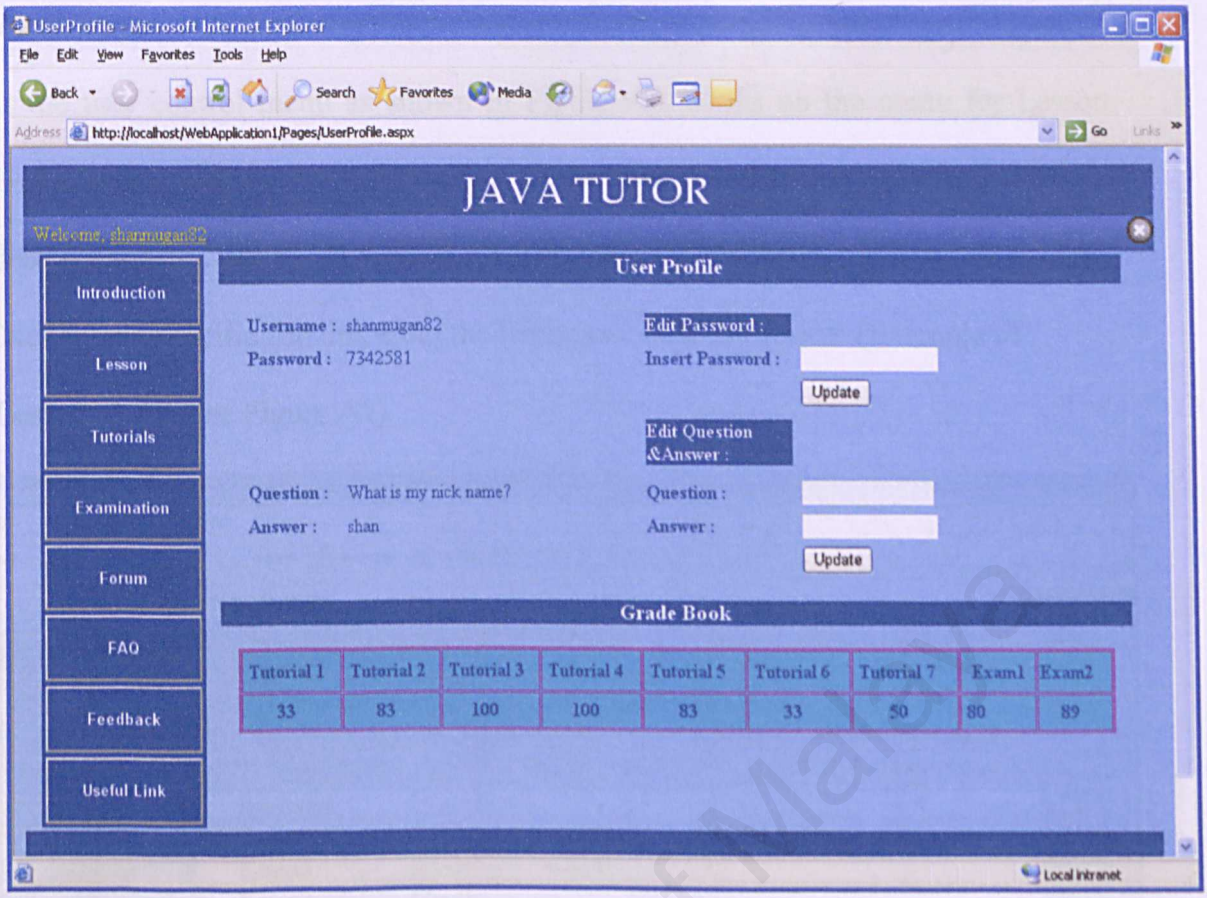

Figure A4: User Profile Page

3.2 Change Password

1. Insert your new password in the Edit Password section. Make sure your password length must at least 6 characters long.
2. Click Update button. You can see your new password in the user profile section.

3.3 Edit Question and Answer For Forgot Password

1. Insert your new question and answer in the Edit Question & Answer section.
2. Click Update button. You can see your new question and answer in the user profile section

4. Lesson Page

1. At the user control menu as shown in Figure A6, clicks on the menu for Lesson. Lesson Page will be shown as Figure A5 with the listings of Lesson title and descriptions.
2. Click on the specific file link from the listings to view the lesson. (Example of Lesson1 page, see Figure A7).

