Tutorial Letter 101/3/2012
Computer Systems: Fundamental Concepts

COS1521

Semesters 1 and 2

School of Computing

This tutorial letter contains important information about your module.

Bar code

CONTENTS

Please note / important notes:

This is a **semester** module. To be considered for examination in this module, you must meet the following requirement:

Semester 1: Submit Assignment 01 by 12 March 2012.

Semester 2: Submit Assignment 01 by 03 September 2012.

Your semester mark and examination mark will determine your final mark.

Your semester mark will be based on the percentages you achieve for Assignments 01 and 02.

1 INTRODUCTION AND WELCOME

Dear Student

Welcome to COS1521! (Previously, the module code for this module was COS113W.) This is a semester module that is presented by the School of Computing.

This module provides you with a background on computers. In modern society, computers already play such a major role in our daily lives that we accept their use as a matter of course. In COS1521 you are introduced to number systems, data storage and operations on data. Furthermore, the basics of logic gates and Boolean algebra will eventually help you to draw simple combinational logic circuits when given a problem statement. The fundamentals of sequential logic circuits are also investigated. You become better acquainted with numerous concepts and properties of the hardware and software components of computer systems. The concept of software engineering is explained. Concepts relating to data structures, databases and database management are introduced. We also look at the role that computers play in data communication in the modern world.

We hope this module will open up a whole new world for you. We bid you a hearty welcome and wish you everything of the best for your studies this semester.

Regards

The COS1521 Lecturers.

Note: As from 2010, the tutorial matter for COS1521 is only available in English.

1.1 Tutorial matter

The information supplied for the module is included in the following tutorial matter:

- Tutorial Letters 101 and 102
- Textbook
- CAI tutorial available on the school's CD software (optional)

Some of this tutorial matter may not be available when you register. Tutorial matter that is not available when you register will be posted to you as soon as possible, but is also available on myUnisa.

It is important to make use of *myUnisa* and regular use of the Internet. You must be registered on *myUnisa* to be able to submit assignments, to have access to the Library functions, download study material, "chat" to their lecturers or fellow students and participate in online discussion forums and get access to all sorts of learning resources.

2 PURPOSE OF, OUTCOMES FOR AND SYLLABUS OF THE MODULE

2.1 Purpose

COS1521 is one of a number of first-year Computer Science modules offered by the School of Computing at Unisa. The purpose of this module is to introduce students to the computer as a system. The module covers hardware concepts such as internal representation of numbers and characters and basic computer architecture, and software concepts such as systems software and applications software. It also includes a brief introduction to databases, and to systems analysis and design.

2.2 Outcomes

A range of tasks (in study guides, tutorial letters, assignments and examinations) will show that students have achieved the following outcomes, namely to:

Specific outcome 1
Demonstrate how data are represented, manipulated and stored in a computer using number systems, Boolean algebra, Karnaugh maps, truth tables and basic logic circuits drawings, in the context of given problem statements.

Range:
Basic knowledge of internal data, logic gates, and memory elements will be demonstrated only in the context of the design of basic combinational and sequential logic circuits.

Assessment criteria:
1.1 Conversions between different number systems (binary, octal, decimal and hexadecimal);
1.2 The application of different arithmetic methods in the binary number system;
1.3 The identification of computer data includes the different internal representations;
1.4 Explanations include the basic restrictions placed by computer architecture upon numerical computations;
1.5 The determination of outputs of basic combinational logic circuits for given inputs;
1.6 Graphical representations of the combinational circuits for given Boolean functions;
1.7 The simplifications of Boolean functions by implementing appropriate rules/methods;
1.8 The determination of a Boolean function for a given problem statement using truth tables (at most 4 variables);
1.9 Boolean expressions and binary logic that describe the behaviour of logic circuits;
1.10 The descriptions of the functioning of different types of combinational and sequential logic circuits.

Specific outcome 2
Demonstrate an understanding of the basic functions of computers, the software development process and units of hardware and software components.

Range:
The context is basic computer hardware and systems software with its relevant algorithms.

Assessment criteria:
2.1 Today's computers are described in context of some short historical background, different architectures and ethical scenarios/issues;
2.2 Descriptions of software engineering and operating systems include the development of software in a historical context;
2.3 The description of a basic computer includes the three basic hardware subsystems and their interconnecting functioning;
2.4 The description of an operating system includes the functioning of its components;
2.5 The descriptions of popular operating systems with references to different popular operating platforms;
2.6 The definition of an algorithm includes its relation to problem solving;
2.7 Definitions of the three algorithm constructs include descriptions of their use in algorithms;
2.8 Descriptions of basic algorithms include their applications;
2.9 Descriptions of the sorting and searching concepts of algorithms include an understanding of their mechanisms;
2.10 Descriptions of sub-algorithms include their relations to algorithms;
2.11 Descriptions of the development process models in software engineering include the concepts of the software life-cycle phases and documentation.

Specific outcome 3
Demonstrate an understanding of the basics of data communications and networks.

Range:
The context is the basics of Information Communication Technologies.

Assessment criteria:
3.1 Descriptions of physical structures of networks include references to network criteria, physical structures and categories of networks;
3.2 The description of the Internet includes the TCP/IP protocol suite with reference to the characteristics of its layers and their relationships;
3.3 Descriptions of Internet applications in the context of client-server communications.

Specific outcome 4
Describe data structures and how different databases function.

Range:
The contexts are typical of the demands of first-year undergraduate study.

Assessment criteria:
4.1 Descriptions of data structures include references to the differentiation between different structures;
4.2 Descriptions of file structures include references to updating and access methods, and categories of directories and of files;
4.3 Definitions of a database and some traditional database models include the relational database design;
4.4 The definition of a database management system (DBMS) includes its architecture;
4.5 Descriptions include the steps in database design.

2.3 Syllabus

The syllabus is covered by Chapters 1 - 11, 13 & 14 of F&M and the contents of all the tutorial letters.

The following topics are covered in the prescribed book:

Chapter 1: Introduction

Chapter 2: Number systems

Chapter 3: Data storage; (Appendix A: ASCII and Unicode)

Chapter 4: Operations on data;

Appendix E: Boolean algebra and logic circuits.

Chapter 5: Computer organization

Chapter 6: Computer networks

Chapter 7: Operating systems

Chapter 8: Algorithms

Chapter 9: Programming languages

Chapter 10: Software engineering

Chapter 11: Data structures

Chapter 13: File structures

Tutorial Letter 102 contains information on the study material in the prescribed book (certain sections are excluded from the prescribed chapters), a summary, learning outcomes and explanatory notes for Appendix E, additional exercises, and errata for F&M.

A **summary** and list of **key terms** are given at the end of each chapter of the textbook. These are very useful for identifying the most important concepts covered in the relevant chapter.

In the School of Computing all students must have access to the Internet, but no references to interactive work (working on the computer or searches on the Internet) are obligatory.

3 LECTURERS AND CONTACT DETAILS

3.1 Lecturers

The best means to contact your lecturers is by email. The email address to use for Semester 1 is COS1521-12-S1@unisa.ac.za and for Semester 2 is COS1521-12-S2@unisa.ac.za

You can find the names of your lecturers, their contact details (including emails) and School of Computing contact information on myUnisa as follows:

- The lecturers of this module: Tutorial letter COSALLF for 2012
- Telephone numbers in the School: Tutorial letter COSALLF for 2012

You can also obtain lecturers' and school's contact information on http://osprey.unisa.ac.za.

The COS1521 discussion forum on myUnisa gives you the opportunity to discuss ideas and problems with fellow students. This forum is for the benefit of the students and the lecturers do not necessarily play an active part in the discussions. You can post queries regarding this module on the COS1521 discussion forum.

You are more than welcome to phone us, but please consult your tutorial letters or the relevant web sites first to see whether we have not already addressed your queries. Since most students encounter the same problems, we address the most common problems in the tutorial letters or web sites.

Remember, you may phone the lecturers directly. However, sometimes we are not available due to other School or University duties. The names and telephone numbers of the lecturers will be given in one of the COSALL tutorial letters that you will receive early in the semester. Should you have difficulty in contacting the lecturers, you are welcome to phone the secretary of the School of Computing at (012) 429-6122 to leave a message

Note that in respect of **all administrative enquiries**, the UCC (*Unisa Contact Centre*) must be contacted. The contact details are provided in the brochure the *my Studies @ Unisa*.

3.2 Department

See the information in Section 3.1

3.3 University

Unisa's Contact Centre numbers are as follows: 0861 670 411 (South Africa only) or +27 11 670 9000 (international calls). Staff at the Contact Centre will redirect calls as required. You will find general Unisa contact details in the *my Studies @ Unisa* brochure. Please remember to use your student number when contacting the University.

4 MODULE RELATED RESOURCES

4.1 Prescribed books

The prescribed book for this module is:

Forouzan, Behrouz & Mosharraf, Firouz. *Foundations of Computer Science*, 2nd edition. Cengage Learning (Thomson Learning), 2008. ISBN: 978-1-84480-700-0.

We refer to the prescribed book as F&M throughout this tutorial letter.

Tutorial Letter 102 contains notes on the study material in the prescribed book and also contains **supplementary study material**.

The prescribed book is **not** included with your study material. To obtain a copy of the prescribed book, please refer to the list of official booksellers and their addresses in the *my Studies @ Unisa* brochure.

Prescribed books can be obtained from the University's official booksellers. If you have difficulty in locating your book(s) at these booksellers, please contact the Prescribed Book Section at Tel: 012 429-4152 or e-mail vospresc@unisa.ac.za.

