Tutorial letter 101/3/2018

Computer Systems: Fundamental Concepts

COS1521

Semesters 1 & 2

School of Computing

IMPORTANT INFORMATION:

This tutorial letter contains important information about your module.

Please register on myUnisa, activate your myLife e-mail address and make sure that you have regular access to the myUnisa site **COS1521-S1-2018** (for sem 1) or **COS1521-S2-2018** (for sem 2), as well as your e-tutor group site

Note: This is an online module and therefore it is available on myUnisa. However, in order to support you in your learning process, you will also receive some study material in printed format.

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CONTENTS

Page

Please note

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

Semester 1: Submit Assignment 01 by 09 March 2018.

Semester 2: Submit Assignment 01 by 23 August 2018.

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

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

1 INTRODUCTION AND WELCOME

Dear Student

Welcome to Computer Systems: Fundamental Concepts (COS1521). This is a semester module offered by the School of Computing.

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

This is a partially online module, so some learning content and all tutorial letters are available on myUnisa. However, in order to support you in your learning process, we will send you the tutorial letter 101 in print format. To see your study material online and read about what to do for the module, go to https://my.unisa.ac.za and log in with your student number and password. You will find COS1521-2018-S1 for the first semester and COS1521-2018-S2 for the second semester in the row of modules in the orange blocks across the top of the webpage. Remember to check in the “More” tab if you cannot find the module in the orange blocks. Click on the module you want to open.

The study material for COS1521 is available in English only.

2 PURPOSE OF AND OUTCOMES AND SYLLABUS FOR THIS MODULE

2.1 *PURPOSE*

COS1521 is one of a number of first-level Computer Science modules offered by the School of Computing at Unisa. The purpose of this module is to introduce you to the computer as a system. The module covers hardware concepts such as internal representation of numbers and characters and basic computer architecture, as well as 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) give you the opportunity to see whether you have achieved the following outcomes:

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

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

Assessment criteria
You should be able to
1.1 convert between different number systems (binary, octal, decimal and hexadecimal)
1.2 apply different arithmetic methods in the binary number system
1.3 identify computer data, including the different internal representations
1.4 explain the basic restrictions that computer architecture places on numerical computations
1.5 determine outputs of basic combinational logic circuits for given inputs
1.6 draw the combinational circuits for given Boolean functions
1.7 simplify Boolean functions by implementing appropriate rules/methods
1.8 determine a Boolean function for a given problem statement using truth tables (at most four variables)
1.9 use Boolean expressions and binary logic that describe the behaviour of logic circuits
1.10 describe 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 Describe today's computers, with a brief historical background, in terms of different architectures and ethical scenarios/issues.
2.2 Describe software engineering and operating systems, including the development of software, by providing an historical context.
2.3 Describe a basic computer, including the three basic hardware subsystems and their interconnected functioning.
2.4 Describe an operating system, including the functioning of its components.
2.5 Describe popular operating systems with reference to different popular operating platforms.
2.6 Define an algorithm, and state its relation to problem-solving.
2.7 Define the three algorithm constructs and explain how they are used in algorithms.
2.8 Describe basic algorithms, including their applications.
2.9 Describe the sorting and searching concepts of algorithms and understand their mechanisms.
2.10 Explain what sub-algorithms are and state how they are related to algorithms.

2.11 Describe the development process models in software engineering, including 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 and communication technologies.

Assessment criteria
3.1 Describe physical structures of networks and include references to network criteria, physical structures and categories of networks.
3.2 Describe the internet, including the TCP/IP protocol suite with reference to the characteristics of its layers and their relationships.
3.3 Describe 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 Describe data structures and include references to the differentiation between different structures.
4.2 Describe file structures and include references to updating and access methods, and to categories of directories and files.
4.3 Define a database and some traditional database models, including the relational database design.
4.4 Define a database management system (DBMS) and include its architecture.
4.5 Describe the steps in database design.

2.3 *SYLLABUS*

The module content is covered in **chapters 1 to 11, 13 and 14** of the prescribed book, referred to as **Forouzan** (details are given in section 4.1 of this tutorial letter), and in all the tutorial letters, including Tutorial Letter 102. The previous editions of the text books were by two authors **Forouzan** and **Mosharraf**, so you may still see reference to **F&M** in some of the study material.

The following sections/subsections are excluded from the syllabus: (Note that if you do not use the 3rd edition, section numbers and page numbers may differ – so please look at the section headers below to make sure that you exclude the correct section/subsection).

Section 2.3: Non-positional number systems, pp. 33-34

Fig 4.8: Addition and subtraction of reals in floating point format, p. 91

Example 4.24: pp. 92-93

In Appendix E: Product of sums and examples, pp. 550-551, plus any further reference to product of sums. The rest of the Appendix is important for the assignments and exam.

Section 5.7.3: Pipelining, pp. 121-122

Section 5.7.4: Parallel processing, p. 122

Section 5.8: A simple computer, pp. 124-133

Section 8.7: Recursion, pp. 239-241

Section 9.4: Common concepts, pp. 261-271

Section 14.6: Database design, pp. 385-389

The following topics in the prescribed book are covered:

Chapter 1: Introduction

Chapter 2: Number systems

Chapter 3: Data storage (Appendix A: Unicode)

Chapter 4: Operations on data

Appendix E: Boolean algebra and logic circuits

Chapter 5: Computer organisation

Chapter 6: Computer networks and the internet

Chapter 7: Operating systems

Chapter 8: Algorithms

Chapter 9: Programming languages

Chapter 10:Software engineering

Chapter 11:Data structures

Chapter 13:File structures

Chapter 14:Databases

Tutorial Letter 102 contains information about the study material in the prescribed book a summary, learning outcomes, explanatory notes relating to Appendix E, additional exercises and errata relating to **Forouzan**. You will also find the solution to the self-assessment assignment in Tutorial Letter 102.

Very important: *You must read through Tutorial Letter 102* ***before*** *you complete the self-assessment assignment and Assignment 01, especially units 1 to 4 and from page 24 to the end. This material will help you to understand the content of the prescribed book better, and this in turn will help you answer the questions in Assignment 01.* ***Please read Tutorial Letter 102 as soon as you receive it.*** *It is available on myUnisa under Additional Resources.*

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

All students studying through the School of Computing must have access to the internet, but references to interactive work (working on the computer or searches on the internet) are not required.