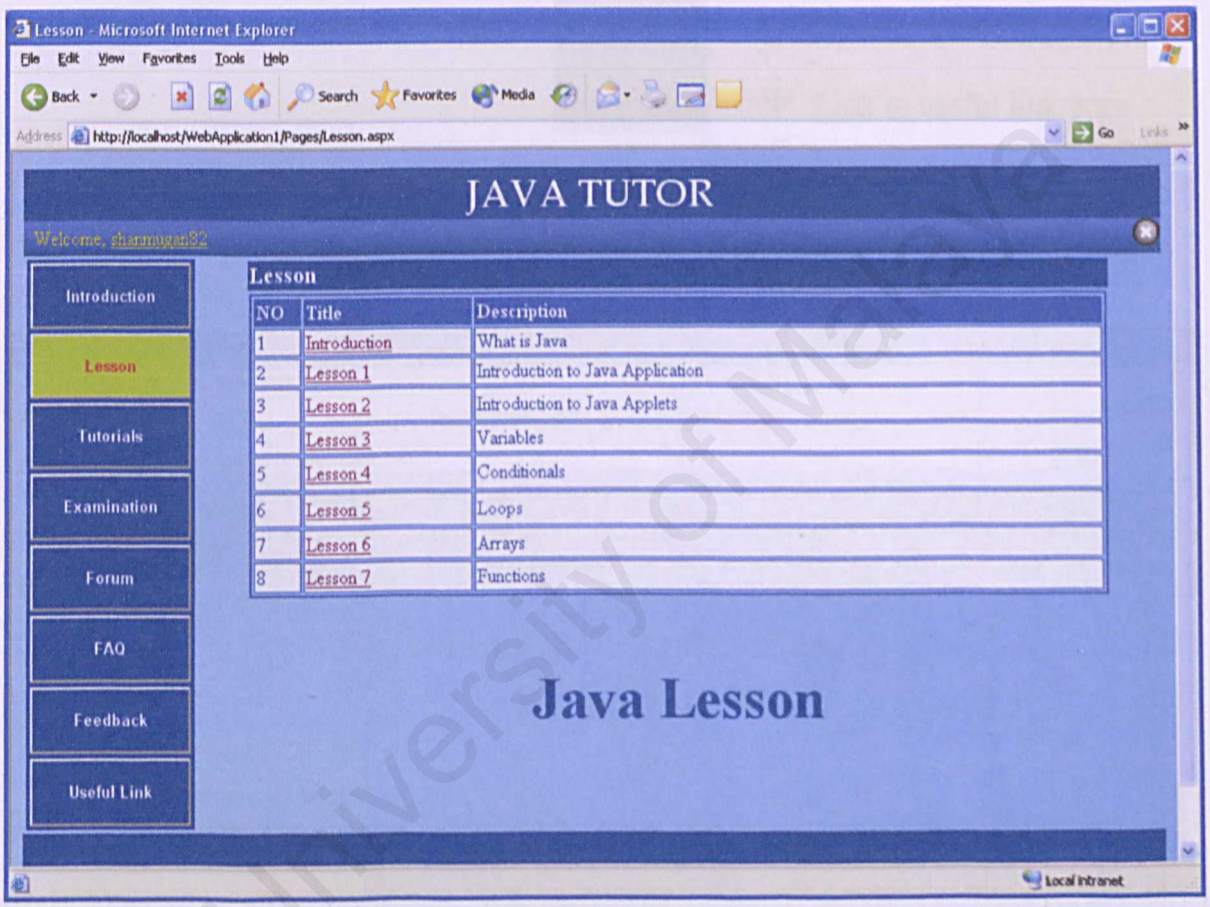

Figure A5: Lesson Page

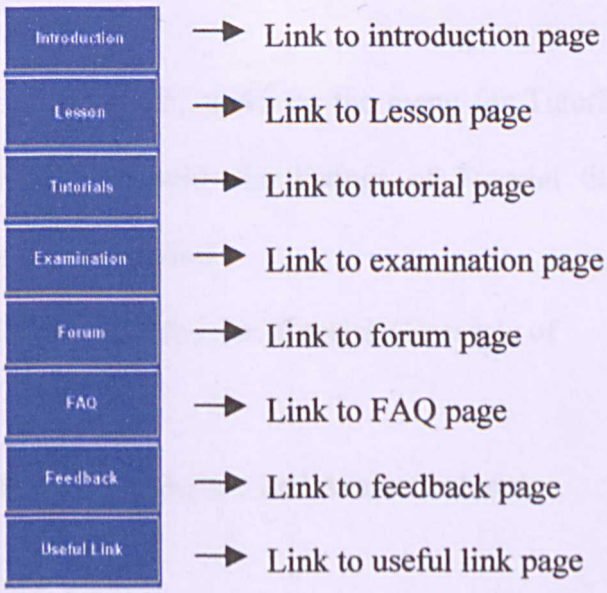

Figure A6: User Control Menu

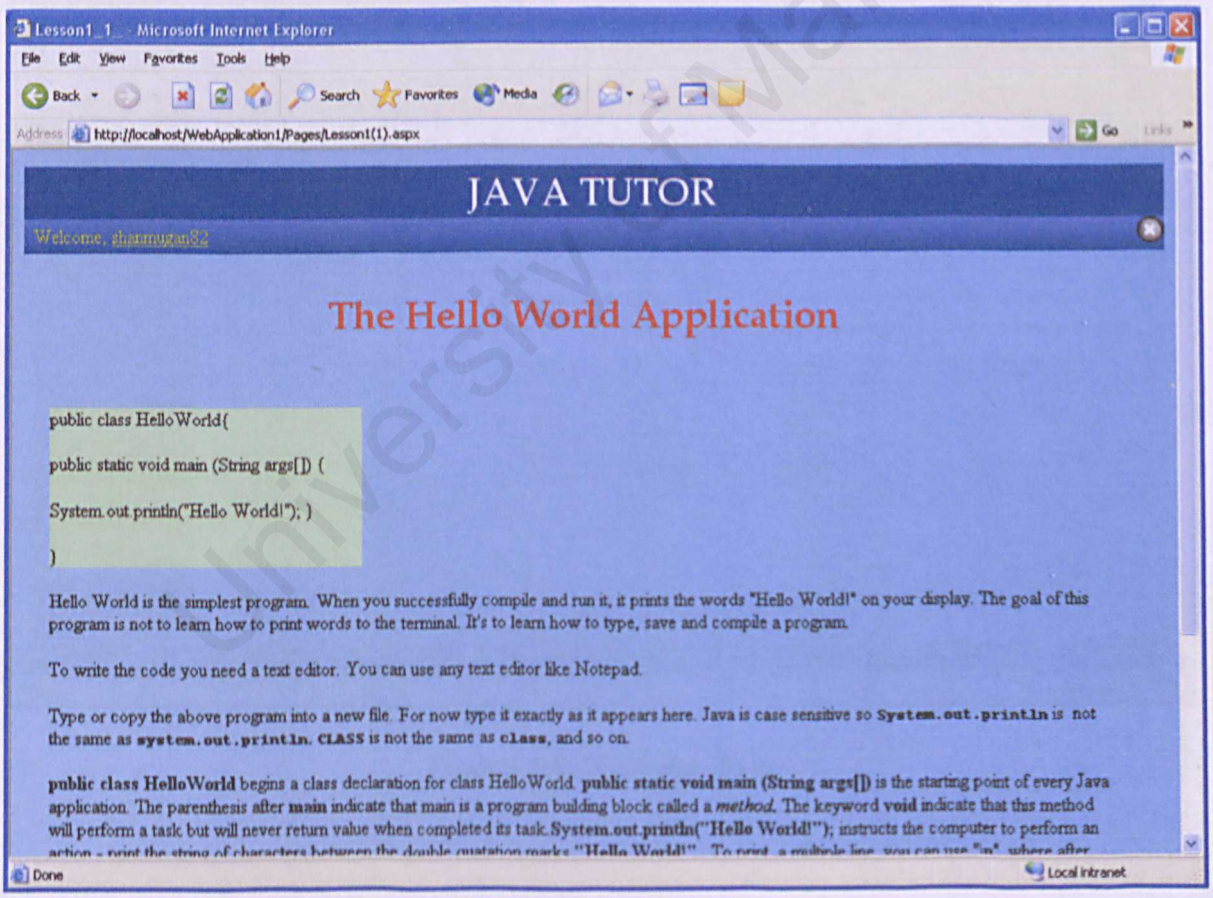

Figure A7: Lesson Page

5. Tutorial Page

1. At the user control menu as shown in Figure A6, clicks on the menu for Tutorial. Tutorial Page will be shown as Figure A8 with the listings of Tutorial title, descriptions Question and Answer for coding section.
2. Click on the specific file link from the listings to view the Tutorial. (Example of Tutorial page, see Figure A9).
3. To do programming tutorial, choose link from Question and Answer column.

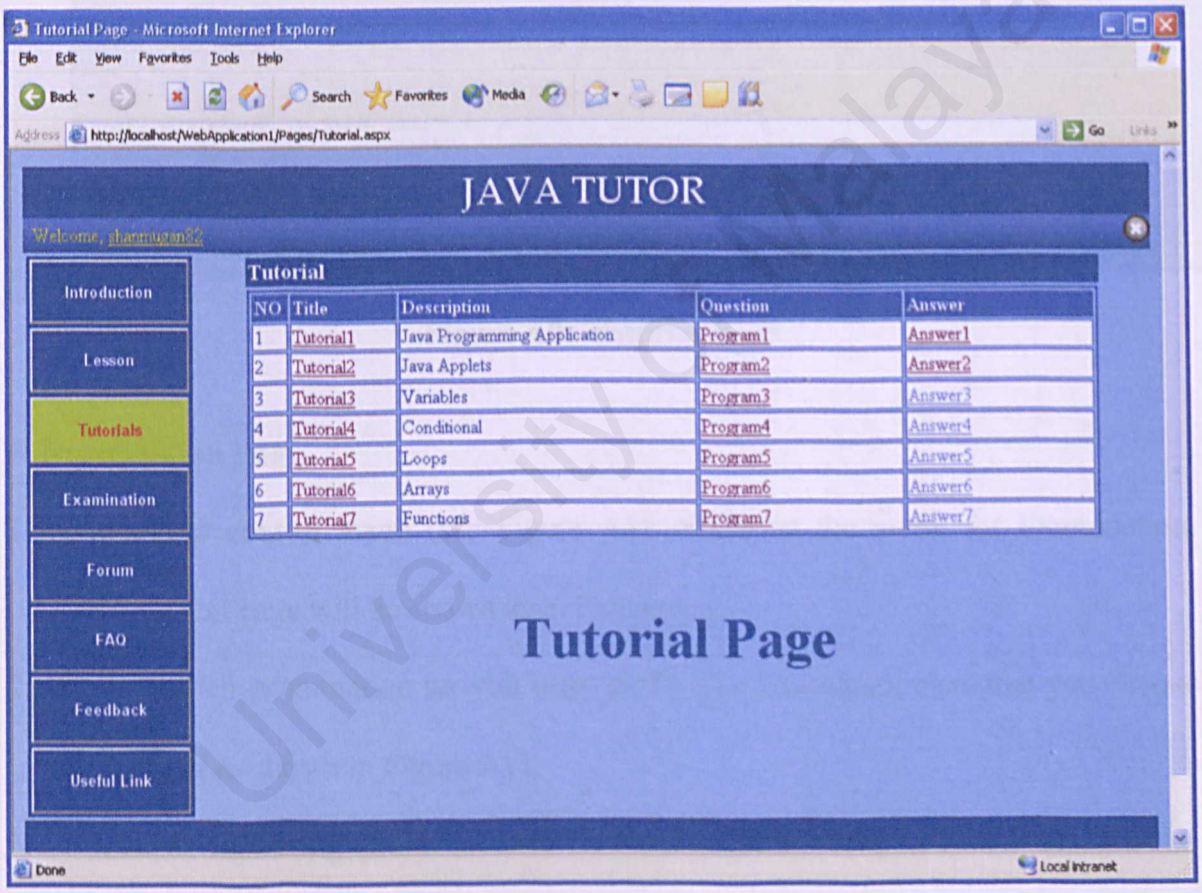

Figure A8: Tutorial Page

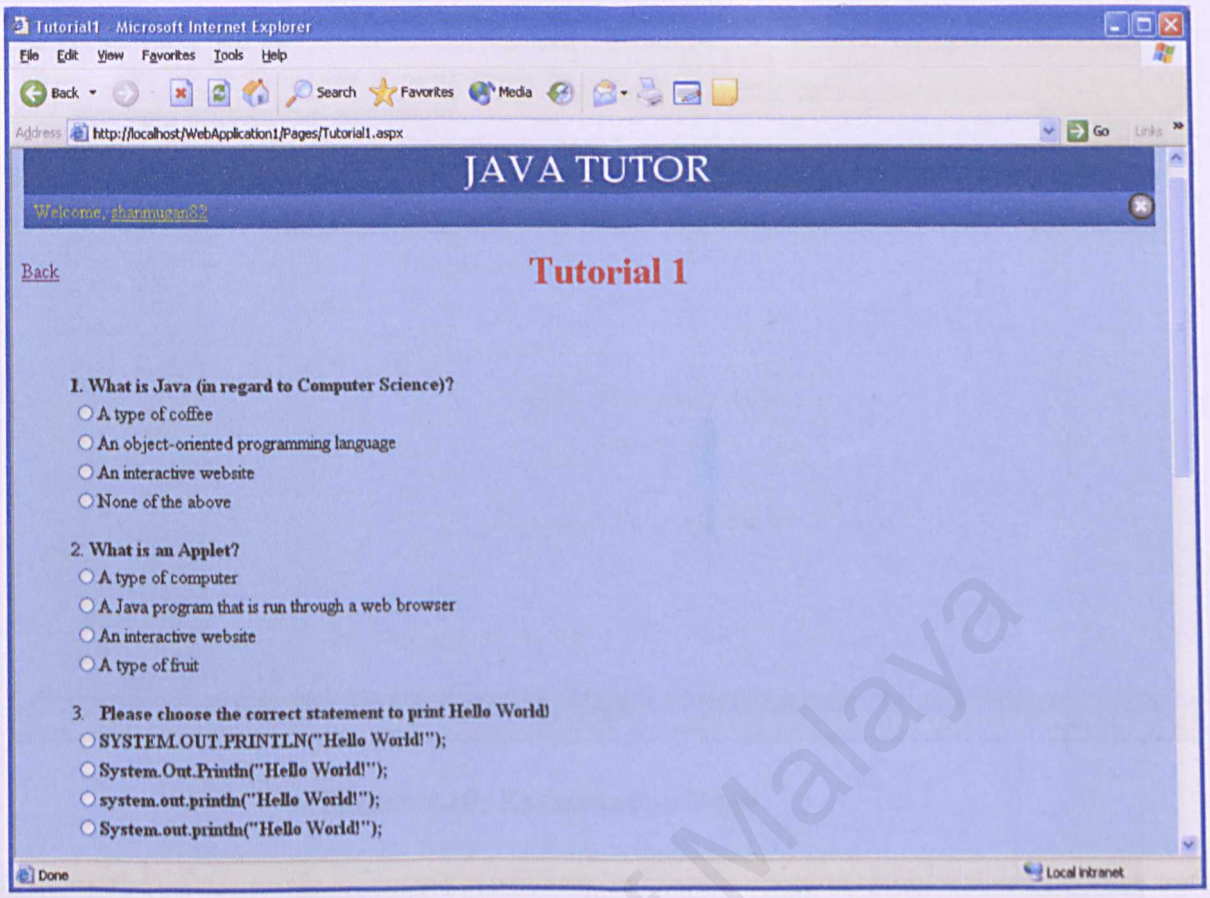

Figure A9: Tutorial Page

6. Examination Page

1. At the user control menu (see Figure A6), clicks on the menu for Examination. Examination page will be shown as in Figure A10.
2. Choose which examination set you want to do. The Examination set that you choose will appear as shown in Figure A11.
3. Once finish answering questions, click on Submit button, the system will calculate the score and display to the mark. You can also view your mark at the User Profile page.