4.2 Recommended books

Should you wish to know more about a particular topic, you may consult any of the following books: (Please note that these books are not necessarily included in the Study Collection in the Unisa library. The library cannot guarantee that they will be available, nor draw up waiting lists for them. Exams and assignments will be solely based on the prescribed textbook.

CLEMENTS A. *The principles of computer hardware*, 3rd edition. Oxford University Press, Oxford, 2000.

O'BRIEN J.A. *Introduction to information systems*, 8th edition. Irwin Homewood, Burr Ridge Illinois, 1996.

HUTCHINSON S.E. and SAWYER S.C. *Computers, Communications & Information. A user's Introduction*, 7th edition. Irwin McGraw-Hill, Boston, 2000.

MARCOVITZ A.B. *Introduction to logic design*. McGraw-Hill Higher Education, Avenue of the Americas, New York, NY10020, 2002.

WILLIAMS B. K. and SAWYER S.C. Using Information Technology. A practical introduction to computers & communications, 5th edition. Irwin McGraw-Hill, Boston, 2003.

CAPRON H. L. and JOHNSON J.A. *Computers. Tools for an information age*, 7th edition. Prentice Hall, Upper Saddle River, New Jersey, 07458, 2002.

SHELLY G. and VERMAAT M.E. *Discovering computers 2010. Living in a digital world.* Course Technology, 20 Channel Center Street, Boston, MA 02210, USA, 2010.

4.3 Electronic Reserves (e-Reserves)

There are no e-Reserves for this module.

4.4 E-learning tutorial

There is an optional CAI-lesson namely *Karnaugh* available that we highly recommend.. It is available on the school's software CD. It deals with the simplification of Boolean expressions by means of *Karnaugh* maps (diagrams) and includes background material. This material is covered in Assignment 01 and the lesson can also help with examination preparation on this topic. The lesson is highly recommended by past students. Check the ICT2521 *myUnisa* home page if you need information on how to get this CD.

5 STUDENT SUPPORT SERVICES FOR THE MODULE

Important information appears in the *my Studies @ Unisa* brochure. For example, the tutorial services information is found in this brochure. Please constantly refer to this brochure. In addition this module is part of a science foundation programme (SFP).

SCIENCE FOUNDATION PROGRAMME

5.1 What is foundation provision?

Foundation provision is an extended additional teaching and learning intervention whose primary purpose is that of improving the success and graduation rate of identified "at-risk" students. Because Unisa is a higher education distance-learning institution, the extended additional teaching and learning intervention will include:

- the appointment of science-specific tutors to assist the “at-risk” student
- supporting “at-risk” students with academic learning gaps
- arranging peer-collaborative learning opportunities with fellow students on regional level.

5.2 What is the science foundation programme?

The SFP runs concurrently with normal science teaching and learning activities. It creates more opportunities for students to be exposed to the learning content and activities. For 2008 – 2012 the extended additional teaching and learning intervention will be limited to science students who register in the College of Science, Engineering and Technology and the College of Agriculture and Environmental Sciences in their first year. The foundation provision will be available for students registered for COS1521.

5.3 Who can participate in the SFP?

All new science students to Unisa adhering to specific SFP admission criteria are allowed into the SFP. Selection criteria that will identify “at-risk” students are determined taking into account the student’s M-count total; marks in school Mathematics, Physical sciences (and/or Biology, Physiology, etc.) and language subjects. A post-registration diagnostic test will further inform “at-risk” student of any academic literacy gaps. More information will be sent to you at a later stage.

5.4 How does a student gain admission to the SFP?

Once a student has been identified as “at risk”, she/he will automatically qualify for the SFP. Such students will be contacted by either the regional academic manager/coordinator or SFP tutor to inform the student of additional tutoring classes, peer-group learning classes or academic literacy sessions (Consult the *my studies @ Unisa* brochure for more information). These interventions will be provided at no additional cost.

5.5 Will participation in the SFP prove to be successful?

Given the extended and additional learning opportunities created by the SFP it is envisaged that the success rate of “at-risk’ students will be increased. Much of the success will be determined by the student’s willingness to spend additional time and effort to attend the tutoring classes, academic literacy sessions and peer-collaborative learning opportunities.

6 MODULE SPECIFIC STUDY PLAN

Use the *my Studies @ Unisa* brochure for general time management and planning skills.

FIRST SEMESTER STUDY PROGRAMME Take note of the order in which the assignments should be attempted.			
Week	**Date**	**Activities**	**Tutorial matter**
1	24/1 – 27/1		F&M, Chapters 1 & 2 Tutorial Letter 102, Units 1 & 2
2	30/1 – 3/2		F&M, Chapters 3 & 4; Appendix A Tutorial Letter 102, Units 3 & 4
3	06/2 – 10/2	Assignment Y Complete by 10 Feb. (**Do not submit**.)	F&M, Chapters 1 – 4; Appendix A Tutorial Letter 102, Units 1 – 4
4	13/2 – 17/2		F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
5	20/2 – 24/2		F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
6	27/2 - 02/3		F&M, Appendix E Tutorial Letter 102, Unit 4
7	05/3 – 09/3	Do Assignment 1. (Due date: 09 March.)	F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
8	12/3 - 16/3		F&M, Chapters 5 – 7 Tutorial Letter 102, Units 5 – 7
9	19/3 - 23/3		F&M, Chapters 5 – 7 Tutorial Letter 102, Units 5 – 7
10	26/3 – 30/3		F&M, Chapters 8 & 9 Tutorial Letter 102, Units 8 & 9
11	02/4 – 05/4	Do Assignment 02. (Due date: 07 April.)	F&M, Chapters 5 – 9 Tutorial Letter 102, Units 5 – 9 Start with F&M, Chapter 10 Tutorial Letter 102, Unit 10
12	10/4 – 13/4		F&M, Chapters 10, 11 & 13 Tutorial Letter 102, Units 10, 11 & 13
13	16/4 – 20/4	Assignment Z Complete by 17 April. (**Do not submit**.)	F&M, Chapters 10, 11, 13 & 14 Tutorial Letter 102, Units 10, 11, 13 & 14
14 - 15	23/4 – 03/5	Revision	
16 -19	04/05 – 04/06	Examinations	

SECOND SEMESTER STUDY PROGRAMME Take note of the order in which the assignments should be attempted.			
Week	Date	Activities	Tutorial matter
1	16/7 – 20/7		F&M, Chapters 1 & 2 Tutorial Letter 102, Units 1 & 2
2	23/7 – 27/7		F&M, Chapters 3 & 4; Appendix A Tutorial Letter 102, Units 3 & 4
3	30/7 – 03/8	Assignment Y Complete by 03 August **(Do not submit.)**	F&M, Chapters 1 – 4; Appendix A Tutorial Letter 102, Units 1 – 4
4	06/8 – 10/8		F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
5	13/8 – 17/8		F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
6	20/8 - 24/8		F&M, Appendix E Tutorial Letter 102, Unit 4
7	27/8 – 31/8	Do Assignment 1. (Due date 31 Aug.)	F&M, Chapter 4; Appendix E Tutorial Letter 102, Unit 4
8	03/9- 07/9		F&M, Chapters 5 – 7 Tutorial Letter 102, Units 5 – 7
9	10/9 – 14/9		F&M, Chapters 5 – 7 Tutorial Letter 102, Units 5 – 7
10	17/9 – 21/9		F&M, Chapters 8 & 9 Tutorial Letter 102, Units 8 & 9
11	24/9 – 28/9	Do Assignment 02. (Due date: 29 Sept.)	F&M, Chapters 5 – 9 Tutorial Letter 102, Units 5 – 9 Start with F&M, Chapter 10 Tutorial Letter 102, Unit 10
12	01/10 – 05/10		F&M, Chapters 10, 11 & 13 Tutorial Letter 102, Units 10, 11 & 13
13	08/10 – 12/10	Assignment Z Complete by 08 Oct. (**Do not submit.)**	F&M, Chapters 10, 11, 13 & 14 Tutorial Letter 102, Units 10, 11, 13 & 14
14	15/10 – 19/10	Revision	
15 - 18	21/10 – 21/11	Examinations	

7 MODULE PRACTICAL WORK AND WORK INTEGRATED LEARNING

None.

8 ASSESSMENT

We realise that it might be difficult to keep to given schedules, but the dates by which assignments must be submitted were scheduled by the academic planner so we have to adhere to these dates. Please do not contact us for extension of assignments submissions.

In the School of Computing all students must have access to the internet. Study material can therefore be downloaded if for some reason there is a delay in the sending of tutorial matter. The following URL can be accessed if you want to download tutorial matter: https://my.unisa.ac.za

8.1 Assessment plan

NO ASSIGNMENTS WILL BE ACCEPTED AFTER THE EXTENSION DATES.

There are four assignments:

Assignments Y and Z: These are self-assessment assignments **not** to be submitted;

Assignments to be submitted
Assignment 01: A written (or typed) assignment that will be marked by us; and
Assignment 02: A multiple-choice assignment that will be marked electronically.

All multiple-choice assignments, such as Assignment 02, are marked electronically by the Assignments Department. This means that this department has a specific date by which they feed all the submitted mark-reading sheets to the computer (batch processing). For this procedure to be successful, **no multiple-choice assignment received after the extension date will be accepted**.

Self-assessment Assignments
Two self-assessment assignments namely **Assignment Y** and **Assignment Z** are provided for both the first and the second semester. **Do not submit these assignments.** You will receive model solutions for these assignments early in the semester. **Assignment Y should be attempted before Assignment 01 and Assignment Z after Assignment 02.**

You will get a ***semester mark*** based on the percentages you achieve for Assignments 01 and 02. The semester mark will contribute 10% towards your final mark for this module. A semester mark does not contribute to the result of a student writing a supplementary examination. It will contribute in the case of an aegrotat examination. A discussion of the way in which the semester mark is calculated, follows.