3 LECTURERS AND CONTACT DETAILS

3.1 *LECTURERS*

The best means of contacting your lecturers is by e-mail. If you are registered for Semester 1, the e-mail address to use is **COS1521-18-S1@unisa.ac.za**, and if you are registered for Semester 2, the e-mail address is **COS1521-18-S2@unisa.ac.za.**

You will find the names and contact details of your lecturers (including e-mail addresses) and contact details for the School of Computing in Tutorial Letter COSALLF for 2018. This tutorial letter is available online on myUnisa.

You will also find the above contact information on http://osprey.unisa.ac.za.

The COS1521 discussion forum on myUnisa gives you the opportunity to share ideas and discuss problems with fellow students. This forum is for your benefit, and the lecturers do not necessarily play an active part in the discussions. You are welcome to 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 websites first to see whether the answers to your queries appear there. Since most students encounter the same problems, we offer solutions to the most common problems in the tutorial letters or on the websites.

You may phone your lecturers. However, sometimes we are not available due to other school or university duties. If you are unable to contact us, you are welcome to phone the secretary of the School of Computing and leave a message. The contact number to call is also given in Tutorial Letter COSALLF. **Note that the school has moved from the Muckleneuk campus in Pretoria to the Science campus in Roodepoort, Johannesburg.**

If you have **administrative enquiries** relating to **registrations, fees, assignment submission, and examination matters such as aegrotats and special exams,** consult the brochure entitled *my Studies @ Unisa* or the Unisa website to see whom to contact.

3.2 *DEPARTMENT*

The School of Computing can be contacted at

Telephone number: 011 670 9200

E-mail: computing@unisa.ac.za

3.3 *UNIVERSITY*

To contact the university, follow the instructions in *my Studies @ Unisa*. Always be able to supply your student number when you contact the university.

4 RESOURCES FOR THE MODULE

4.1 *PRESCRIBED BOOK*

Here are the bibliographical details of the prescribed book for this module:

Authors: Forouzan, Behrouz
Title: *Foundations of Computer Science*
Edition: 3rd
Year: 2014
ISBN-10: 1-408-04411-0
ISBN-13: 978-1-4080-4411-7

We refer to the prescribed book as **Forouzan** throughout this tutorial letter.

Tutorial Letter 102 contains notes on the study material in the prescribed book. It also contains **supplementary study material**. See section 2.3 of this tutorial letter for more information about Tutorial Letter 102.

The prescribed book is **not** included with your study material, so please obtain a copy of **Forouzan** as soon as possible. Prescribed books can be obtained from the university's official booksellers. You will find a list of official booksellers and their addresses in *my Studies @ Unisa*.

If you have difficulty in locating your book at one of the official booksellers, please contact the Prescribed Book section at 012-4294152, or e-mail vospresc@unisa.ac.za.

4.2 *RECOMMENDED BOOKS*

If you would like to know more about a particular topic, you may consult any of the books listed below. 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 based on the prescribed book and the content of Tutorial Letter 102.

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, New York, 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, New York, 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, 2002.

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

4.3 *ELECTRONIC RESERVES (E-RESERVES)*

There are no e-reserves for this module.

4.4 *OPTIONAL CAI TUTORIAL*

There is an **optional** CAI tutorial, which we highly recommend. Please see Appendix A of this tutorial letter for instructions on how to download it from the web. The tutorial deals with the simplification of Boolean expressions by means of Karnaugh maps (diagrams), and includes background material. You need to be familiar with this subject matter for Assignment 01, and the tutorial can also help you with your examination preparation relating to this topic. Past students recommend this tutorial highly.

4.5 *TUTORIALS OFFERED BY UNISA*

Unisa now offers online tutorials (e-tutoring) to students registered for modules at NQF levels 5, 6 and 7 – in other words, qualifying first-level, second-level and third-level modules.

Once you have registered for a qualifying module, you will be allocated as part of a group of 200 students to an e-tutor with whom you will be interacting during the tuition period.

You can ask the e-tutor questions about any content-related issues in the module. You will receive an SMS informing you about your group, the name of your e-tutor and instructions on how to log on to myUnisa in order to receive further information on the e-tutoring process.

Online tutorials are offered free of charge and are conducted by qualified e-tutors appointed by Unisa. To participate in e-tutoring, all you need is a computer with an internet connection. If you live close to a Unisa regional centre or a telecentre contracted with Unisa, you are welcome to access the internet there. E-tutoring takes place on myUnisa, where you are expected to connect with other students in your group. The e-tutor is there to guide you through your study material during this interaction process. To get the most out of online tutoring, you need to participate in the online discussions that the e-tutor will be facilitating.

There is a high failure rate for some modules. Face-to-face tutors and tutorials have been arranged for these modules and will take place at the Unisa regional centres. Also, these tutorials are offered free of charge. To secure a place in the classes, please register at your nearest Unisa regional centre as soon as you have registered.

5 FREE COMPUTER AND INTERNET ACCESS

Unisa has entered into partnerships with establishments (referred to as telecentres) in various locations across South Africa to give you (as a Unisa student) free access to computers and the internet. This access enables you to conduct the following academic activities: registration; online submission of assignments; engaging in e-tutoring activities and signature courses etc. Please note that any other activities outside of these are for your own cost, e.g. printing and photocopying. For more information on the telecentre nearest to you, please visit www.unisa.ac.za/telecentres.

6 STUDENT SUPPORT SERVICES AND THE EXTENDED SCIENCE PATHWAY PROGRAMME

Important information about the full range of student support services available at Unisa appears in *my Studies @ Unisa*. For example, the tutorial services information is found in this brochure, which you must please refer to constantly. The module is part of the Extended Science Pathway (ESP). For students who are not part of the ESP, e-tutoring support will be provided. Check the *my Studies @ Unisa* brochure for more information or enquire at your nearest Unisa study centre. **Each student will be allocated a tutor whom he/she can contact in case of any difficulties or queries related to the content of the module**. Please refer all such difficulties or queries to the tutor. The details of the tutors, including their contact information, will be provided to you or will appear on the home page of the module's page on myUnisa.

EXTENDED SCIENCE PATHWAY PROGRAMME:

6.1 *WHAT IS EXTENDED SCIENCE PATHWAY?*

Extended science pathway 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; and
- arranging peer-collaborative learning opportunities with fellow students at regional level.

6.2 *WHAT IS THE EXTENDED SCIENCE PATHWAY PROGRAMME?*

The ESP runs concurrently with normal science teaching and learning activities. It creates more opportunities for students to be exposed to the learning content and activities. The extended additional teaching and learning intervention is 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 extended science pathway is available for students registered for COS1521.

6.3 *WHO CAN PARTICIPATE IN THE ESP?*

All new Unisa science students adhering to specific ESP admission criteria are allowed into the ESP. Selection criteria that will identify "at risk" students are determined on the basis of the student's M-count total, and 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.