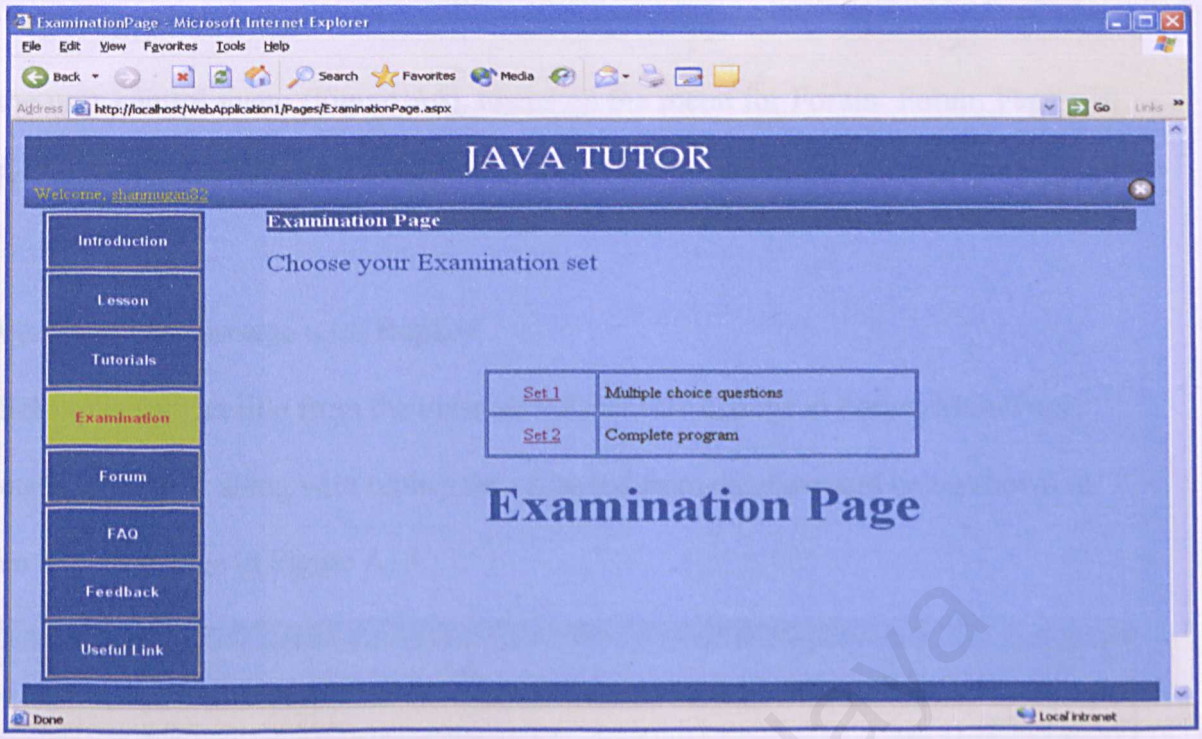

Figure A10: Examination Page

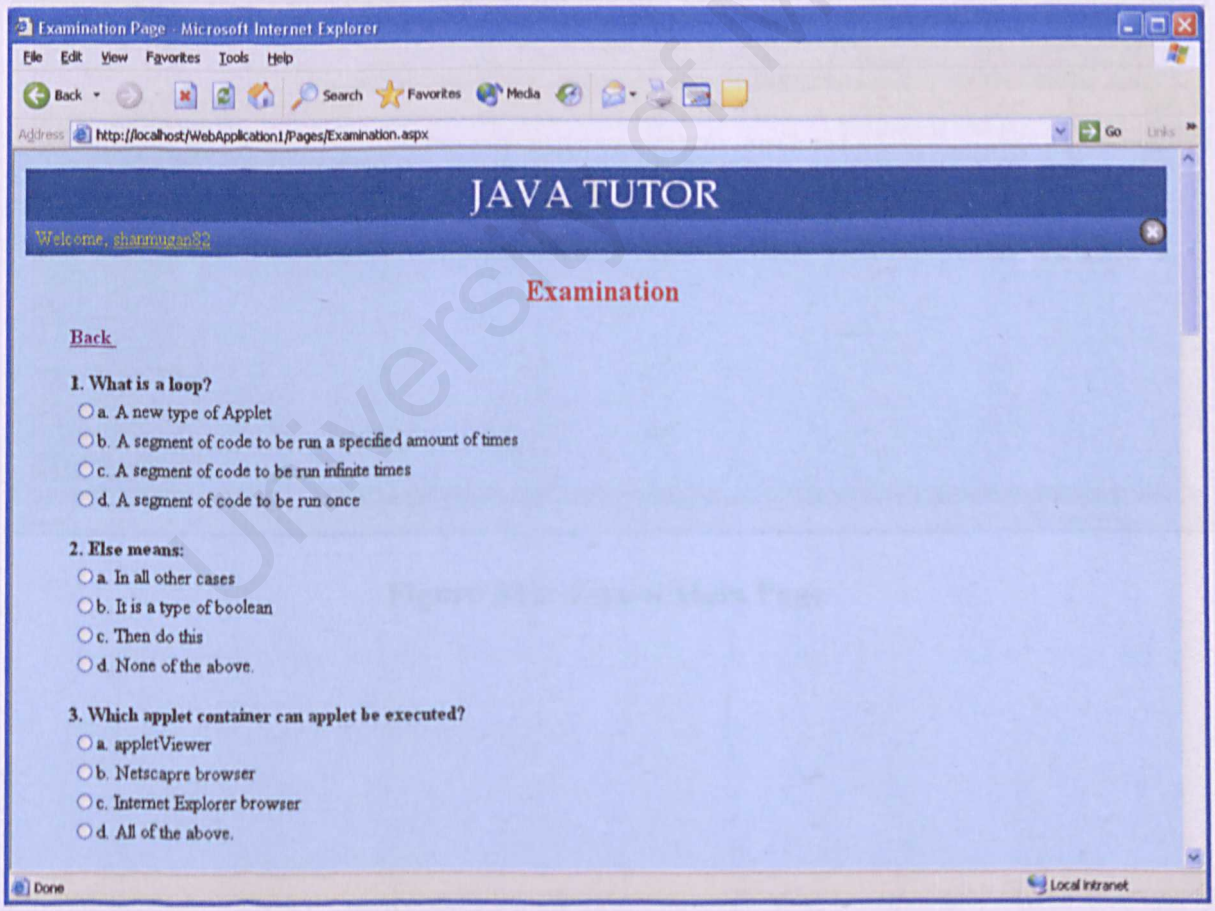

Figure A11: Examination Set

7. Forum Main Page

At the user control menu (Figure A6), clicks on the menu for Forum. Forum Page will be shown as in figure A12.