According to the assessment policy of the University, the School of Computing uses a semester mark to contribute to your final mark for COS1521. The semester mark will count

10% towards your final mark. A weight of 50% towards the year mark is allocated to each of the two assignments (Assignments 01 and 02). No weights are assigned to Assignments Y and Z. We use an example to explain.

Suppose you obtained the following marks for your assignments:
Assignment 01 70%
Assignment 02 90%

Your semester mark will be calculated as follows:

(70 × 0.5)+(90 × 0.5)% = 80%, where 0.5 (50%) is the weight associated with Assignments 01and 02 respectively.

Suppose you achieve an ***exam mark*** of 74%. Your ***final mark*** will be calculated as follows:
(80 × 0.10) + (74 × 0.90)% = (8 + 66.6)% = 74.6% that will be rounded to 75%.

Due dates are given for Assignments 01 and 02, but extension dates are also provided if you cannot submit the assignments by the due dates. Please do not contact us for further extension. Assignments that are posted at a regional campus must be posted well in advance of the due dates. Please note that it is your responsibility to make sure that your assignments reach the University. Also make sure that your marks for Assignments 01 and 02 are incorporated in your semester mark before you write the examination.

Since most students of all semester modules will probably try to submit their assignments around dates scheduled by the academic planner (corresponding to the extension dates for your assignments), we advise that you submit your assignments before or on the due dates.

Note that if myUnisa is down on the last submission date, or if assignments are posted in good time in Unisa post boxes but are registered on myUnisa after the due date for some logistical reasons, the academic planner and lecturers will be notified.

Please do not contact lecturers if any of these problems occur since any problem situation shall be taken into consideration.

You are welcome to work together in small groups because it can be very useful and stimulating. However, it is important that you complete your own assignment because it is dishonest and unethical to submit the work of somebody else as your own.

Plagiarism is the act of taking words, ideas and thoughts of others and passing them off as your own. It is a form of theft which involves a number of dishonest academic activities. Students are advised to study the *Disciplinary Code for Students* (2004) that is given to all

students who register. Take note of Sections 2.1.13 and 2.1.14 (2004: 3-4). Also take note of the University's *Policy on Copyright Infringement and Plagiarism*.

8.2 General assignment numbers

8.2.1 Unique assignment numbers

Semester 1	
Assignment	**Unique assignment number**
01	**721313**
02	**768850**

Semester 2	
Assignment	**Unique assignment number**
01	**869426**
02	**710279**

8.2.2 Due dates of assignments

First semester		
Assignment	**Due date**	**Weight towards semester mark**
01	**09 March**	**50%**
02	**07 April**	**50%**
Second semester		
Assignment	**Due date**	**Weight towards semester mark**
01	**31 August**	**50%**
02	**29 September**	**50%**

SELF-ASSESSMENT ASSIGNMENTS FOR FIRST AND SECOND SEMESTERS		
SELF-ASSESSMENT ASSIGNMENTS	**COMPLETION DATE**	**WEIGHT**
Assignment Y (Self-assessment)	**First semester: 10 February** **Second semester: 03 August** (**Not to be submitted. Attempt this assignment before Assignment 01.**)	–
Assignment Z (Self-assessment)	First semester: 17 April Second semester: 08 October (**Not to be submitted. Attempt this assignment after Assignment 02.**)	–

8.3 Submission of assignments

You may submit written assignments and assignments completed on mark-reading sheets either by post **or** Mobile MCQ submission **or** electronically via *my*Unisa. Assignments may not be submitted by fax or e-mail.

For detailed information on assignments, please refer to the *my Studies @ Unisa* brochure, which you received with your study package.

To submit an assignment via *my*Unisa:

- Go to *my*Unisa.
- Log in with your student number and password.
- Select the module.
- Click on assignments in the menu on the left-hand side of the screen.
- Click on the assignment number you wish to submit.
- Follow the instructions.

8.4 Assignments to be done

There are four assignments:

Assignments Y and Z: These are self-assessment assignments **NOT** to be submitted but must be attempted

Assignment s 01 and 02 are to be submitted. See all the assignments from page 18.

9 EXAMINATIONS

FIRST SEMESTER: In order to be considered for the **first semester examination admission** in COS1521, a student **must submit Assignment 01 by 12 March 2012.**

SECOND SEMESTER: In order to be considered for the **second semester examination admission** in COS1521, a student **must submit Assignment 01 by 03 September 2012.**

There will be a two hour examination at the end of the semester. The format of the exam and its scope will be sent to you during the semester. Supplementary exams will be done at the end the semester following the semester in which you sat for the exam. This is the case with aegrotat examination. Please do not contact the lecturer for supplementary or aegrotat exams rather refer to the *my Studies @ Unisa* brochure for guidelines. Read the *my Studies @ Unisa* brochure for general examination guidelines and examination preparation guidelines.

The assignments and the examination letter provided to you contain enough examples of the type of questions that you can expect in the examination. We therefore request you not to contact the lecturers of this module for past paper examination papers or their solutions if there are none on myUnisa.

Note that the examination mark contributes 90% towards your final mark and the semester mark contributes the other 10%. See section 8.1 for a calculation of the final mark. If you fail the examination with less than 40%, the year mark will **not** count to pass you.

10 OTHER ASSESSMENT METHODS

None.

11 FREQUENTLY ASKED QUESTIONS

The *my Studies @ Unisa* brochure contains an A-Z guide of the most relevant study information. Please refer to this brochure.

12 ASSIGNMENTS

ASSIGNMENTS FIRST AND SECOND SEMESTERS

SELF-ASSESSMENTS

12.1 SELF-ASSESSMENT ASSIGNMENT Y

(Attempt this assignment before Assignment 01.)

Completion date: 10 February 2012 (First semester) **(Not to be submitted.)**

03 August 2012 (Second semester) **(Not to be submitted.)**

Study material: F&M: Chapters 1 – 4; Appendix A

Tutorial Letter 102: Units 1 – 4

Semester-mark weight: -

DO NOT SUBMIT

Do not submit Assignment Y.

Question 1

Provide a detailed answer to each of the following questions:

(a) List the four subsystems comprising a machine based on the von Neumann model.
(b) What does the concept ‘a stored program’ mean?
(c) What are the two important aspects of programming that must be understood when we consider the von Neumann model?
(d) Why does it make sense that data and program instructions have the same format?
(e) What is a computer program?
(f) Describe in your own words what an algorithm is.
(g) What is meant by the term ‘software engineering’ as defined in the context of the textbook?
(h) List some of the main functions of an operating system.

(i) Compare and contrast the memory contents of early computers with the memory contents of a computer based on the von Neumann model.

(j) According to the von Neumann model, can the hard disks of today be used as input or output device? Explain.

Question 2

Convert the following numbers to decimal:

(a) $(10101.1)_2$

(b) $(1010011.01)_2$

(c) $(517)_8$

(d) $(710.01)_8$

(e) $(A9F)_{16}$

(f) $(B08.4)_{16}$

Question 3

Convert the following decimal numbers to binary, octal and hexadecimal:

(a) 613.625 (b) 120.25

Question 4

Why is 845,3 not an octal number?

Question 5

Do the following binary arithmetic:

(a) 10111 + 1111 (b) 110100 - 10011

Question 6

What are the disadvantages of the sign-and-magnitude representation?

Question 7

Write down the following numbers in binary, normalised floating-point representation:

(a) 78.43 (b) 1.39×10^2

Question 8

What is the result if a logical right-shift operation is applied to the bit pattern 11001111?

Question 9

Using an 8-bit allocation, use two's complement arithmetic to determine -15 + 12.

12.2 SELF-ASSESSMENT ASSIGNMENT Z

(Attempt this assignment after Assignment 02.)

Completion date: 17 April 2012 (First semester) **(Not to be submitted.)**

08 October 2012 (Second semester) **(Not to be submitted.)**

Study material: F&M: Chapters 10, 11, 13 & 14

Tutorial Letter 102: Units 10, 11, 13 & 14

Semester-mark weight: -

DO NOT SUBMIT

Select an alternative which you consider to be the most appropriate. **Do not submit Assignment Z.**

Question 1

If we use the _____ model of systems development, an entire phase of the project is completed before the next phase starts.

1. incremental
2. black box
3. progressive
4. waterfall

Question 2

_____ is a measure of how tightly two modules in a software system are bound to each other.

1. Coupling
2. Interaction
3. Cohesion
4. Interoperability

Question 3
Which one of the following is NOT one of the factors that comprise the operability of a system?

1. flexibility
2. security
3. efficiency
4. timelines

Question 4
The concept of testing a program without knowing what is inside or how it works, is known as ____ testing.
1. black box
2. white box
3. transparent
4. encapsulation

Question 5
The development process in the software life cycle involves four phases. Which one of the following is NOT among them?

1. design
2. implementation
3. analysis
4. remediation

Question 6
_____ is a tool for visualising the relationships among classes in an object-oriented system.
1. UML
2. A class diagram
3. A structure chart
4. The quality circle

Question 7
The software life cycle ends when:

1. a software package is delivered.
2. the testing phase is complete.
3. a program is deemed correct.
4. a software package becomes obsolete.

Question 8
In an array, the _____ indicates the ordinal number of an element in the array counting from the beginning of the array.