6.4 *HOW DOES A STUDENT GAIN ADMISSION TO THE ESP?*

Once a student has been identified as "at risk", she/he will automatically qualify for the ESP. Consult the *my Studies @ Unisa* brochure for more information. An e-tutoring system might be used. These interventions will be provided at no additional cost.

6.5 *WILL PARTICIPATION IN THE ESP PROVE TO BE SUCCESSFUL?*

Given the extended and additional learning opportunities created by the ESP 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 invest additional time and effort on attending the tutoring classes and academic literacy sessions and making use of peer-collaborative learning opportunities.

7 STUDY PLAN

Consult *my Studies @ Unisa* for suggestions about general time management and planning.

Here is a study programme for the first and second semesters for this module. We hope that you find it helpful.

FIRST-SEMESTER STUDY PROGRAMME			
Week	**Starting on**	**Activities**	**Study material**
1	5 February		**Forouzan** chapters 1 and 2 Tutorial Letter 102, units 1 and 2, and Part II
2	12 February	Start Assignment 01	**Forouzan** chapters 3 and 4; Appendix A Tutorial Letter 102, units 3 and 4, and Part II
3	19 February	Do Self-assessment (Section A) **(Do not submit.)**	**Forouzan** chapters 1–4; Appendix A Tutorial Letter 102, units 1–4, and Part II
4	26 February		**Forouzan** chapter 4; Appendix E Tutorial Letter 102, unit 4, and Part II
5	20 February	Do Self-assessment (Section B) by 24/02/17. **(Do not submit.)**	**Forouzan** chapter 4; Appendix E Tutorial Letter 102, unit 4, and Part II
6	5 March	**Complete Assignment 01** **(Due date: 9 March)**	**Forouzan** Appendices A and E Tutorial Letter 102, units 1–4, & Parts II & III
7	12 March	Start Assignment 02	**Forouzan** chapters 5 and 6 Tutorial Letter 102, units 5 & 6
8	19 March		**Forouzan** chapters 7, 8 and 9 Tutorial Letter 102, units 7, 8 and 9
9	26 March		**Forouzan** chapters 10 and 11 Tutorial Letter 102, units 10 and 11
10	2 April		**Forouzan** chapters 13 and 14 Tutorial Letter 102, units 13 and 14
11	9 April	**Complete Assignment 02** **(Due date: 12 April)**	**Forouzan** chapters 5–14 Tutorial Letter 102, units 5–14
12–15	16 April until examination date	Revision	
		Examinations	

Please try and submit your assignment a day before the due date. If you wait until the evening of the due date, myUnisa will be very busy because all students are trying to submit.

SECOND-SEMESTER STUDY PROGRAMME			
Week	**Starting on**	**Activities**	**Tutorial matter**
1	16 July		**Forouzan** chapters 1 and 2 Tutorial Letter 102, units 1 and 2, and Part II
2	23 July	Start Assignment 01	**Forouzan** chapters 3 and 4; Appendix A Tutorial Letter 102, units 3 and 4, and Part II
3	30 July	Do Self-assessment (Section A) by 28/07/17. **(Do not submit.)**	**Forouzan** chapters 1–4; Appendix A Tutorial Letter 102, units 1–4, and Part II
4	06 August		**Forouzan** chapter 4; Appendix E Tutorial Letter 102, unit 4, and Part II
5	13 August	Do Self-assessment (Section B) by 11/08/17. **(Do not submit.)**	**Forouzan** chapter 4; Appendix E Tutorial Letter 102, unit 4, and Part II
6	20 August	**Complete Assignment 01 (Due date: 23 August)**	**Forouzan** Appendices A and E Tutorial Letter 102, units 1–4, and Parts II and III
7	27 August	Start Assignment 02	**Forouzan** chapters 5 and 6 Tutorial Letter 102, units 5 and 6
8	3 September		**Forouzan** chapters 7, 8 and 9 Tutorial Letter 102, units 7, 8 and 9
9	10 September		**Forouzan** chapters 10 and 11 Tutorial Letter 102, units 10 and 11
10	17 September		**Forouzan** chapters 13 and 14 Tutorial Letter 102, units 13 and 14
11	24 September	**Complete Assignment 02 (Due date: 27 September)**	**Forouzan** chapters 5–14 Tutorial Letter 102, units 5–14
12–15	1 October until the examination date	Revision	
		Examinations	

Please try and submit your assignment a day before the due date. If you wait until the evening of the due date, myUnisa will be very busy because all students are trying to submit.

8 PRACTICAL WORK AND WORK-INTEGRATED LEARNING

There are no practical sessions or work-integrated learning components for this module.

9 ASSESSMENT

We realise that it might be difficult to keep to given schedules, but once assignment dates are set, they are captured on the Unisa system and cannot be changed by anyone, including the lecturer. We therefore have to adhere to these dates. Please do not contact us to ask for extensions with regard to assignment due dates. The assignments for this module are multiple choice assignments marked by a computer on a specific date soon after the assignment due date.

9.1 *ASSESSMENT PLAN*

NO ASSIGNMENTS WILL BE ACCEPTED AFTER THE SUBMISSION DATES.

There are three assignments. You will find all of them in section 14 of this tutorial letter.

Self-assessment assignment
First- and second-semester students complete the same self-assessment assignment. **Do not submit it.** You will receive a suggested solution to this assignment in Tutorial Letter 102 early in the semester. The self-assessment assignment does not contribute to either the semester mark or the final mark.

Assignments to be submitted
Assignment 01: A multiple-choice assignment that will be marked electronically.
Assignment 02: A multiple-choice assignment that will be marked electronically.

All multiple-choice assignments are marked electronically by the Assignments section of the Directorate: Student Assessment and Administration (DSAA). There is a specific date by which the DSAA feeds all the submitted mark-reading sheets into the computer (this is called batch processing). As a result, **no multiple-choice assignment received after the due date will be accepted**. We recommend that you submit your assignments via myUnisa.

You will be awarded a **semester mark** based on the percentages you achieve for Assignments 01 and 02. The semester mark will contribute 20% towards your final mark for this module.

The mark you obtain for Assignment 01 contributes 40% towards the semester mark, and the mark you obtain for Assignment 02 contributes 60% towards the semester mark. We will show you what we mean by means of an example.

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

Your semester mark will be calculated as follows:

(70 × 0.4) + (90 × 0.6)% = 82%, where 0.4 (40%) and 0.6 (60%) are the weights assigned to Assignments 01 and 02 respectively.