7.1 View Posted Message with Replies

1. Clicks on a subject title from the message subject title listings in Forum Main Page.

2. Detailed message along with replies are extracted from database and being shown in Forum Message page in Figure A13.

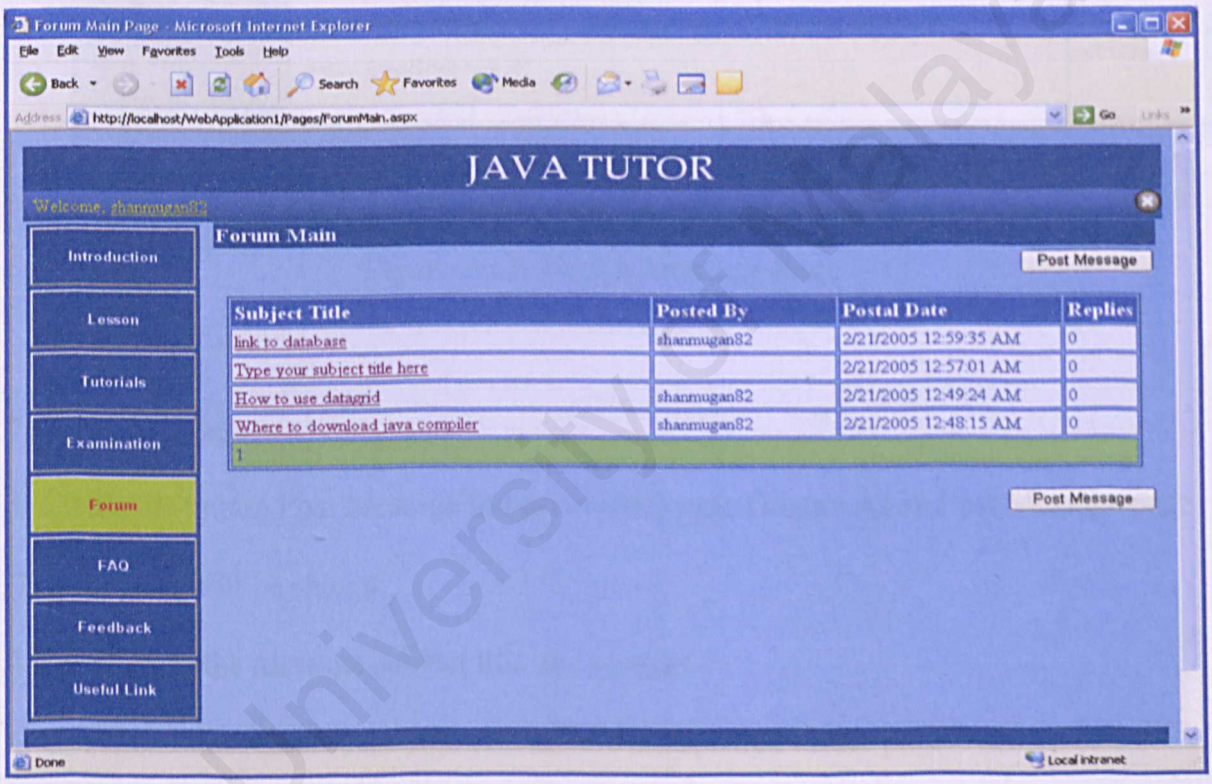

Figure A12: Forum Main Page

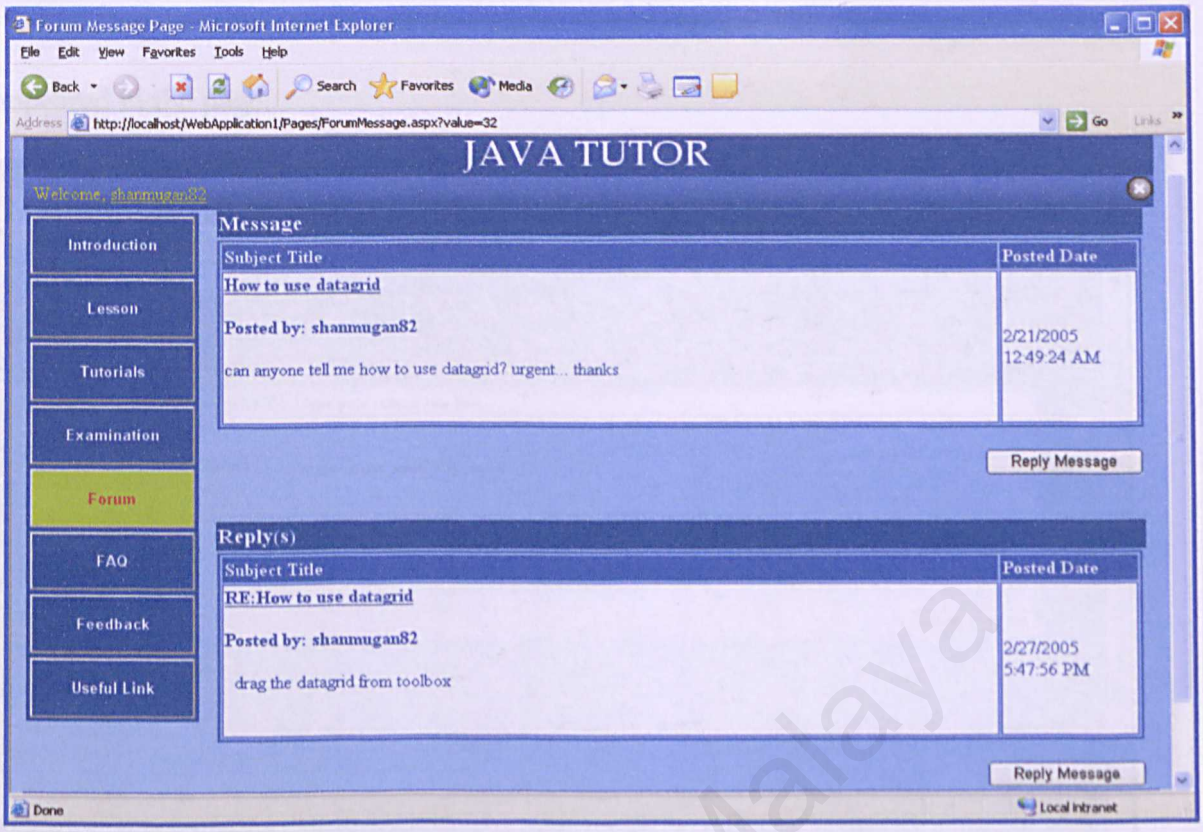

Figure A13: Forum Message Page

7.2 Post Message

1. Clicks the button Post Message in Forum Main page (Figure A12). Post Message page (Figure A14) will be shown.

3. User key in the message subject title and content.

4. Clicks Submit button. Message sent label will appeared on the page.

7.3 Reply Message

1. User clicks on Reply message button after viewing message in Forum Message page (Figure A13). Reply Message page (Figure A15) will be shown.