1. dimension
2. place number
3. index
4. subscript

Question 9
A record is:

1. a collection of related items, possibly of different types, having a single name.
2. one component of a field.
3. a collection of character strings.
4. a collection of related items of the same type having a single name.

Question 10
A_____ is the smallest element of named data in a record that has meaning.

1. variable
2. string
3. field
4. data item

Question 11
Each element of a single linked list contains two parts, namely the _____ and the _____.

1. forward link, backward link
2. pointer, variable
3. forward link, record
4. data, link

Question 12
A list consisting of only a null head pointer

1. contains only one node.
2. is empty.
3. contains only one node plus a pointer.
4. contains only backward pointers.

Question 13
A two-dimensional array:

1. consists of a couple of elements that are linearly arranged.
2. has more than one plane of data.
3. is used to hold both character and text strings.
4. consists of rows and columns.

Question 14
A record is a type of data structure. Which one of the following statements regarding a record is NOT TRUE?

1. The elements in a record can be of the same data type.
2. The elements in a record can be of different data types.
3. All elements in a record are related.
4. Each element in a record contains two parts, namely data and an address.

Question 15
In a(n) _____, the data is organised linearly in one direction.

1. multidimensional array
2. two-dimensional array
3. one-dimensional array
4. one-dimensional record

Question 16
If a two-dimensional array is stored in memory with the first column of elements ‘to the left’ and the last column ‘to the right’, this is known as _____ storage.

1. column-major
2. multi-dimensional
3. row-major
4. item-major

Question 17
If we step through a list visiting each node in succession this is known as list:

1. sequential processing
2. traversal
3. visitation
4. implementation

Question 18
With regard to the updating of sequential files, the new master file contains the _____ data.

1. changed
2. permanent
3. transaction
4. most current

Question 19
Random access to individual records is allowed if we use _____ files or _____ files.

1. hashed, transaction
2. indexed, master
3. hashed, indexed
4. inverted, transaction

Question 20
For an update program to run efficiently, all the files need to be sorted. If the keys of the transaction file and the master file are compared and the key of the transaction file is less than that of the master file, the following happens:

1. The data is written (unchanged) from the old master file to the transaction file.
2. If the transaction is a deletion, the data is removed from the master file.
3. If the transaction is an update or a revision, the contents of the data in the old master file are changed and the updated data written to the new master file.
4. The data contained in the transaction is written to the new master file.

Question 21
When a sequential file needs to be updated, the _____ file in storage becomes the _____ file.

1. transaction, new master
2. new master, old master
3. old master, new master
4. new master, transaction

Question 22
When the _____ hashing method is used, the key is divided by the file size, and the remainder
+ 1 is used for the address.

1. direct
2. digit extraction
3. modulo division
4. pseudo-random

Question 23
A(n) _____ occurs when a hashing algorithm produces an address for an insertion key and that address is already occupied.

1. conflict
2. resolution
3. open address
4. collision

Question 24
When we use hashed files a _____ is used to map a key to a unique address.

1. correspondence
2. relation
3. association
4. function

Question 25
A(n) _____ file is a file stored in the internal format of the computer.

1. text
2. ASCII
3. binary
4. Unicode

Question 26

The following are files that are associated with the updating of sequential files:

A. a new master file
B. an old master file
C. an inverted file
D. a transaction file
E. an error report file

Alternatives:

1. A, B, C, D and E.
2. Only A and B.
3. Only A, B and D.
4. Only A, B, D and E.

Question 27

One of the advantages of an indexed file is that there can be more than one index, each with a different key. This type of file is usually called a(n) _____ file.

1. inverted
2. two-dimensional indexed
3. binary
4. multi-frequency

Question 28

Consider the following statements:

A. The distributed database model is based on the relational database model.
B. Data is localised in a fragmented database.
C. In a replicated database each site contains an exact replica of another site.
D. An object-oriented database attempts to retain the advantages of the relational model thus it does not allow users access to structured data.

Choose the correct alternative:

1. Only A and B are false.
2. Only A, B and C are true.
3. Only C and D are false.
4. Only A, C and D are true.

Question 29
Within a relational database (RDB) it is possible to define many operations that can be used to create new relations from existing ones. Consider the following statements regarding operations on relations in the RDB context and choose the one that is NOT TRUE.

1. The intersection, difference and project operations on relations are binary operations.
2. The select, insert and delete operations are unary operations.
3. The join operation is a binary operation.
4. The update operation is a unary operation.

Question 30
In a _____ database model, data are organised as an upside-down tree.

1. hierarchical
2. binary tree
3. network
4. distributed

Question 31
In a _____ database model, the entities are organised in a graph, where some entities can be accessed through several paths.

1. hierarchical
2. binary tree
3. network
4. relational

Question 32
In a relational database model, each column in a relation is called a(n):

1. attribute
2. relation
3. record
4. list

Question 33
The total number of rows in a relation is called the _____ of the relation.

1. depth
2. cardinality
3. size
4. length

Question 34
SQL is a(n) _____ programming language used for queries on relational databases.

1. functional
2. declarative
3. imperative
4. object-oriented

Question 35
The ANSI-SPARC developed a _____ level architecture for a database management system. This consists of the following levels:

1. four; internal, conceptual, external and hierarchical
2. two; internal and external
3. two; conceptual and external
4. three; internal, conceptual and external

FIRST SEMESTER ASSIGNMENTS

12.3 FIRST SEMESTER: ASSIGNMENT 01

Due date: 09 March 2012

Extension date: 12 March 2012

Study material: F & M: Chapter 4; Appendix E

Tutorial Letter 102: Unit 4

Do the relevant exercises in F&M and Tutorial Letter 102 before attempting this assignment.

Submission procedure: Written or via myUnisa.(see section 8.3)

Year-mark weight: 50

Unique assignment number: **721313**

- Submit your assignment via *myUnisa* by the due date or post your assignment in good time so that it will **reach** Unisa by the due date. Do not be concerned if *myUnisa* is down on the last submission date. We are notified and shall take this type of delay into consideration.
- **Tutorial Letter 102** contains some exercises with solutions and explanatory notes for Appendix E.
- Provide detailed solutions to all the questions. It is possible that not all questions will be marked. We will decide in advance which of them (or all) to mark and you will not be informed about the decision.
- The mark that you achieve from a possible 30 marks will be converted to a **percentage** and will contribute towards your semester mark.
- **Assignment Y should be attempted before Assignment 01.**

FIRST SEMESTER ASSIGNMENT 01 Total: [30]

Question 1 **[4]**

(a) Use the XOR operator on the bit patterns 100110101 and 101010011.
(Determine 100110101 XOR 101010011.)

(b) Determine 1101101 + 1000110 in binary.

(c) A 6-bit digital counter can be made up of _____ T flip-flops. At the start the counter represents _____.

Question 2 **[4]**

Draw the logic circuit for the following Boolean expression (do not simplify the expression):

$F(x, y, w) = [(x' + y + w) + xy]' \oplus w'$

(The circuit should include one OR gate, one AND gate, one NOR gate, one XOR gate and two inverters. Draw all the gates clearly.)

Question 3 **[8]**

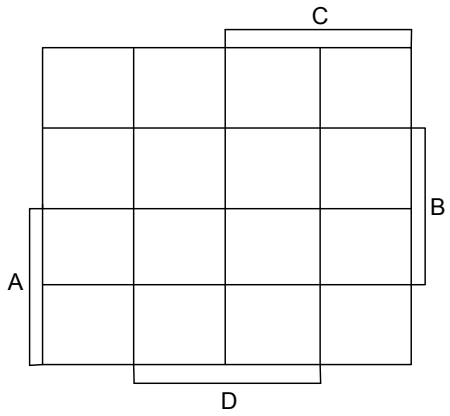
Use only Boolean algebra to simplify the Boolean expression F. (First determine F_1 and F_2, then simplify $F_1 + F_2$, showing all the steps. You need not provide the names of the Boolean rules that you apply.)

$F_1 = x'(wy')' + x'wy'$
$F_2 = (xw + w')'$
$F(w, x, y) = F_1 + F_2$.

Question 4 **[5]**

Use a *Karnaugh* map to find the simplest form of
$H(A, B, C, D)) = m_0 + m_1 + m_2 + m_3 + m_5 + m_6 + m_8 + m_9 + m_{13}$.

Derive the terms of H directly from the *Karnaugh* map without making use of algebraic manipulations or truth tables. Clearly show the groupings.
Use exactly the same order for the variables as given in the following diagram:



Question 5 **[9]**

Four types of package (A, B, C and D) with chemicals are supplied to research laboratories. Each package contains unique types of chemicals.
Package A contains 3 different types of chemicals,
Package B contains 6 different types of chemicals,
Package C contains 5 different types of chemicals and
Package D contains 2 different types of chemicals.

Suppose the input variables A, B, C and D in a truth table take on the value 1 whenever a laboratory receives a package with chemicals. For example, if A = 0, B = 1, C = 0 and D = 1, it means that a laboratory receives packages B and D.

Construct a truth table (use the same order for the variables as in the table given here) to determine the Boolean function F(A, B, C, D) that gives a 1 whenever a laboratory receives more than 11 different types of chemicals.

Give F as a sum-of-minterms in m-notation.

A	**B**	**C**	**D**	**F**	minterms
0	0	0	0		
0	0	0	1		
0	0	1	0		
0	0	1	1		
0	1	0	0		
0	1	0	1		
0	1	1	0		
0	1	1	1		
1	0	0	0		
1	0	0	1		
1	0	1	0		
1	0	1	1		
1	1	0	0		
1	1	0	1		
1	1	1	0		
1	1	1	1		

Multiple-choice review exercises

Note: Please do not submit your answers to these exercises as they will not be marked. Each exercise has one correct alternative. You can compare your answers to the model solutions that you will receive in Tutorial Letter 201.