Now suppose you achieve an **exam mark** of 68%. Your **final mark** will be calculated as follows:

(82 × 0.20) + (68 × 0.80)% = (16.4 + 54.4)% = 70.8%. That will be rounded up to 71%.

Please make sure that your assignments reach the university **before or on** the due dates. Also make sure that your marks for Assignments 01 and 02 have been taken into account in the calculation of your semester mark before you write the examination. **The fastest and most secure way to submit your MCQ assignments is through myUnisa.** We recommend that you submit both assignments this way.

If myUnisa is down on the last submission date, the DSAA and lecturers will be notified. Try to resubmit the assignment as soon as myUnisa is up again. Please do not contact lecturers if a problem of this kind occurs, since system problems will be taken into consideration. If you have queries with regard to the submission of assignments, please contact the Assignments section of the DSAA.

9.2 *UNIQUE ASSIGNMENT NUMBERS*

Semester 1	
Assignment	**Unique assignment number**
01	**772344**
02	**787763**
Semester 2	
Assignment	**Unique assignment number**
01	**731793**
02	**835274**

9.3 *DUE DATES FOR ASSIGNMENTS*

Self-assessment assignment for first and second semesters		
Semester	Finish by	Contribution towards semester mark
01	Part A: 10 Feb Part B: 24 Feb	- -
02	Part A: 28 July Part B: 11 Aug	- -
First semester		
Assignment	Due date	Contribution towards semester mark
01	9 March	40%
02	12 April	60%
Second semester		
Assignment	Due date	Contribution towards semester mark
01	23 August	40%
02	27 September	60%

9.4 SUBMISSION OF ASSIGNMENTS

We **recommend** that you submit both Assignments 01 and 02 **via myUnisa**.

For detailed information about assignments, please refer to *my Studies @ Unisa*.

To submit an assignment via myUnisa:

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

You may not submit your assignments by fax or e-mail.

If you have administrative enquiries about assignments, please send an e-mail to the address supplied in *my Studies @ Unisa*.

9.5 NUMBER OF ASSIGNMENTS TO BE DONE

There are **three** assignments.

Complete the **self-assessment assignment**, but **do not** submit it for marking.

You must submit Assignments 01 and 02. You will find all the assignments in section 14 of this tutorial letter.

10 OTHER ASSESSMENT METHODS

There are no other forms of assessment for this module.

11 EXAMINATIONS

FIRST SEMESTER: **In order to be admitted to** the first-semester **COS1521** examination, you must submit Assignment 01 by **9 March 2018**.

SECOND SEMESTER: **In order to be admitted to** the second-semester **COS1521** examination, you must submit Assignment 01 by **23 August 2018**.

There will be a two-hour examination at the end of the semester. We will send information about the format and scope of the examination during the semester. Supplementary examinations will be written at the end of the semester following the semester in which you sat for the original examination. This is also the case with aegrotat examinations. Please do not contact your lecturer regarding supplementary or aegrotat examinations; rather refer to *my Studies @ Unisa* for guidelines. Read *my Studies @ Unisa* for general examination guidelines and examination preparation guidelines.

The assignments and the examination letter that you will receive contain enough examples of the type of questions that you can expect in the examination. Please do not contact the lecturers for this module to ask for past examination papers if there are none on myUnisa. The lecturers do not provide solutions to past examination papers on myUnisa.

As discussed in section 9.1, your examination mark contributes 80% towards your final mark and your semester mark contributes the other 20%. If you obtain less than 40% for the examination, your semester mark will **not** be taken into account in the calculation of your final mark.

If you write a supplementary examination, please download all relevant study material, such as the examination tutorial letter, from myUnisa before the end of the semester in which you are registered, since this material will not be available after the end of the semester.

If you have enquiries about the examination, please send an e-mail to the address given in *my Studies @ Unisa*.

12 FREQUENTLY ASKED QUESTIONS

The *my Studies @ Unisa* brochures contains an A–Z guide of the most relevant study information. Please refer to it.

13 IN CLOSING

Do not hesitate to contact any of your lecturers (**COS1521-18-S1@unisa.ac.za for Semester 1 or COS1521-18-S2@unisa.ac.za for Semester 2)** or tutors by e-mail if you are experiencing problems with the **content** of this tutorial letter or any aspect of the module.

We wish you every success in your studies.

COS1521 lecturers

14 ASSIGNMENTS FOR COS1521

14.1 SELF-ASSESSMENT ASSIGNMENT FOR THE FIRST AND SECOND SEMESTERS

(Complete this assignment before you begin Assignment 01)

This assignment consists of sections A and B

Please complete sections A **and** B of this assignment before you begin Assignment 01.

Completion dates: Section A: 10/02/17; Section B: 24/02/17 (first semester)
Section A: 26/07/17; Section B: 11/08/17 (second semester)

Contribution to semester mark: None

We give the solution to this assignment in Tutorial Letter 102 which can be downloaded from MyUnisa under Additional Resources. Compare your answers with those we supply.

DO NOT SUBMIT THIS SELF-ASSESSMENT ASSIGNMENT FOR MARKING.

14.1.1 SECTION A – SELF-ASSESSMENT

Study material: (1) **Forouzan**: chapters 1–4; Appendix A

(2) Tutorial Letter 102: Part I: units 1–4 and Part II

DO NOT SUBMIT

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 the main functions of an operating system.
(i) Compare the memory content of early computers with the memory content 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 devices? Explain.

Question 2

Convert the following numbers into decimals:

(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 into binaries, octals and hexadecimals:

(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 2s complement arithmetic to determine -15 + 12.

14.1.2 SECTION B – SELF-ASSESSMENT

Study material: (1) **Forouzan**: chapter 4; Appendix E

(2) Tutorial Letter 102: Parts 1 and II Unit 4

Do the relevant exercises in Forouzan and Tutorial Letter 102 before attempting this section.

DO NOT SUBMIT

WRITTEN QUESTIONS

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]**

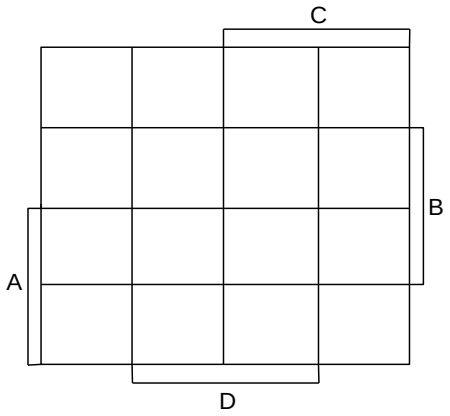
Use only Boolean algebra to simplify the Boolean expression F. (First determine F_1 and F_2, then simplify $F_1 + F_2$, showing all the steps. You need not provide the names of the Boolean rules that you apply.)