2. User key in the message and then clicks Submit button. Message sent label will appeared in the page.

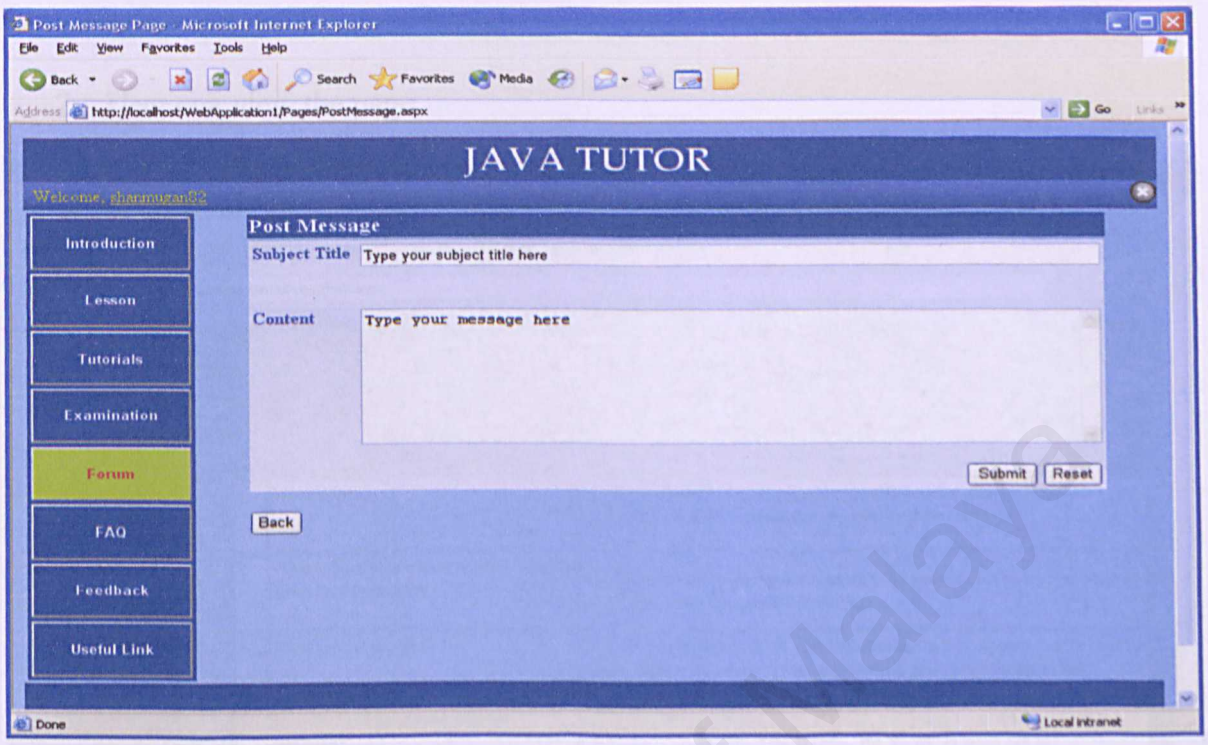

Figure A14: Post Message Page

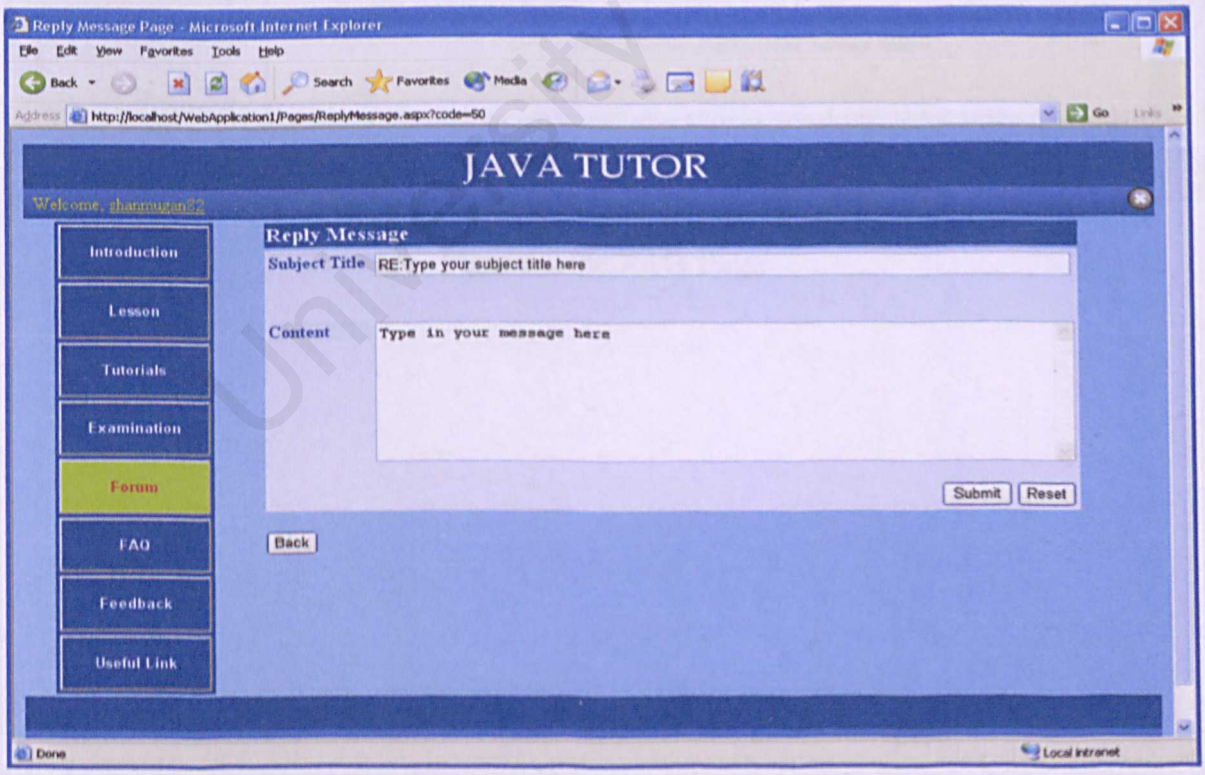

Figure A15: Reply Message Page

8. FAQ Page

1. At the user control menu (Figure A6), clicks on FAQ menu. FAQ page as shown below will be shown as below.

2. User can view the page.

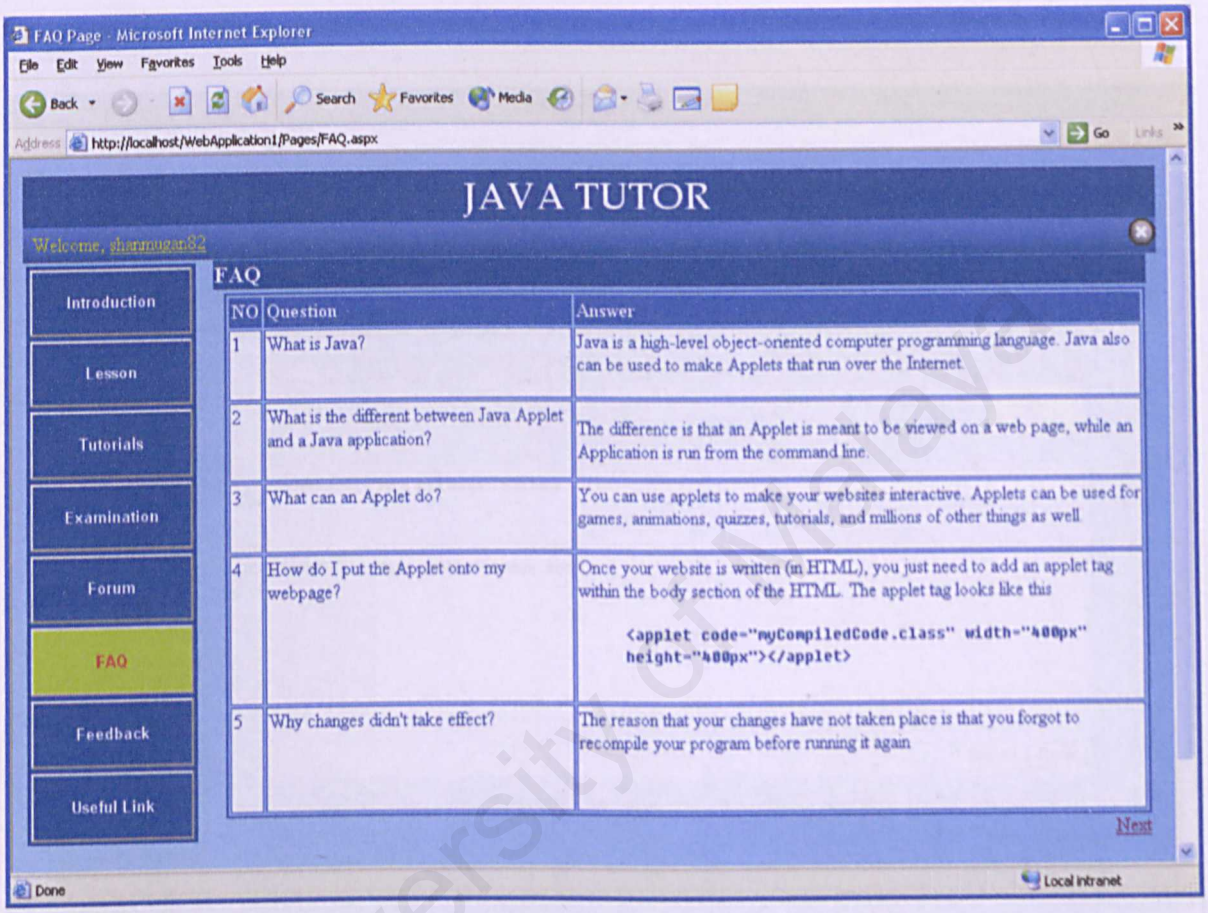

Figure A16: FAQ Page

9. Feedback Page

1.At the user control menu (Figure A6), clicks on menu for Feedback. Feedback page will be shown as below.

2. User key in the message and then clicks Submit button. Thank you message will appeared in the page.

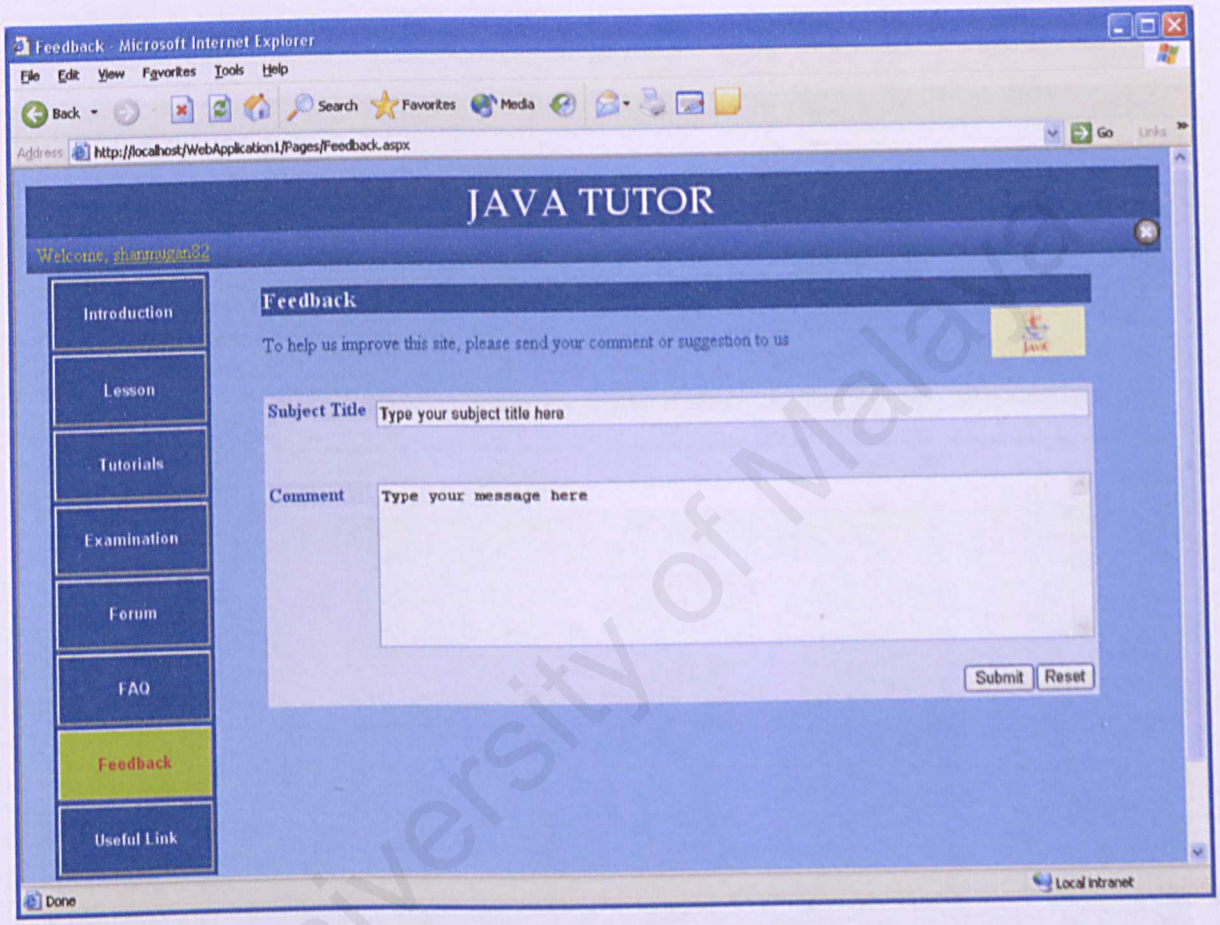

Figure A17: Feedback Page

10. Links Page

1. At the user control menu (Figure A6), selects Links menu. Links Page with all links available in the system will appear as below.