NB Your answers to these exercises should not be submitted.

Exercise 1

Which logic gate has an output of 1 only if it has two inputs that are not equal?

A. OR
B. XNOR
C. NAND
D. XOR

Exercise 2

How many adjacent minterms must be grouped together in a four variable *Karnaugh* map to derive a simplified term consisting of three variables?

A. 8
B. 4
C. 2
D. 1

Exercise 3

In which category of logic circuits does a flip-flop fall?

A. combinational circuits
B. sequential circuits
C. adders
D. multiplexers

Exercise 4

A three-bit digital counter counts from 0 to _____.

A. 16
B. 15
C. 8
D. 7

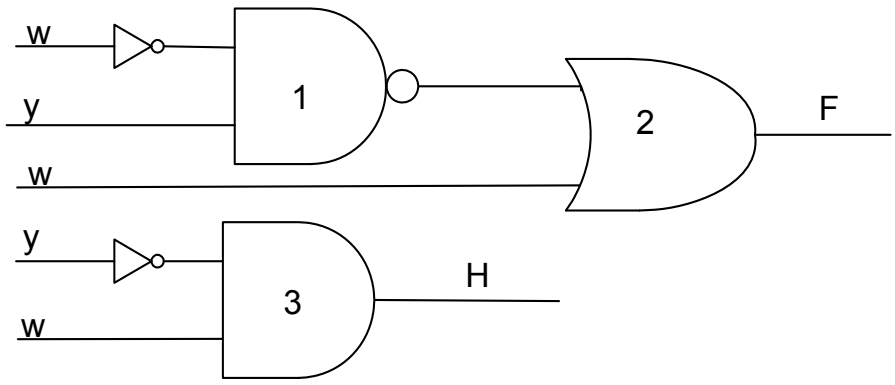
Exercise 5

Which one of the following statements best describes a multiplexer?

A. A combinational circuit that has *n* inputs and *n* outputs.
B. A combinational circuit that has *n* inputs and only 1 output.
C. A sequential circuit that has *n* inputs and *n* outputs.
D. A sequential circuit that has *n* inputs and *n* − 1 outputs.

Exercise 6

Consider the following two logic circuits:



These two logic circuits are not equivalent. The outputs are F = (w'·y)' + w and H = y'·w. One of the four gates must be changed in order for the circuits to become equivalent. Which gate must be changed and what kind of gate must it become?

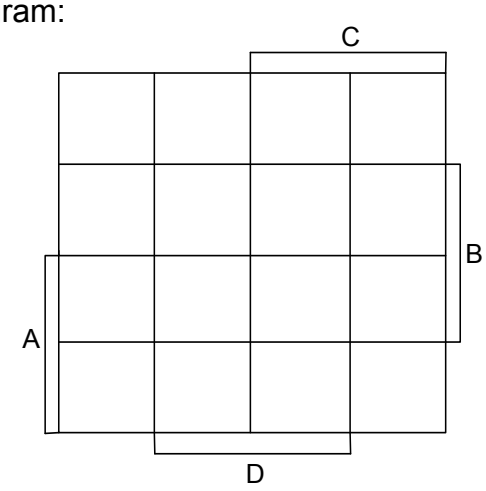
A. Gate 1 must change to a NOR gate.
B. Gate 1 must change to an OR gate.
C. Gate 3 must change to a NAND gate.
D. Gate 3 must change to an OR gate.

Exercise 7

Use a *Karnaugh* map to find the simplest form of the following sum-of-minterm expression:

$$F(A, B, C, D) = m_1 + m_6 + m_7 + m_9 + m_{10} + m_{14} + m_{15}$$

Derive the terms of F directly from the *Karnaugh* map without making use of algebraic manipulations or truth tables. Use exactly the same order for the variables as given in the following diagram:

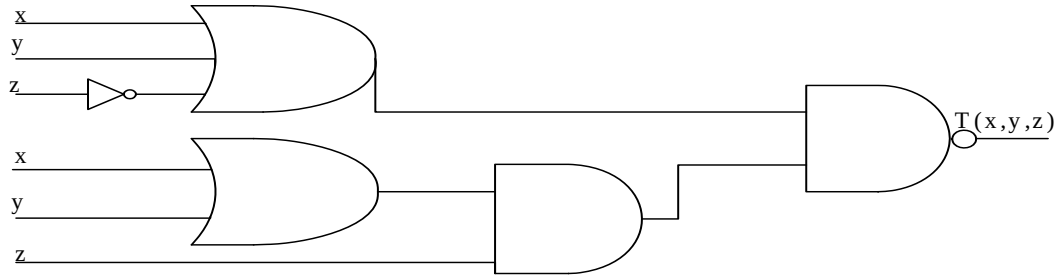


What is the simplified expression of F, derived directly from the *Karnaugh* map?

A. F = AB'CD' + B'C'D + BC
B. F = B'C'D + ACD' + BC
C. F = B'C'D + BCD + CD'
D. F = AB'C'D' + A'B'C'D' + ACD' + BC

Exercise 8

Consider the following logic circuit:



What is the final output T(x, y, z) of the given logic circuit?

A. T = (x + y + z')' + ((x + y) · z)'
B. T = [(x · y · z') + ((x · y) + z)]'
C. T = (x + y + z')' · ((x + y) · z)'
D. T = [(x + y + z') · ((x + y) · z)]'

Exercise 9

Consider the expression F = (xy')' · **[**x'z**]** + (x'' + y').
If x = 1, y = 0 and z = 1, what are the values of (xy')'; **[**x'z**]**; (x'' + y') and F?

A. (xy')' = 0; **[**x'z**] = [**0**]**; (x'' + y') = (1) and F = 1
B. (xy')' = 0; **[**x'z**] = [**1**]**; (x'' + y') = (0) and F = 0
C. (xy')' = 1; **[**x'z**] = [**0**]**; (x'' + y') = (1) and F = 1
D. (xy')' = 1; **[**x'z**] = [**1**]**; (x'' + y') = (0) and F = 0

Exercise 10

Use only Boolean algebra to simplify the following Boolean expression: F(v, w, x) = vxw' + (vxw')'
What is the simplest form of F?

A. vxw' + v' + x' + w'
B. w'(vx + (vx)')
C. 0
D. 1

II---oooOooo---II

12.4 FIRST SEMESTER: ASSIGNMENT 02

Due date:	07 April 2012
Extension date:	10 April 2012
Study material:	F&M: Chapters 5 – 9
	Tutorial Letter 102: Units 5 - 9
Submission procedure:	Mark-reading sheet (post) **or** Mobile MCQ submission **or**
	electronically via *my*Unisa. See section 8.3
Year-mark weight:	50

Please read the instructions for the completion of mark-reading sheets in *the my studies @ Unisa* very carefully.

A UNIQUE ASSIGNMENT NUMBER

is allocated to this assignment. If you enter this number incorrectly on the mark-reading sheet, we cannot guarantee that your assignment will be marked. Errors made on mark-reading sheets cannot be corrected by the lecturer, as the entire marking process is handled by the Assignment Section.

Unique assignment number: **768850**

- Each multiple-choice question has four possible answers. You should select the alternative you consider to be the most appropriate, and mark the sheet accordingly.
- Before submitting the assignment, first check that
  - all details are filled in correctly on the sheet;
  - the unique assignment number is filled in correctly;
  - the mark-reading sheet is completed with an HB pencil if you are submitting by post.
- N.B.: Submit your assignment via *myUnisa* by the due date or post your assignment in good time so that it will **reach** UNISA by the due date. Do not be concerned if *myUnisa* is down on the last submission date. We are notified and shall take this type of delay into consideration.
- **Assignment Z should be attempted after Assignment 02.**

FIRST SEMESTER ASSIGNMENT 02

Question 1

Which of the following make up the broad categories of computer hardware?

A. Central processing unit (CPU)
B. Arithmetic and logic unit (ALU)
C. Main memory
D. Input / output subsystem
E. Control Unit

Alternatives:

1. Only A, B and C
2. Only A, C and D
3. Only B, C and E
4. A, B, C, D and E.

Question 2

A computer has 1024 MB (1 gigabytes) of memory. Each word in this computer is 64 bytes. How many bits are needed to address each word in memory?

1. 6
2. 24
3. 30
4. 64.

Question 3

Memory-mapped I/O is one of the methods that handle the addressing of I/O devices. Which one of the following properties regarding the memory-mapped I/O method is a disadvantage of this method?

1. The CPU treats each register in the input/output controller as a word in memory.
2. It uses a smaller number of instructions as compared to the isolated I/O method.
3. Part of the memory address space is allocated to registers in I/O controllers.
4. All the memory instructions can be used by the input/output devices.

Question 4

Three methods have been devised for the synchronisation of the operation of the CPU with input/output devices. Identify the methods by using the following descriptions:

i	The CPU informs the I/O device that a transfer is going to happen, but it does not test the status of the I/O device continuously.
ii	A large block of data is transferred between a high-speed I/O device and memory directly.
iii	The I/O device and the transfer of data between them are done by an instruction in the program.

1. (i) interrupt-driven I/O; (ii) direct memory access; (iii) programmed I/O.
2. (i) programmed I/O; (ii) interrupt-driven I/O; (iii) direct memory access.
3. (i) direct memory access; (ii) interrupt-driven I/O; (iii) programmed I/O.
4. (i) interrupt-driven I/O; (ii) programmed I/O; (iii) direct memory access

Question 5

Which of the following optical devices has the highest data storage capacity?