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

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. Show the groupings clearly.
Use exactly the same order for the variables as given in the following diagram:



Question 5 **[9]**

Four types of packages (A, B, C and D) containing chemicals are supplied to research laboratories. Each package contains unique types of chemicals:

Package A contains three different types of chemicals.
Package B contains six different types of chemicals.
Package C contains five different types of chemicals.
Package D contains two 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 containing 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 given in the table below) to determine the Boolean function F(A, B, C, D), which 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 QUESTIONS

Question 6

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

Question 7

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

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

Question 8

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

A. Combinational circuits
B. Sequential circuits
C. Adders
D. Multiplexers

Question 9

A three-bit digital counter counts from 0 to …

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

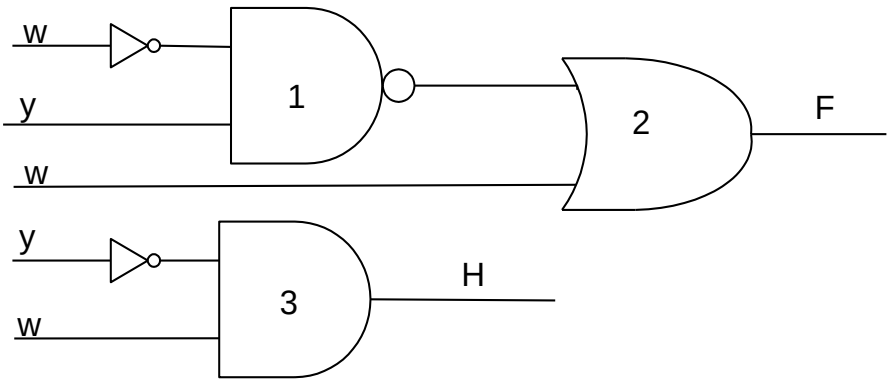
Question 10

Which one of the following options 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

Question 11

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?

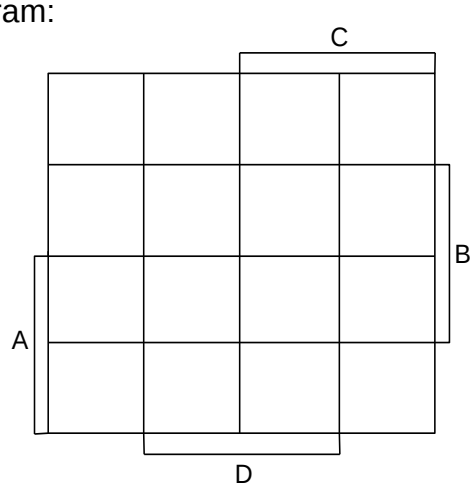
A. Gate 1 must change to a NOR gate.
B. Gate 1 must change to an OR gate.
C. Gate 3 must change to a NAND gate.
D. Gate 3 must change to an OR gate.

Question 12

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:

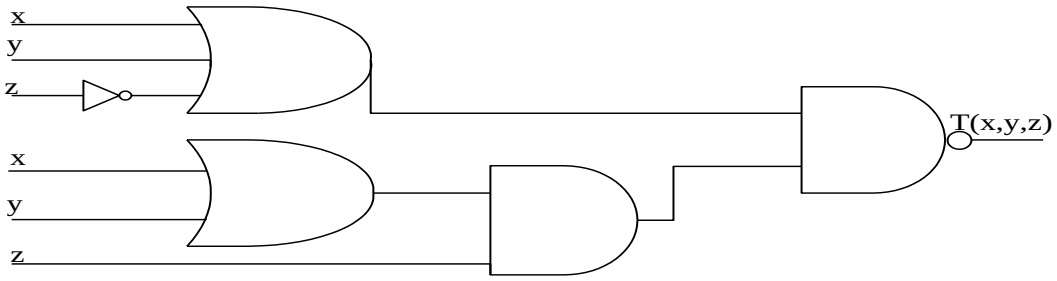


What is the simplified expression of F, derived directly from the Karnaugh map?

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

Question 13

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)]'

Question 14

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

Question 15

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

FIRST-SEMESTER ASSIGNMENTS

14.2 FIRST SEMESTER: ASSIGNMENT 01

Due date: **9 March 2018**

Study material: **(1) Forouzan: chapters 1–4; Appendices A and E (prescribed book)**

(2) Tutorial Letter 102:

Part I: units 1–4

Part II: ALL (pages 24–74)

Part III: solution to self-assessment assignment

Do the relevant exercises in Forouzan, Tutorial Letter 102 and the self-assessment assignment before attempting this assignment. See more information about Tutorial Letter 102 in section 2.3 of this tutorial letter.

Submission procedure: Via myUnisa (see section 9.4)

Contribution to semester mark: 40%

Unique assignment number: **772344**

This assignment is compulsory. To be admitted to the **examination** for this module, you must submit this assignment by **09 March 2018.**

- Each multiple-choice question has four possible answers. Select the option you consider to be the most appropriate.
- Submit your assignment via myUnisa by the due date. Do not be concerned if myUnisa is down on the due date. If this happens, we are notified about the situation and will take this type of delay into consideration. Try to resubmit the assignment as soon as myUnisa is up again.
- The mark that you achieve out of a possible 40 marks will be converted into a **percentage** and will contribute 40% towards your semester mark.

QUESTION 1

Which one of the following scientists was NOT involved in the development of electronic computers in 1930-1950?

1. John Atanasoff
2. Alan Turing
3. Konrad Zuse
4. Blaise Pascal

QUESTION 2

In 1890 a machine was designed that could automatically read, tally and sort data on punched cards. Who designed it?

1. Herman Hollerith
2. Charles Babbage
3. Joseph-Marie Jacquard
4. Gottfried Leibnitz

QUESTION 3

In a programmable data processor, such as the Turing machine, which one of the following statements is NOT true?

1. The output data depends on the input and the program.
2. With the same input and a change in the program, we can generate different output.
3. With the same program and different input, we can generate different output.
4. With the same input and the same program, we can generate different output.

QUESTION 4

In which computer generation was the integrated circuit invented, and did software packages become available?

1. Second generation
2. Third generation
3. Fourth generation
4. Fifth generation

QUESTION 5

Ethical issues created by the development of computers are:

1. Privacy, copyright and computer crime.
2. Privacy, social justice and computer crime.
3. Copyright, computer crime and digital divide.
4. Copyright, dependency and privacy.