2. Clicks on any website's links that you wish to access. The system shows/links to the relevant website

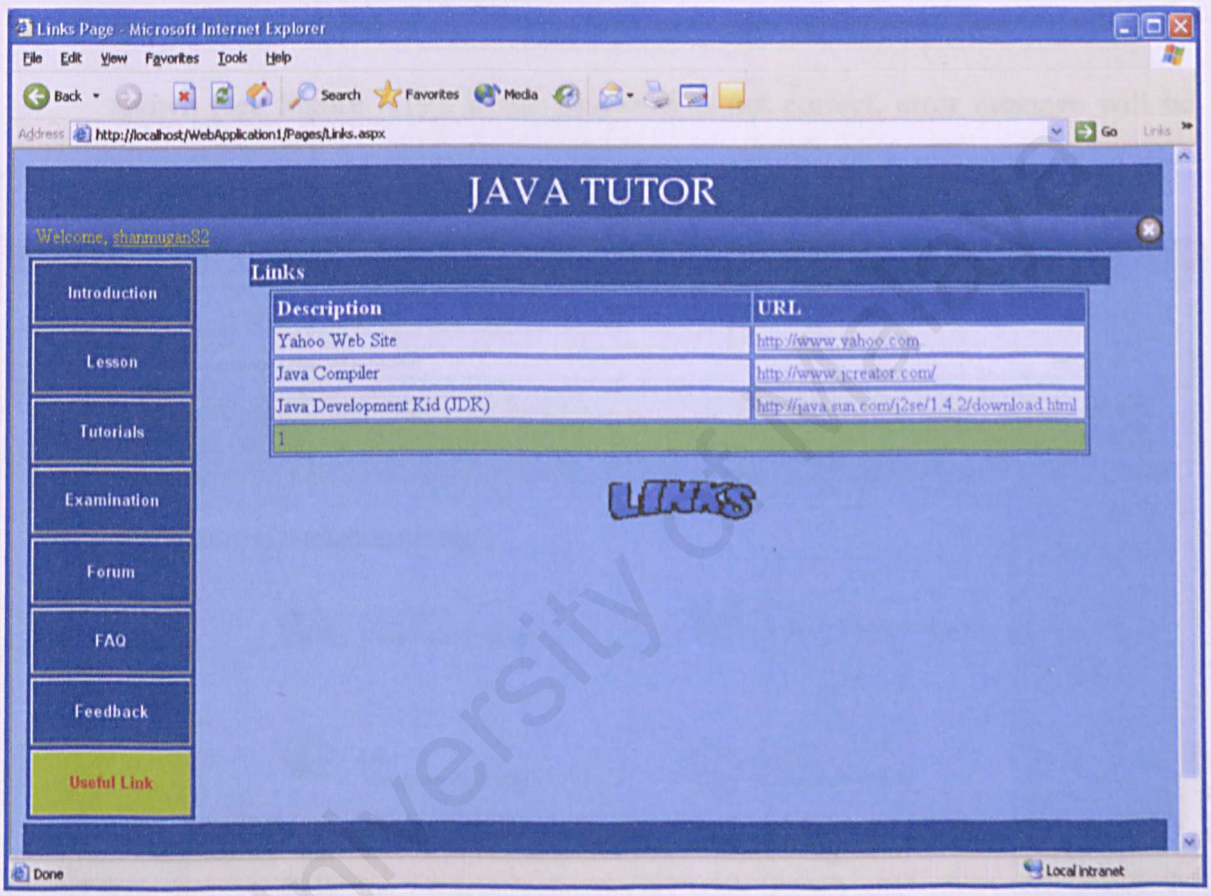

Figure A18: Links Page

User Manual For Administrator

1.Login

Administrator need to login into the system to perform the maintenance activities.

1. At the Login page (see Figure A1), Insert username and password.
2. Below the Login button, choose the Administrator option.
3. Click the Login button. The system will validates the username and the password and if the password is correct, for administrator, the Maintenance page will be shown (see Figure A19). If the password is not correct, error message will be shown.

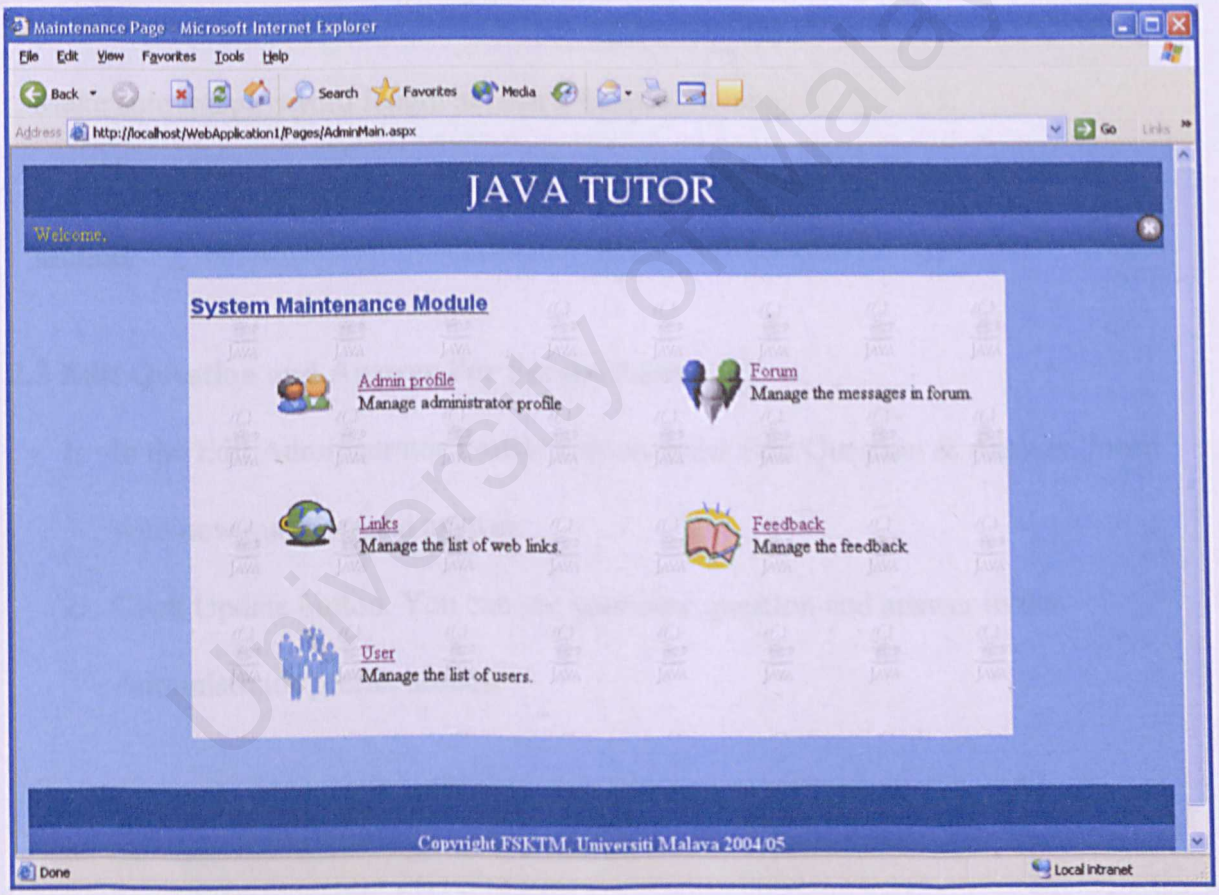

Figure A19: Maintenance Page

2. Admin Profile

This page will show the administrator's username, password, question and answer if the user forgot password. Administrator can change all the information in this page.

2.1 View Administrator Profile

1. At the Maintenance page (Figure A19), Clicks on the Admin Profile link or image button. Admin profile page will be shown as in Figure A20.
2. Administrator can view all the information in this page.

2.2 Change Password

1. At the Edit Administrator profile section under Edit Password, insert new password. Make sure the password length at least 6 characters long.
2. Click Update button. You can see your new password in the Administrator profile section.

2.3 Edit Question and Answer For Forgot Password

1. In the Edit Administrator Profile section under Edit Question & Answer, Insert your new question and answer.
2. Click Update button. You can see your new question and answer in the Administrator profile section

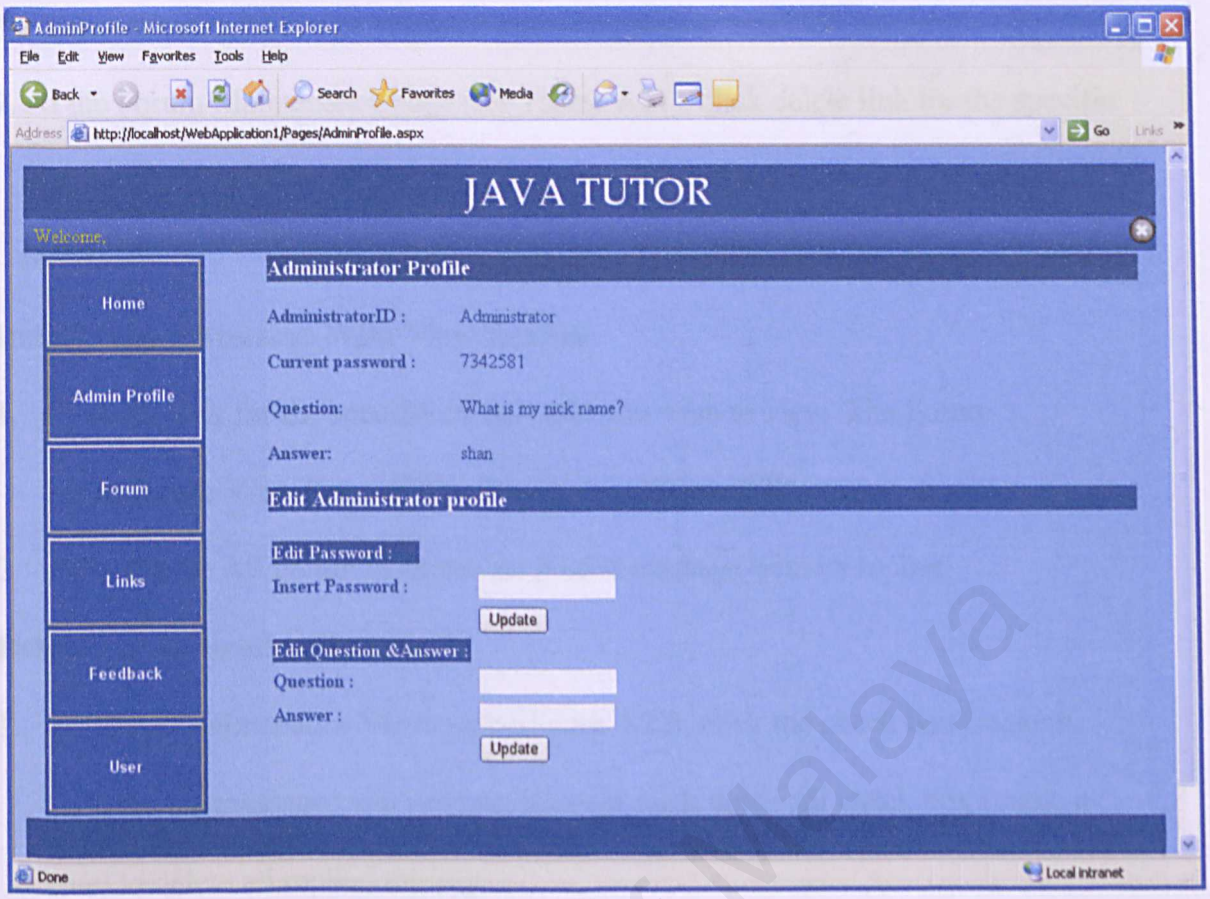

Figure A20: Admin Profile Page

3. Forum Maintenance Page

1.At the Maintenance page (Figure A19), Clicks on the Forum link or image button.