1. CD-R
2. CD-RW
3. DVD single-sided, dual-layer
4. DVD double-sided, single-layer

Question 6

A network must meet a certain number of criteria. Identify the three most important criteria by using the following descriptions:

i	_____ can be measured in many ways, including transit time and response time.
ii	_____ protects data from unauthorised access, damage and development, and implementing policies and procedures for recovery from breaches and data losses.
iii	_____ is measured by the frequency of failure, the time it takes a link to recover from failure, and the network's robustness in a catastrophe.

1. (i) Performance; (ii) Reliability; (iii) Security.
2. (i) Performance; (ii) Security; (iii) Reliability.
3. (i) Reliability; (ii) Security; (iii) Performance.
4. (i) Security; (ii) Performance; (iii) Reliability.

Question 7
Which one of the following statements is NOT TRUE about basic network topologies?

1. In a ring topology, a signal can be passed in only one direction.
2. In a bus topology, nodes are connected to the bus cable by drop lines and taps.
3. In a mesh topology, every device has a dedicated point-to-point link to one other device.
4. In a star topology, each device has a dedicated point-to-point link only to the hub.

Question 8
What is the MAIN factor that differentiates a local area network (LAN) from a wide area network (WAN)?

1. The number of computers on a network.
2. The speed (bandwidth) of a network.
3. The number of nodes on a network.
4. The size of the geographical area covered by a network.

Question 9
Which one of the following components is NOT required in order to use the World Wide Web (WWW)?

1. Browser
2. Web server
3. Hypertext Transfer Protocol (HTTP)
4. Facebook

Question 10
There are several layers in the TCP/IP protocol suite. What is the transport layer responsible for?

1. Logical delivery of a message between client and server processes.
2. The delivery of individual packets from the source host to the destination host.
3. Providing service to the user.
4. The movements of individual bits from one node to the next.

Question 11
Which one of the following is NOT part of an operating system?

1. Hardware manager
2. Process manager
3. Memory manager
4. User interface

Question 12
In which of the following states can a process be?
A. hold
B. ready
C. running
D. waiting
E. terminated.

Alternatives:
1. A, B, C, D and E.
2. Only B, C and D.
3. Only A, B and D.
4. Only A and E.

Question 13
Which of the following is NOT a necessary condition for a deadlock to occur?

1. Mutual exclusion
2. Circular waiting
3. Resource holding
4. Starvation

Question 14
When _____ is/are used, the program is divided into pages and the memory into frames. This technique does not require the complete program to be in memory for execution. The required page can be loaded into any free frame.

1. segmentation
2. paging
3. demand paging and segmentation
4. demand paging

Question 15
An operating system (OS) is designed as a modular architecture with several layers. What attribute is given to this type of design?

1. Reliability
2. Compatibility
3. Extensibility
4. Portability

Question 16
Partitioning is one technique used in multiprogramming. Which one of the following statements regarding partitioning is NOT TRUE?

1. When a program is being run, no other program can be executed.
2. Priority levels can be used to control the amount of the CPU time allocated to each program.
3. Memory is divided into variable-length memory blocks.
4. Each program is entirely loaded in memory.

Question 17
A certain multiprogramming operating system uses a partitioning scheme and divides the 512 MB of available memory into three partitions of 140 MB, 172 MB and 200 MB respectively. The first program to run needs 163 MB and occupies the second partition. The second program needs 113 MB and occupies the first partition. The third program needs 108 MB and occupies the third partition. What percentage of memory is wasted?

1. 25
2. 27
3. 92
4. 128

Question 18
Which of the following specifically refers to a situation where resources are shared between different jobs, with each job being assigned a portion of time to use a resource?

1. Real processing
2. Time-sharing
3. Batch processing
4. Distributed processing

Question 19
Which of the following is NOT a 'basic' algorithm in computer science, according to *F & M*?

1. Product
2. Searching
3. Summation
4. Selection

Question 20
Suppose a list contains the following elements:

63 13 48 6 81 93 4 66

What is the order of the elements in the list after two passes if selection sort is used?
1. 4 6 13 48 81 93 63 66
2. 4 6 13 48 63 66 81 93
3. 4 6 13 48 81 93 13 66
4. 4 6 48 13 81 93 63 66

Question 21
A list contains the following elements:

8 15 19 21 37 41 49 64 71 77 88 111 120

At the beginning, *first* = 1, *mid* = 7 and *last* = 13. What are the values of *first, mid* and *last* respectively after two iterations of the binary search algorithm if the goal is 21?

1. 11, 12, 13
2. 1, 3, 6
3. 4, 5, 6
4. 1, 7, 13

Question 22
By using subalgorithms, an algorithm is made _____

1. more efficient.
2. more cumbersome.
3. faster.
4. more understandable.

Question 23
Consider Algorithm 8.2, page 220, in Chapter 8 of *F & M*. What will the output be for an input of 69?

1. nopass
2. pass
3. 69
4. fail

Question 24
A list contains the following elements:

3 12 6 23 17 20 87 59

The first two elements have been sorted using insertion sort. What is the value of the elements in the list after three more passes of insertion sort?

1. 3 6 12 17 23 20 87 59
2. 3 6 12 23 17 20 87 59
3. 3 12 6 23 17 20 87 59
4. 3 6 12 17 20 23 59 87

Question 25
Which of the following is described as a pictorial representation of an algorithm in *F & M*?

1. Pseudocode
2. UML
3. A subroutine
4. A Gantt chart

Question 26
When a high-level program is translated into a machine language it becomes a (n) _____program.

1. source
2. string
3. text
4. object

Question 27
Which of the following is NOT TUE about a machine language?

1. It is tedious to write programs in this language.
2. The program written in it truly represents how data is manipulated by the computer.
3. It is difficult to find errors in programs written in this language.
4. The era of machine languages is referred to as the third generation of programming languages.

Question 28
In which one of the following languages can a program be an application or an applet?

1. FORTRAN
2. C^{++}
3. Java
4. COBOL

Question 29
An assembler is used to translate a code from (i) _____ language into (ii) _____ language.

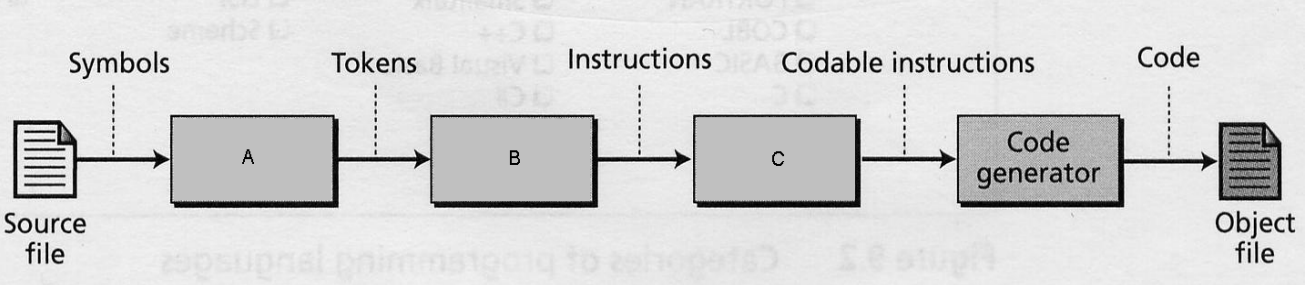
1. (i) machine (ii) assembly
2. (i) English (ii) assembly
3. (i) assembly (ii) machine
4. (i) English (ii) machine

Question 30
Which of the following supports object-oriented programming?

1. C#
2. FORTRAN
3. C
4. Pascal

Question 31

Which different analyzers (depicted as A, B and C in the following diagram) take part in the source code translation process in which the source file is converted into an object file?



1. (A) syntax; (B) semantic; (C) lexical
2. (A) lexical; (B) syntax; (C) semantic
3. (A) lexical; (B) semantic; (C) syntax
4. (A) syntax; (B) lexical; (C) semantic

Question 32

In object-oriented programming, defining several operations with the same name that can do different things in related classes is known as _____.

1. polymorphism
2. encapsulation
3. inheritance
4. encryption

Question 33

In the Scheme version of LISP, if A = (23 35 88 107 250 444) then (car(cdr (cdr (cdr A)))) would give a result of:

1. 88
2. 107
3. 250
4. 444

Question 34

One of the famous declarative languages is _____.

1. Smalltalk
2. Java
3. Prolog
4. Scheme

Question 35

To what computer language paradigm does LISP belong?

1. functional
2. procedural
3. object-oriented
4. descriptive

NB: Have you filled in the unique assignment number for this assignment correctly?

II---oooOooo---II

SECOND SEMESTER ASSIGNMENTS

12.5 SECOND SEMESTER: ASSIGNMENT 01

Due date: 31 August 2012

Extension date: 03 September 2012

Study material: F & M: Chapter 4; Appendix E

Tutorial Letter 102: Unit 4

Do the relevant exercises in F&M and Tutorial Letter 102 before attempting this assignment.

Submission procedure: Written or via myUnisa (see section 8.3)

Year-mark weight: 50

Unique assignment number: **869426**

- Submit your assignment via *myUnisa* by the due date or post your assignment in good time so that it will **reach** Unisa by the due date. Do not be concerned if *myUnisa* is down on the last submission date. We are notified and shall take this type of delay into consideration.
- **Tutorial Letter 102** contains some exercises with solutions and explanatory notes for Appendix E.
- Provide detailed solutions to all the questions. It is possible that not all questions will be marked. We will decide in advance which of them (or all) to mark and you will not be informed about the decision.
- The mark that you achieve from a possible 30 marks will be converted to a **percentage** and will contribute towards your semester mark.
- **Assignment Y should be attempted before Assignment 01.**

SECOND SEMESTER ASSIGNMENT 01 Total: [30]

Question 1 **[4]**

(a) Use the OR operator on the bit patterns 110110011 and 101011001.
(Determine 110110011 OR 101011001.)