QUESTION 6

Computer science can be divided into two categories, namely, system areas and application areas. Which of the following belong(s) to application areas?

1. Computer networking
2. Computer databases
3. Computer architecture
4. Computer security

QUESTION 7

Which of the following is TRUE for the second generation computers?

1. The generation roughly lasted from 1950 to 1959.
2. Integrated circuits were invented.
3. The high-level programming languages FORTRAN and COBOL were invented.
4. Computers were only used by big organisations because of their high cost.

QUESTION 8

Convert $(25.25)_{10}$ into a binary number.

1. $(1001.01)_2$
2. $(11001.01)_2$
3. $(1001.1001)_2$
4. $(11001.11001)_2$

QUESTION 9

Convert $(1001100.11)_2$ into a hexadecimal number.

1. $(94.3)_{16}$
2. $(94.C)_{16}$
3. $(4C.3)_{16}$
4. $(4C.C)_{16}$

QUESTION 10

Which one of the following number representations is correct?

1. $(102.101)_2$
2. $(876.54)_8$
3. $(1011)_{16}$
4. $(FAG)_{16}$

QUESTION 11

Convert $(111)_{16}$ into a binary number.

1. $(1101111)_2$
2. $(000100010001)_2$
3. $(1110)_2$
4. $(11.1)_2$

QUESTION 12

Convert $(523)_{10}$ into an octal number.

1. $(1013)_8$
2. $(3101)_8$
3. $(310)_8$
4. $(101)_8$

QUESTION 13

Which one of the following is false?

1. $(F)_{16} = (15)_{10}$
2. $(15)_8$ is not equal to $(14)_{10}$
3. $(13)_{16}$ is less than $(23)_8$
4. $(111)_2$ is equal to $(7)_8$

QUESTION 14

What is the 2s complement representation of -56 using 8 bits?

1. $(00111000)_2$
2. $(11001111)_2$
3. $(11111000)_2$
4. $(11001000)_2$

QUESTION 15

Convert $(1110.01)_2$ into normalised form.

1. $(1.11001)_2 \times (2^{-3})_{10}$
2. $(1.11001)_2 \times (2^{3})_{10}$
3. $(0.111001)_2 \times (2^{4})_{10}$
4. $(0.111001)_2 \times (2^{-4})_{10}$

QUESTION 16

Which one of the following statements regarding the representation of an unsigned integer is FALSE?

1. An unsigned integer can never be negative.
2. An unsigned integer can only take positive values greater than 0.
3. Most computers define a constant called the *max unsigned integer* to determine the biggest integer that can be represented.
4. A computer that uses 8 bits to store an unsigned integer, will store $(10111)_2$ as 00010111.

QUESTION 17

Which one of the following statements regarding storing numbers is FALSE?

1. A number is changed to binary before it is stored in a computer.
2. An integer can also be called a floating point number.
3. Fixed-point and floating point representation are used to represent a number such as 123.45
4. The first bit in a byte is used to store the sign of a signed integer.

QUESTION 18

Which one of the following statements regarding storing audio is FALSE?

1. The intensity of an audio signal is stored.
2. Audio is an entity that changes over time.
3. Audio is an example of digital data.
4. We record audio signals over an interval.

QUESTION 19

What would the answer be if the **OR** operation is applied on the two bit patterns **10101010** and **11001101**?

1. 11111111
2. 10001000
3. 01110111
4. 11101111

QUESTION 20

Calculate: $(1111)_2 + (1010)_2$.

1. $(11001)_2$
2. $(11011)_2$
3. $(10001)_2$
4. $(10011)_2$

QUESTION 21

Calculate: $(10101)_2 + (111.01)_2$.

1. $(11100.01)_2$
2. $(10001.00)_2$
3. $(11000.01)_2$
4. $(101100.00)_2$

QUESTION 22

What would the answer be if the **XOR** operation is applied on the two bit patterns **10101010** and **11001100**?

1. 11101110
2. 01110111
3. 10001000
4. 01100110

QUESTION 23

Use an arithmetic right-shift operation on the bit pattern 11011011. The pattern is an integer in 2s complement format. (Hint: find the normal representation first, then do the right-shift, and convert the result back to 2s complement form.)

1. $(01101101)_2$
2. $(01001010)_2$
3. $(10110110)_2$
4. $(11101110)_2$

QUESTION 24

Which logical operation on two input patterns has the following property?

"If corresponding bits in both input patterns are 1, the result of the operation is 1, otherwise it is 0."

1. OR
2. AND
3. XOR
4. NOT

Apply Boolean algebra rules in Questions 25 to 27 (See pp. 41-42 of Tut 102).

QUESTION 25

What is the simplest form of the Boolean function x′y + x′(x + y)?

1. x′(x + y)
2. 0
3. 1
4. x′y

QUESTION 26

What is the simplest form of the Boolean function (x′ + y)(xy)′(x + y′)?

1. 1
2. 0
3. x′y′
4. x′ + y′

QUESTION 27

What is the simplest form of the Boolean function (x + xy) + xz?

1. 0
2. x
3. xy
4. xy + z

QUESTION 28

Use the following Karnaugh diagram to determine the value of F(x,y,z) using minterms.

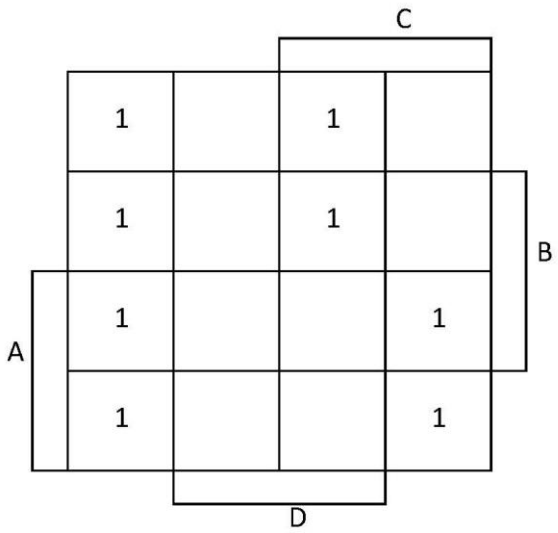
F(x,y,z) = _____?

	y'z'	y'z	yz	yz'
x'	1		1	
x'		1	1	

1. $m_1 + m_4 + m_6 + m_8$
2. $m_1 + m_3 + m_6 + m_7$
3. $m_0 + m_2 + m_5 + m_6$
4. $m_0 + m_3 + m_5 + m_7$