Forum Maintenance page will be shown as in Figure A21.

3.1 View Forum Message With Replies

1. Click the link for the specific subject title you wish to view. The Forum Maintenance View Page will be shown as in Figure A22.
2. You can view the posted message and the replies message regarding the subject of the posted message.

3.2 Delete Forum Message Without View Replies

1. At the Forum Maintenance page (see Figure A21), click delete link for the specific subject title. The system will delete the posted message together with all of its replies.

3.3 Delete Forum Message With View Replies

1. Click the link for the specific subject title you wish to view. The Forum Maintenance View Page will be shown as in Figure A22.
2. Click Delete All button to delete the posted message with its replies.

3.4 Delete Forum Replies Message

1. In Forum Maintenance View page (Figure A22), click the check box (make it true) for the messages you want to delete or click delete all check box (make it true) to delete all replied messages.
2. Click Delete button under Replied Message section. The system will delete all selected messages.

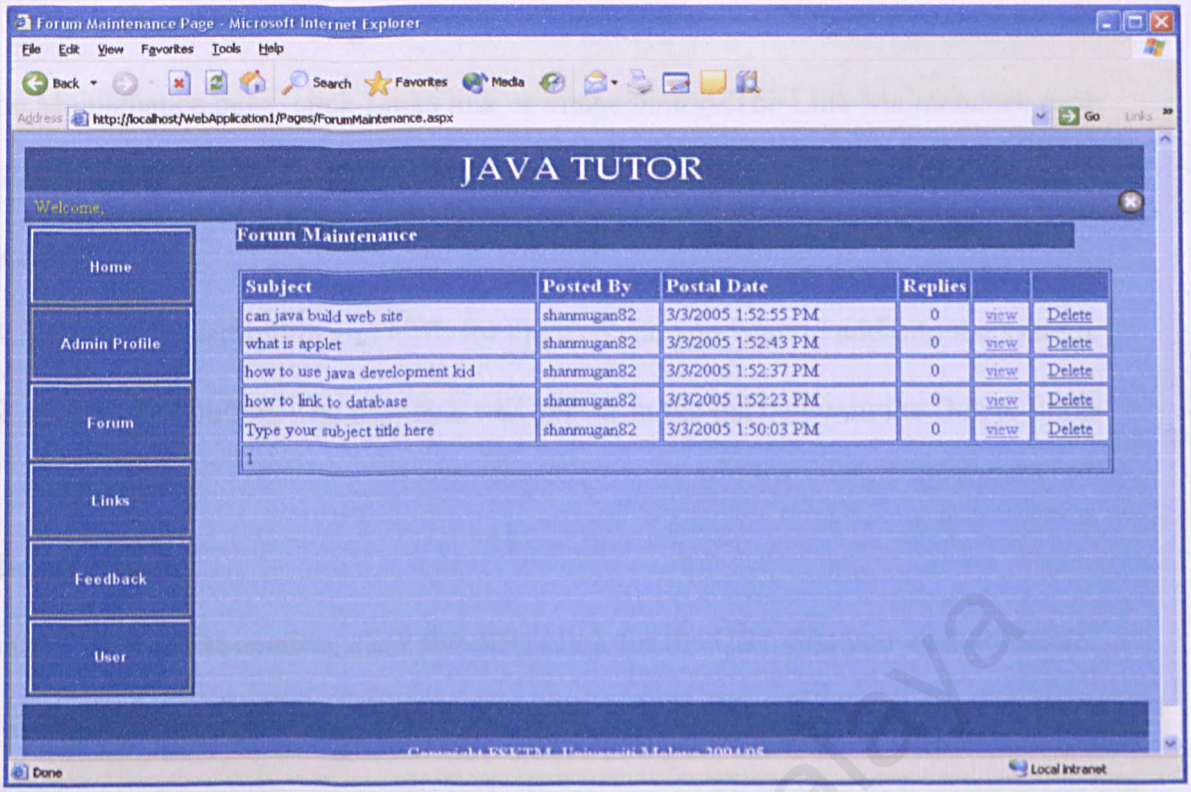

Figure A21: Forum Maintenance Page

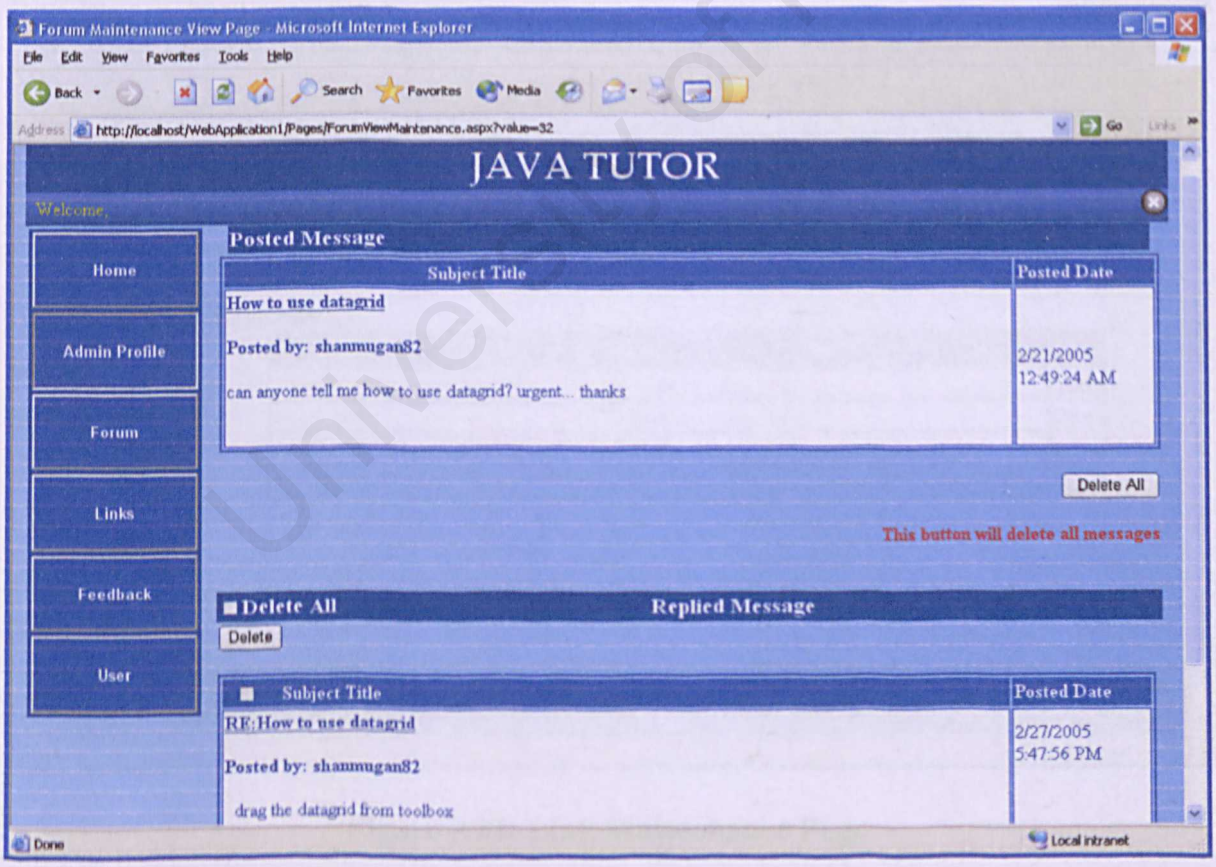

Figure A22: Forum Maintenance View Page

4. Link Maintenance Page

At the Maintenance page, click Links link or image button. The Link Maintenance page will be shown as in figure below

4.1 Add Link

1. Insert the description and URL for the web site you want to add into the system.
2. Click Add button. The new link will appear in the list below in the Delete Links section.

4.2 Delete Link

1. In the Delete Links section, click the delete link for the URL that you want to delete. The system will delete the URL together with its description.