(b) Determine $(1251)_8 + (567)_8$ in octal.

(c) A 6-bit digital counter counts from _____ to _____.

Question 2 **[4]**

Draw the logic circuit for the following Boolean expression (do not simplify the expression):

$F(x, y, w) = [(xy' \oplus (x'y)']' + w$

(The circuit should include one AND gate, one NAND gate, one XNOR gate, one OR gate and two inverters. Draw all the gates clearly.)

Question 3 **[8]**

Use only Boolean algebra to simplify the Boolean expression F. (First determine F_1 and F_2, then simplify $F_1 + F_2$, showing all the steps. You need not provide the names of the Boolean rules that you apply.)

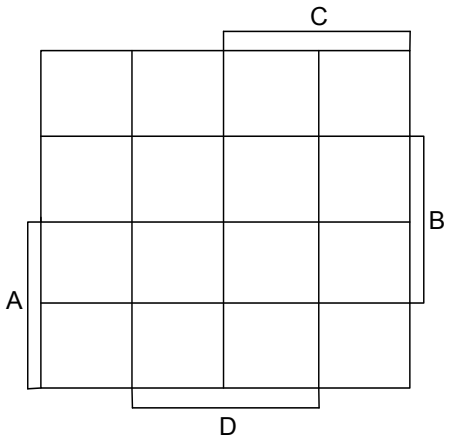
$F_1 = ywx' + yw'x'$
$F_2 = (y' + xw)'$
$F(w, x, y) = F_1 + F_2$.

Question 4 **[5]**

Use a *Karnaugh* map to find the simplest form of

$H(A, B, C, D) = m_3 + m_4 + m_5 + m_6 + m_7 + m_8 + m_{10} + m_{13} + m_{15}$.

Derive the terms of H directly from the *Karnaugh* map without making use of algebraic manipulations or truth tables.
Use exactly the same order for the variables as given in the following diagram:



Question 5 **[9]**

At a junior primary school, a group of four kids (Amu, Brenda, Cara and David) spot a rainbow on a partly cloudy day. Their teacher asks them to write down the names of the colours they see in the rainbow. Suppose the input variables A, B, C and D in a truth table take on the value 1 whenever a specific child writes the following colours:

Amu: green, indigo and violet (A = 1)
Brenda: red, yellow and green (B = 1)
Cara: red, blue, and violet (C = 1)
David: green and indigo (D = 1).

In all other cases A, B, C, D = 0.

Construct a truth table (use the same order for the variables as in the table provided) to determine the Boolean function F(A, B, C, D) that gives a **1** whenever **more than 4** different colours are written down by the group of kids. For example, if A = 1, B = 0, C = 1 and D = 0, the colours written are red, green, blue, indigo and violet, i.e. 5 different colours are written down, so F = 1.

Give F as a sum-of-minterms in m-notation.

A	B	C	D	F	minterms
0	0	0	0		
0	0	0	1		
0	0	1	0		
0	0	1	1		
0	1	0	0		
0	1	0	1		
0	1	1	0		
0	1	1	1		
1	0	0	0		
1	0	0	1		
1	0	1	0		
1	0	1	1		
1	1	0	0		
1	1	0	1		
1	1	1	0		
1	1	1	1		

Multiple-choice review exercises

Note: Please do not submit your answers to these exercises as they will not be marked. Each exercise has one correct alternative. You can compare your answers to the model solutions that you will receive in Tutorial Letter 201.

Your answers to these exercises should not be submitted.

Exercise 1

Which logic gate has an output of 1 only if its two inputs are equal?

A. NAND
B. NOR
C. XOR
D. XNOR.

Exercise 2
How many adjacent minterms must be grouped together in a four variable *Karnaugh* map to derive a simplified term consisting of two variables?

A. 8
B. 4
C. 2
D. 1.

Exercise 3
In which category of logic circuits does a half adder fall?

A. combinational circuits
B. sequential circuits
C. synchronous circuits
D. asynchronous circuits.

Exercise 4
Sequential circuits are building blocks for which important computer components that store data between consecutive clock pulses?

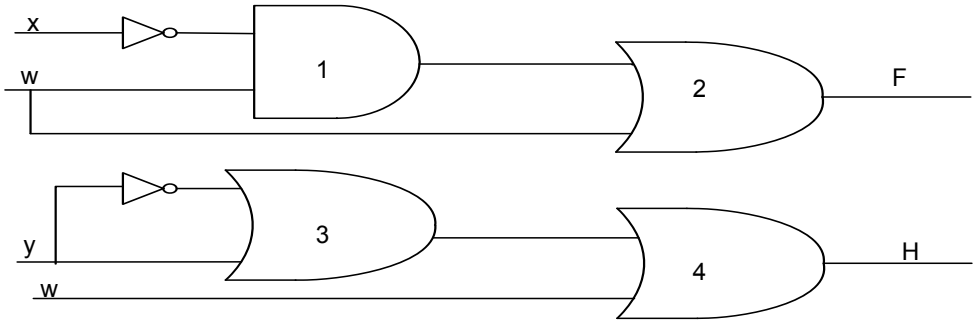
A. multiplexers
B. half adders
C. registers
D. combinational circuits.

Exercise 5
Which input must be added to a flip-flop for it to become synchronous?

A. a toggle
B. a multiplexer
C. an adder
D. a clock

Exercise 6

Consider the following two logic circuits:



These two logic circuits are not equivalent. The outputs are F = x'w + w and H = (y + y') + w. One of the four gates can be changed in order for the circuits to become equivalent. Which gate must be changed and what kind of gate must it become?

A. Gate 1 must change to a NAND gate.
B. Gate 2 must change to a AND gate.
C. Gate 2 must change to a NOR gate.
D. Gate 3 must change to a NOR gate.

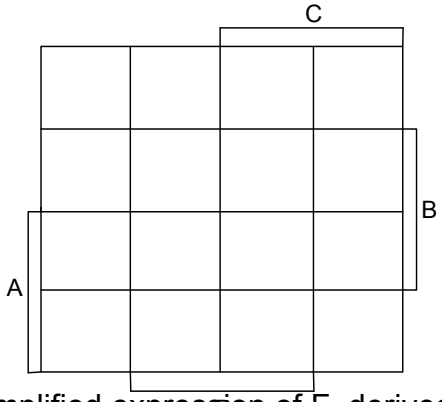
Exercise 7

Use a *Karnaugh* map to find the simplest form of the following sum-of-minterm expression:

$$F(A, B, C, D) = m_3 + m_6 + m_7 + m_8 + m_{10} + m_{14}$$

Derive the terms of F directly from the *Karnaugh* map without making use of algebraic manipulations or truth tables.

Use exactly the same order for the variables as given in the following diagram:

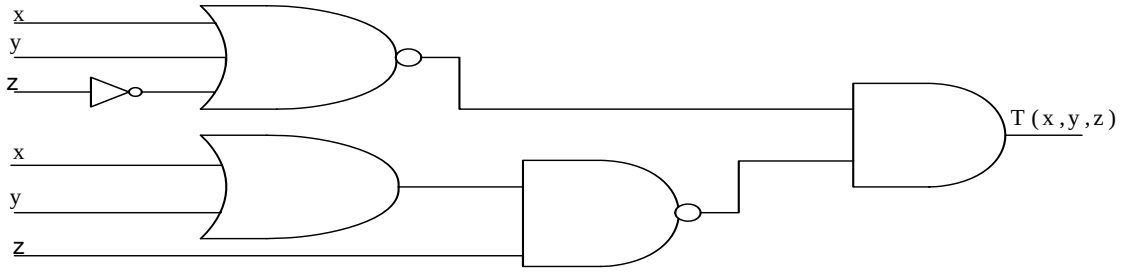


What is the simplified expression of F, derived directly from the *Karnaugh* map?

A. F = A'CD + CD' + AB'C'D'
B. F = A' B'CD + A'BC + ACD' + A B'C'D'
C. F = A'CD + BCD' + AB'D'
D. F = A B'CD' + A'CD + BCD' + A B'C'D'

Exercise 8

Consider the following logic circuit:



What is the final output T(x, y, z) of the given logic circuit?

A. T(x, y, z) = (x + y + z')' · ((x + y) · z)'
B. T(x, y, z) = (x · y · z')' + ((x · y) + z)'
C. T(x, y, z) = (x' + y' + z'') + ((x + y)' · z')
D. T(x, y, z) = (x + y + z')' · ((x + y)' · z')

Exercise 9

Consider the expression F = (xy'z)' · [x' + z] + (x'' + y).
If x = 0, y = 1 and z = 0, what are the values of (xy'z)'; [x' + z]; (x'' + y) and F?

A. (xy'z)' = 0; [x' + z] = [1]; (x'' + y) = (0) and F = 0
B. (xy'z)' = 0; [x' + z] = [0]; (x'' + y) = (1) and F = 1
C. (xy'z)' = 1; [x' + z] = [1]; (x'' + y) = (0) and F = 1
D. (xy'z)' = 1; [x' + z] = [1]; (x'' + y) = (1) and F = 1

Exercise 10

Use only Boolean algebra to simplify the following Boolean expression:

F(v, w, x) = [(x + w)' + x'] + (vxw')'

What is the simplest form of F?