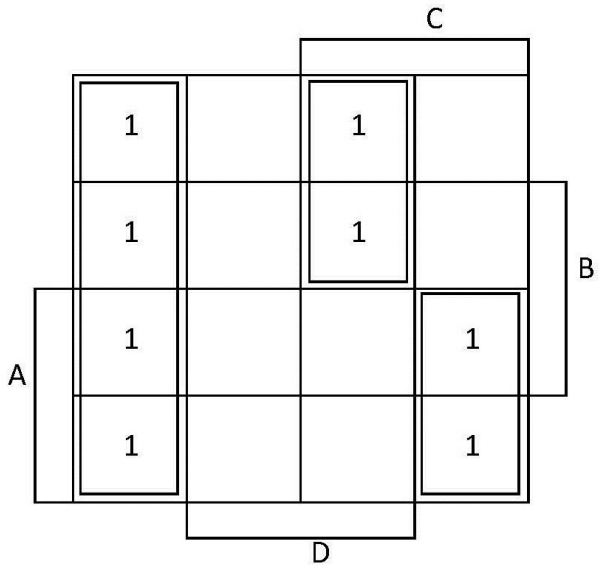
QUESTION 29

Consider the following Karnaugh map:

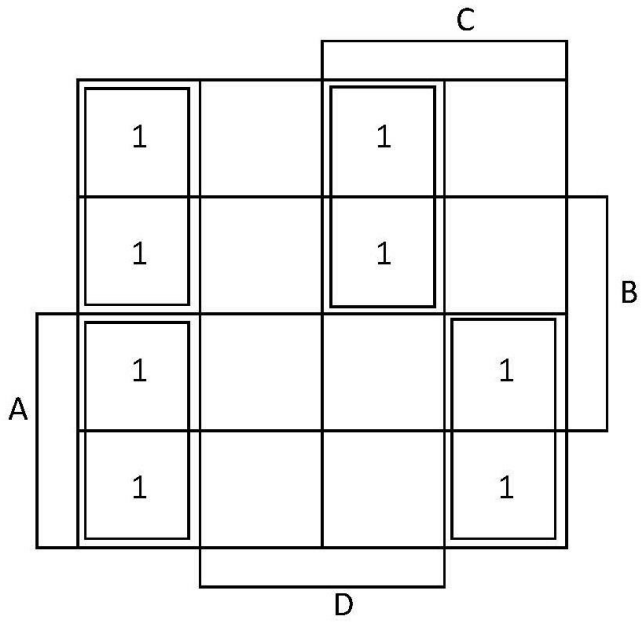


Which one of the following four Karnaugh maps reflects the best forming of groups?

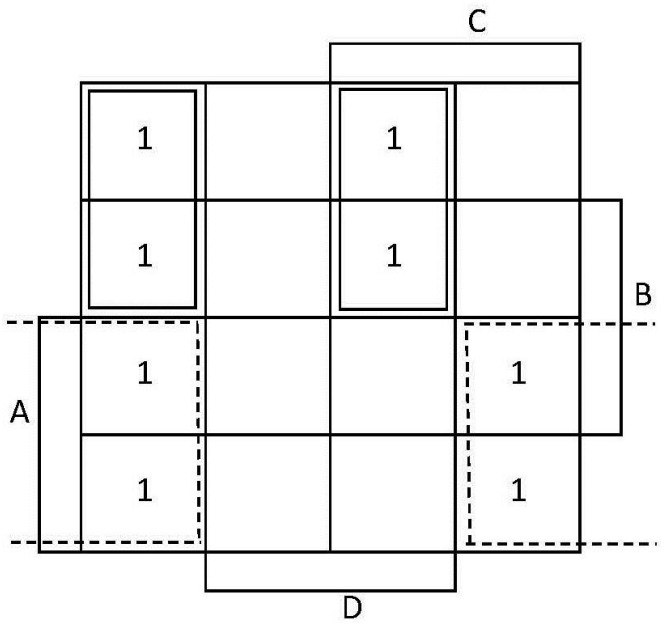
1.



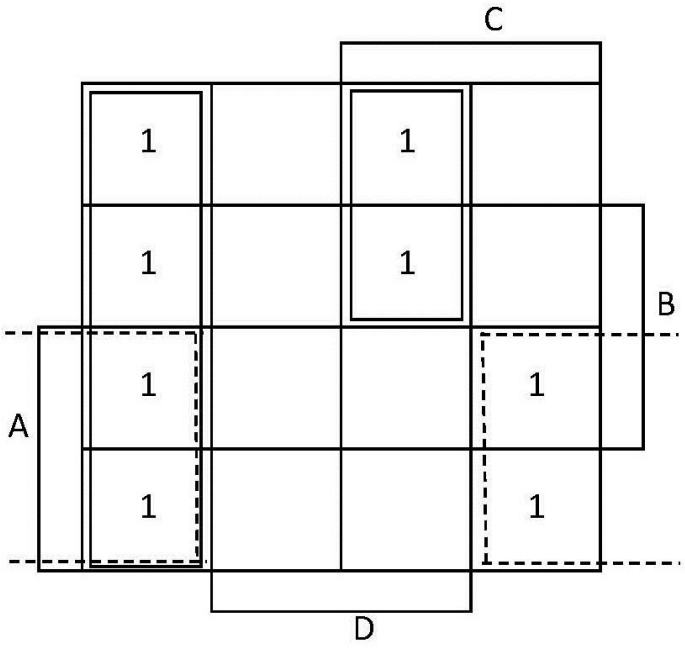
2.



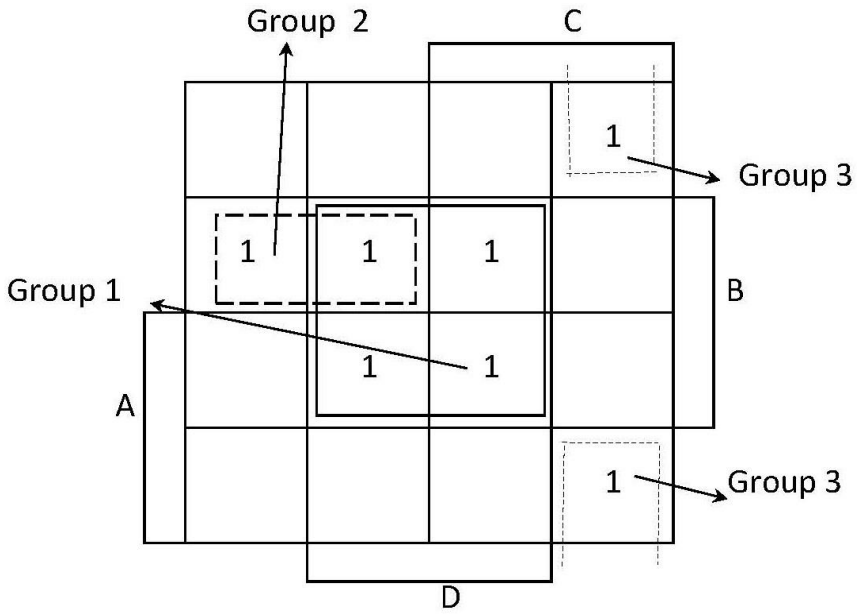
3.