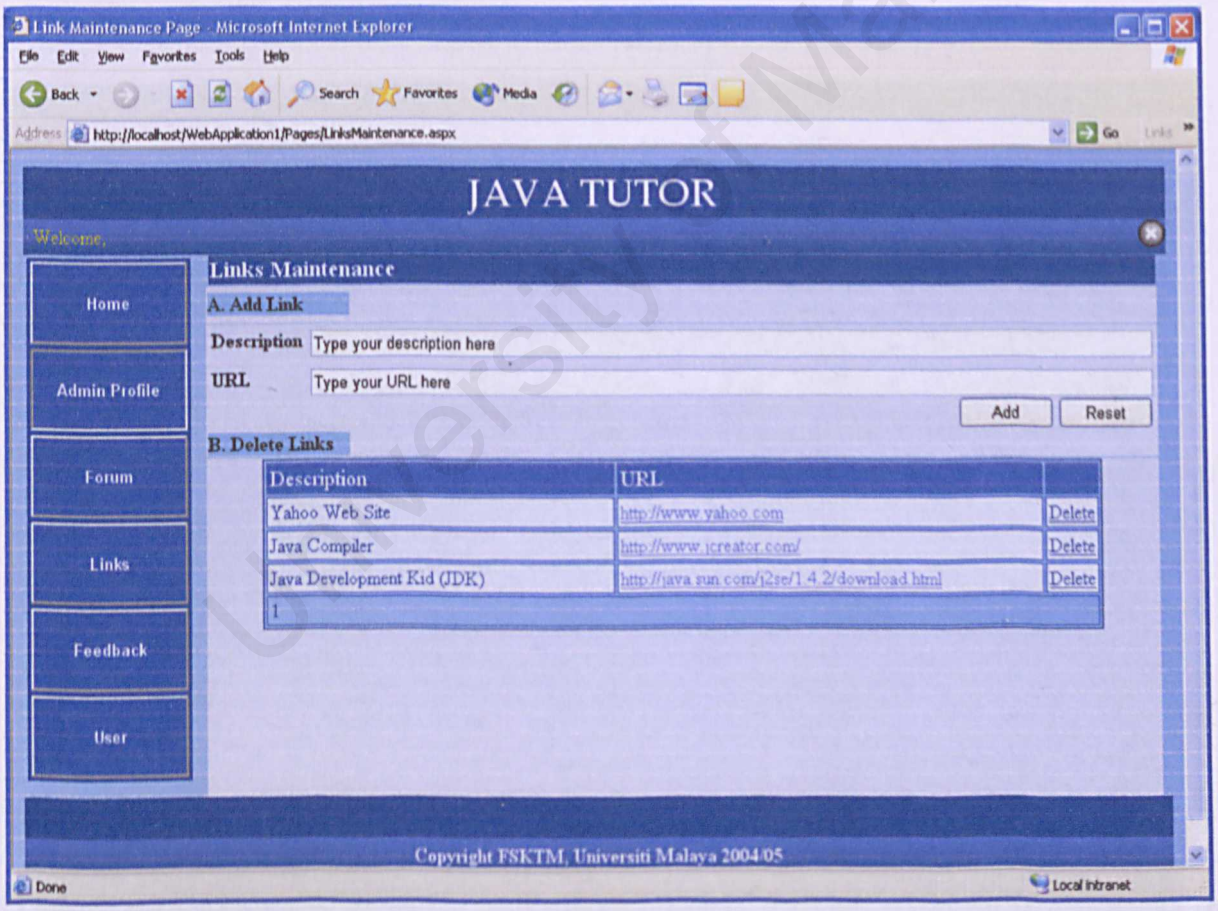

Figure A23: Link Maintenance Page

5. Feedback Page

At the maintenance page (Figure A19), click at Feedback link or image button. The Feedback Maintenance page will be shown as in figure below.

5.1 View Feedback

1. At the Feedback Maintenance page, click view link for the specific subject title that you wish to view. The system will show the feedback message in the Feedback Maintenance View page.

5.2 Delete Feedback

1. At the Feedback Maintenance page, click delete link for the specific subject title that you want to delete. The system will delete the feedback message.

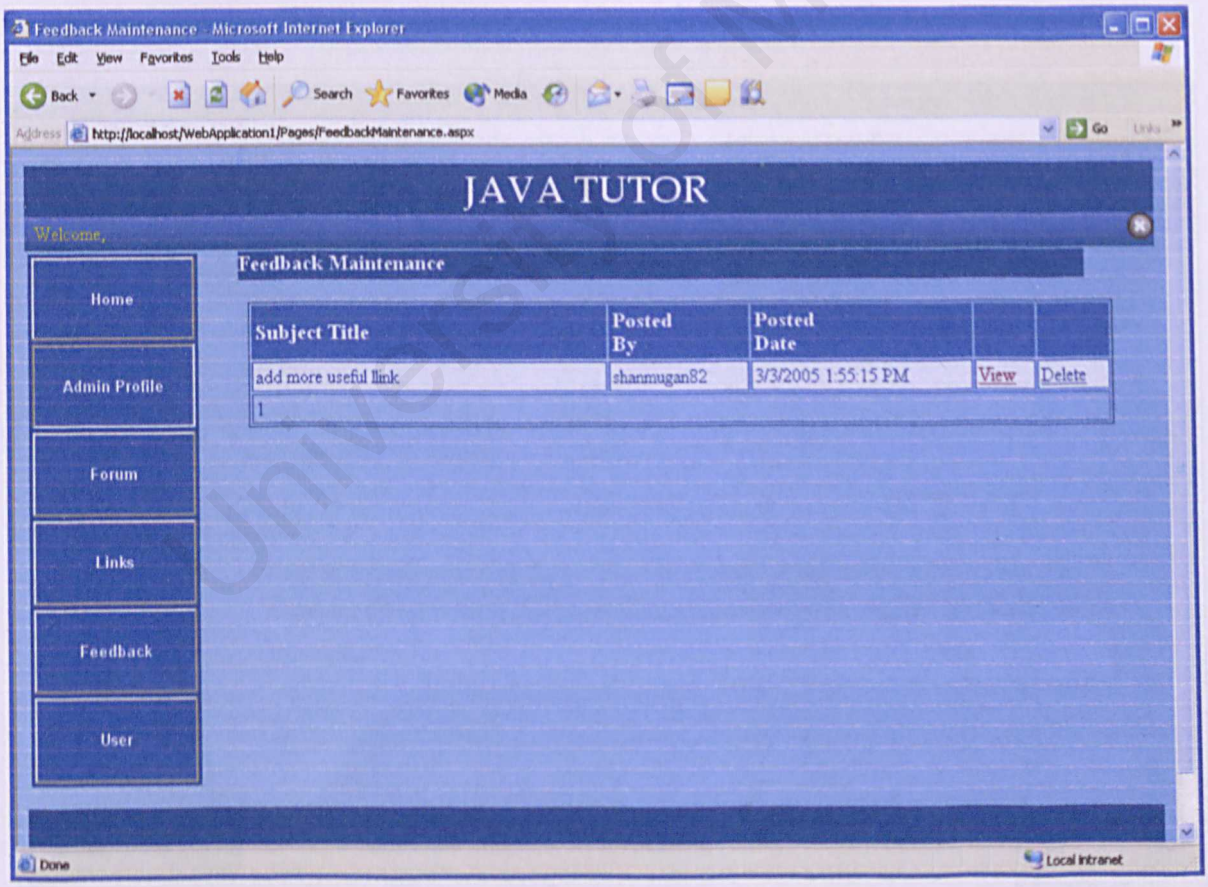

Figure A24: Feedback Page

6. User Maintenance Page

At the Maintenance Page (Figure A19), click on the User link or image button. The user Maintenance page will be shown as in figure below.

6.1 Find User

1. Under Find User section, insert the user username that you want to find.
2. Click Find button. The record found will be shown in the list.
3. To view back all the record, click View All button. All record will be shown in the list.

6.2 Delete User

1. Find the user you want to delete. (Use Find function)
2. Click delete link to delete the user. The user record will disappear in the list

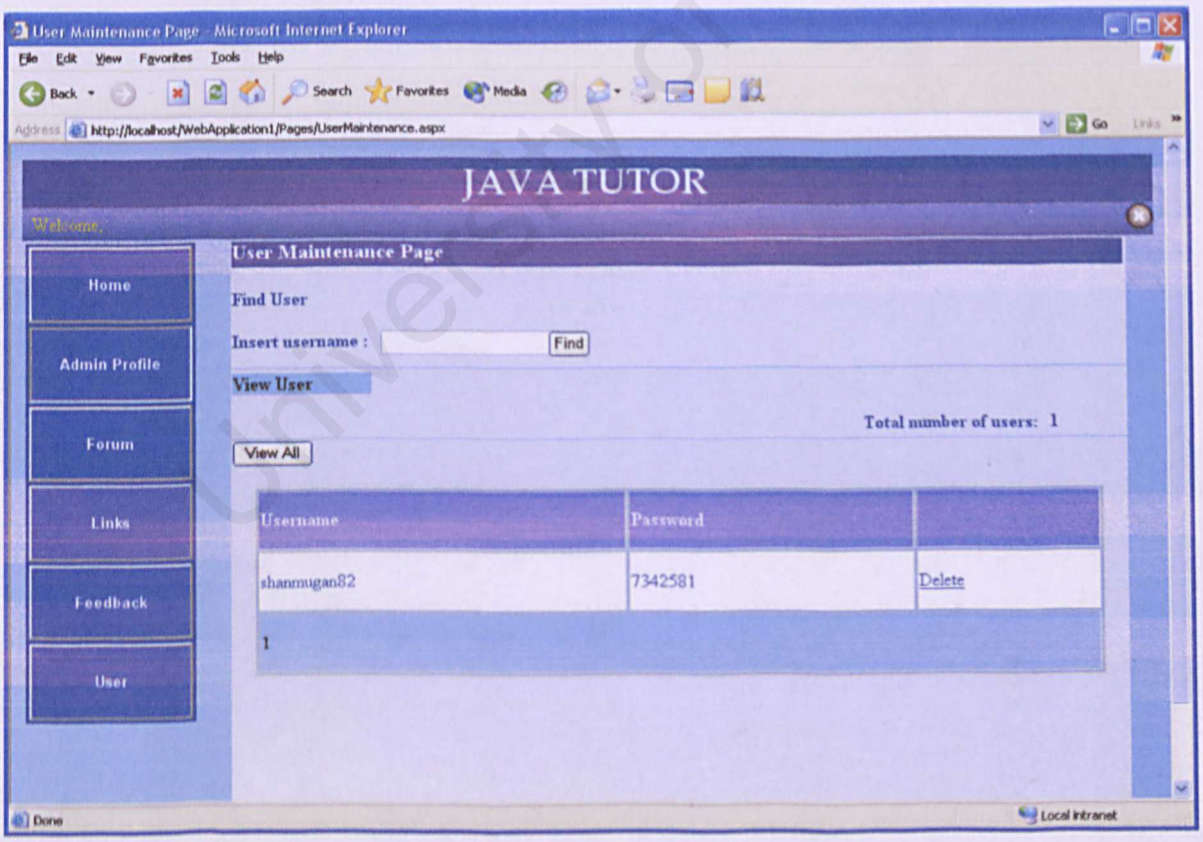

Figure A25: User Maintenance Page

Appendix B: System Evaluation

Java Tutor

This is the evaluation form for Java Tutor. Please tick the answer below regarding the Java Tutor System.

System interface is attractive	☐ **Yes**	☐ **No**
Instruction of the system is understandable	☐ **Yes**	☐ **No**
System is user friendly to use	☐ **Yes**	☐ **No**
Function in the system is useful	☐ **Yes**	☐ **No**
System provide more information	☐ **Yes**	☐ **No**

Thanks for cooperation !!