A. x' + v' + w
B. x'w' + v' + x' + w
C. x
D. 1

II---oooOooo---II

12.6 SECOND SEMESTER: ASSIGNMENT 02

Due date:	29 September 2012
Extension date:	01 October 2012
Study material:	F&M: Chapters 5 – 9
	Tutorial Letter 102: Units 5 - 9
Submission procedure:	Mark-reading sheet (post) **or** Mobile MCQ submission **or** electronically via *my*Unisa (See section 8.3)
Year-mark weight:	50

Please read the instructions for the completion of mark-reading sheets in the my studies @ Unisa very carefully.

A UNIQUE ASSIGNMENT NUMBER

is allocated to this assignment. If you enter this number incorrectly on the mark-reading sheet, we cannot guarantee that your assignment will be marked. Errors made on mark-reading sheets cannot be corrected by the lecturer, as the entire marking process is handled by the Assignment Section.

Unique assignment number: **710279**

- Each multiple-choice question has four possible answers. You should select the alternative you consider to be the most appropriate, and mark the sheet accordingly.
- Before submitting the assignment, first check that
  - all details are filled in correctly on the sheet;
  - the unique assignment number is filled in correctly;
  - the mark-reading sheet is completed with an HB pencil if you are submitting by post.
- N.B.: Submit your assignment via *myUnisa* by the due date or post your assignment in good time so that it will **reach** UNISA by the due date. Do not be concerned if *myUnisa* is down on the last submission date. We are notified and shall take this type of delay into consideration.

Assignment Z should be attempted after Assignment 02.

SECOND SEMESTER ASSIGNMENT 02

Question 1

Which one of the following statements regarding the central processing unit (CPU) is NOT TRUE?

1. The CPU performs operations on data and has three parts: an arithmetic logic unit, a control unit and a set of registers.
2. The ALU performs arithmetic and logical operations.
3. The registers are stand-alone storage devices that hold data permanently.
4. The control unit controls the operations of each subsystem.

Question 2

A computer has 2048 MB (2 gigabytes) of memory. Each word in this computer is 64 bytes. How many bits are needed to address each word in memory?

1. 6
2. 25
3. 31
4. 64

Question 3

Most of the main memory in a computer is made up of _____.

1. cache
2. read-only
3. random access
4. programmed read-only

Question 4

Which of the following buses normally connect the CPU and memory in a computer?

A. Instruction bus
B. Address bus
C. Data bus
D. Register bus
E. Control bus

Alternatives:

1. B, C and E
2. A, C and E
3. A and E
4. A, B and D

Question 5
Suppose a computer has 16 control actions. How many connections for control bus are required?

1. 2
2. 4
3. 5
4. 32

Question 6
Which of the following is a basic topology for a network of computers?

1. Oval
2. Circular
3. Hub
4. Ring

Question 7
Which one of the following statements regarding area networks is NOT TRUE?

1. Due to its size, the Internet is a good example of a LAN.
2. A LAN is designed to allow resource sharing among computers.
3. A home net work of two or more computers is a LAN.
4. A MAN is a network with a size between a LAN and a WAN.

Question 8
Which of the following is NOT an Internet application?

1. Remote login
2. Videoconferencing
3. Accessing the World Wide Web
4. A user datagram.

Question 9
What name is given to connecting devices that can direct the packets (messages) traveling through the internet.

1. Bridges
2. Routers
3. Repeaters
4. Gateways

Question 10
There are several layers in the TCP/IP protocol suite. What is the application layer responsible for?

1. Logical delivery of a message between client and server processes.
2. The delivery of individual packets from the source host to the destination host.
3. Providing services to the user.
4. Movements of individual bits from one node to the next.

Question 11
Which one of the following options, with two components, has ONE of them that is NOT part of an operating system?

1. Hardware manager and user interface
2. Process manager and memory manager
3. Memory manager and user interface
4. Process manager and file manager

Question 12
Which one of the following moves a process from one state to another?

1. job scheduler
2. process scheduler
3. process control unit
4. process administrator

Question 13
The job scheduler moves a job from a (i) _____ state to the (ii) _____ state or from a (iii) _____ state to the (iv) _____ state.

1. (i) hold	(ii) ready	(iii) running.	(iv) terminated
2. (i) terminated	(ii) running	(iii) hold	(iv) ready
3. (i) hold	(ii) running	(iii) ready	(iv) terminated
4. (i) running	(ii) hold	(iii) ready	(iv) terminated

Question 14
Starvation can occur when the operating system puts:

1. a process into a terminated state.
2. too few restrictions on processes and resources.
3. too many resource restrictions on a process.
4. a process into a hold state.

Question 15

In _____, more than one program is in memory at the same time, and they are executed concurrently, with the CPU switching rapidly between the programs.

1. parallel processing
2. multiprogramming
3. multiprocessing
4. microprocessing

Question 16

In which scheme is memory is divided into variable-length sections where each section holds one program?

1. demand paging
2. partitioning
3. segmentation
4. paging

Question 17

Partitioning is a technique that is used for multiprogramming. Which one of the following statements regarding partitioning is NOT TRUE?

1. Memory is divided into variable-length memory blocks.
2. If a program is loaded into a memory block that is larger than the program, the memory blocks are compacted until the program fits into the relevant block.
3. Each program occupies one block of contiguous memory locations.
4. Each program is entirely loaded in memory.

Question 18

A certain multiprogramming operating system uses a partitioning scheme and divides the 810 MB of available memory into four partitions of 135 MB, 180 MB, 225 MB and 270 MB respectively. The first program to be run needs 170 MB and occupies the second partition. The second program needs 100 MB and occupies the first partition. The third program needs 90 MB and occupies the third partition and the fourth program needs 252 MB and occupies the fourth partition. What percentage of memory is wasted?

1. 22
2. 24
3. 68
4. 76

Question 19

In _____ sort, the items are divided into two lists: sorted and unsorted.

A. selection
B. bubble
C. insertion

Alternatives:

1. Only A and C
2. Only A and B
3. Only B and C
4. A, B and C

Question 20

Suppose a list contains the following elements:

22 43 17 87 33 5 56 15

What is the order of the elements in the list after two sort passes if selection sort is used?

1. 5 15 17 87 33 22 56 43
2. 5 43 17 87 33 22 56 15
3. 5 15 17 22 87 33 56 43
4. 22 43 17 87 33 5 56 15

Question 21

A list contains the following elements:

5 7 12 18 27 30 44 52 87 93 100 103 200

At the beginning, *first* = 1, *mid* = 7 and *last* = 13. What are the values of *first, mid* and *last* respectively after two iterations of the binary search algorithm if the goal is 100?

1. 7, 10, 13
2. 8, 10, 13
3. 11, 12, 13
4. 9, 11, 13

Question 22
A structure chart _____

1. shows the logic flow of an algorithm.
2. is the same as pseudocode.
3. is a high-level design tool that shows the relationships between algorithms and subalgorithms.
4. is a special kind of state diagram.

Question 23
Consider Algorithm 8.2, page 220, in Chapter 8 of *F & M*. What will the output be for an input of 76?

1. pass
2. nopass
3. 76 pass
4. passed

Question 24
A list contains the following elements:

9 20 14 5 46 25 90 49

The first two elements have been sorted using insertion sort. What is the value of the elements in the list after three more passes of insertion sort?

1. 5 9 14 20 25 46 90 49
2. 5 9 14 20 46 25 90 49
3. 5 9 14 20 25 46 49 90
4. 9 20 14 5 46 25 90 49

Question 25
Which one of the following statements regarding algorithms is NOT TRUE?

1. It can be considered to be a step-by-step method for solving a problem.
2. It can only be defined formally.
3. It must terminate in a finite time.
4. It can be considered to be an ordered set of unambiguous steps that produces a result.

Question 26
Which of the following methods or approaches CANNOT be used to translate a source program into an object program?

1. Decoding
2. First approach to interpretation
3. Second approach to interpretation
4. Compilation

Question 27
In programming, what name is given to the way in which a computer language looks at the problem to be solved?

1. paradigm
2. program
3. function
4. procedure

Question 28
Which of the following high-level languages was developed to be used as a business programming language in the business environment?
1. FORTRAN
2. C^{++}
3. COBOL
4. C#

Question 29
Which of the following high-level languages was the first high-level language and is still popular within the scientific and engineering communities?

1. FORTRAN
2. C^{++}
3. COBOL
4. C#

Question 30
To what computer language paradigm does Pascal belong?

1. object-oriented
2. functional
3. declarative
4. procedural

Question 31

In the translation process, when a source program is translated to an object program, a _____ reads the source code, symbol by symbol, and creates a list of tokens in the source language.

1. code generator
2. semantic analyzer
3. syntax analyzer
4. lexical analyzer

Question 32

Unlike the procedural language, the object-oriented approach to programming deals with (i) _____ objects instead of (ii) _____ objects.

1. (i) passive (ii) active
2. (i) complex (ii) active
3. (i) active (ii) passive
4. (i) simple (ii) complex

Question 33

A(n) _____ is a black box that maps a list of inputs to a list of outputs.

1. operation
2. subroutine
3. method
4. function

Question 34

In the Scheme version of LISP, if A = (7 9 11 30) then (cdr (cdr (cdr A))) would give a result of:

1. 7
2. 9
3. 11
4. 30

Question 35
Which of the following programming languages facilitates multithreading?

1. COBOL
2. Java
3. Prolog
4. LISP

N.B. Have you filled in the unique assignment number for this assignment correctly?

II---oooOooo---II