4.



The next THREE questions refer to the following Karnaugh map:



QUESTION 30

Which term represents Group 1?

1. BD
2. A′BD
3. ABD
4. B

QUESTION 31

Which term represents Group 2?

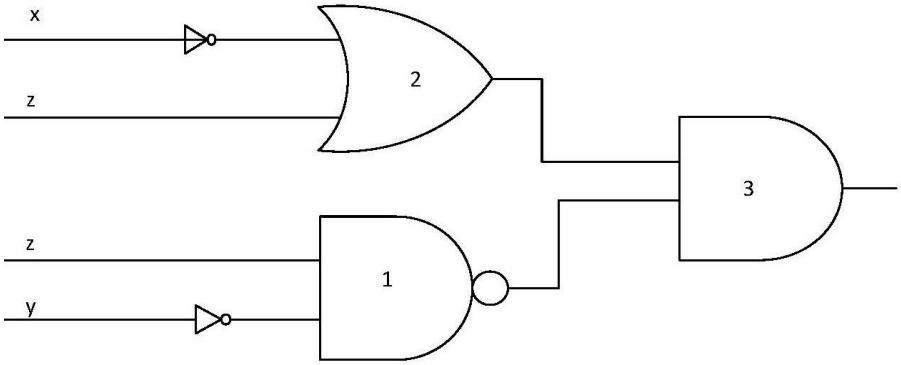
1. A′C′
2. A′BC′
3. A′B′D
4. A′C′D′

QUESTION 32

Which term represents Group 3?

1. CD′
2. B′CD′
3. B′D′
4. B’C

Questions 33 to 35 refer to the following combinational logic circuit:



QUESTION 33

What is the output of Gate 1? (*Hint:* Simplify the answer by using the Boolean rules on p.41 of Tut 102).

1. $z \cdot y'$
2. $z' \cdot y$
3. $z' + y$
4. $z' + y'$

QUESTION 34

What is the output of Gate 2?

1. $x + z$
2. $x' + z$
3. $x' \cdot z$
4. $(x \cdot z)'$

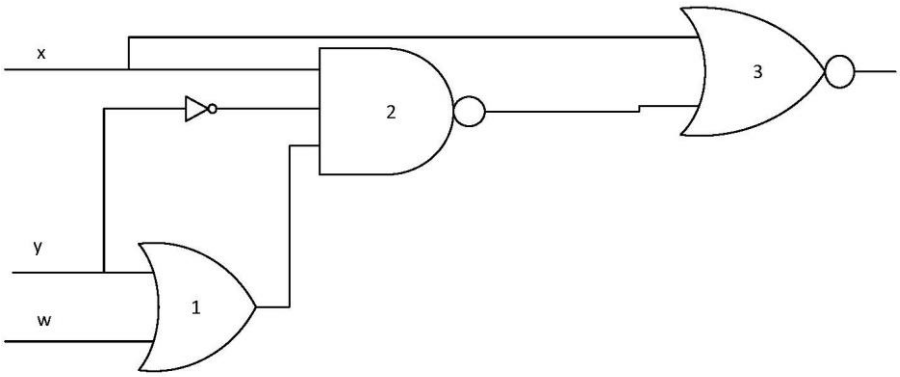
QUESTION 35

Use your answers in Question 33 and 34 and determine the output of Gate 3.

1. $(z' + y) \cdot (x' + z)$
2. $(z' + y) + (x' + z)$
3. $(z' \cdot y) \cdot (x' \cdot z)$
4. $(z' + y') + (x' + z)$

QUESTION 36

Consider the following logic circuit:



Which one of the following regarding the circuit is TRUE?

1. Gates 1 and 3 are OR gates, and Gate 2 is an AND gate.
2. Gates 2 and 3 are NOR gates, and Gate 1 is an OR gate.
3. Gate 1 is an OR gate, gate 3 is an NOR gate and gate 2 is a NAND gate.
4. Gate 1 is an OR gate, gate 3 is an XOR gate and gate 2 is a NAND gate.

Consider the following scenario:

For a school to enter an international music competition, a group of 4 students can be entered, only if the following four musical instruments are all played at the competition:

1. Piano
2. Violin
3. Trombone
4. Cello

Student A plays the cello and violin. Student B plays the piano and cello. Student C plays the violin and trombone and Student D plays the piano and the violin.

A Boolean function F(A,B,C,D) is defined as follows: F(A,B,C,D) = 1 when all 4 musical instruments are available to be played and F(A,B,C,D) = 0 when not all 4 instruments are available to be played (and therefore the group cannot enter the competition). For example, A = 1 when student A brings his/her cello and violin, and 0 otherwise.

Different combinations inputs for A, B, C and D are given in the tables provided in the following FOUR questions. Which alternative shows the correct outputs for F in EACH of the following FOUR questions?

QUESTION 37

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
1	0	1	1	1	0	0	1
1	1	1	0	0	0	1	1

QUESTION 38

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
0	1	1	0	1	0	0	1
1	0	1	0	0	0	1	1

QUESTION 39

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
1	1	0	1	1	0	0	1
0	0	1	1	0	0	1	1

QUESTION 40

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
1	0	1	0	1	0	0	1
0	1	1	0	0	0	1	1

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14.3 FIRST SEMESTER: ASSIGNMENT 02

Due date: 12 **April 2018**

Study material: **(1) Forouzan: chapters 5–14, but excluding chapter 12**

(2) Tutorial Letter 102: Part I: units 5–14

Please read the relevant study material in Forouzan and Tutorial Letter 102 before attempting this assignment. See more information about Tutorial Letter 102 in section 2.3 of the tutorial letter.

Submission procedure: Via myUnisa (see section 9.4)

Contribution to semester mark: 60%

Unique assignment number: **787763**

This assignment is compulsory: the mark you obtain for it contributes to your semester mark.

- Each multiple-choice question has four possible answers. Please select the alternative you consider to be the most appropriate.
- Submit your assignment via myUnisa by the due date. Do not be concerned if myUnisa is down on the due date. If this happens, we are notified about the situation and will take this type of delay into consideration. Try to resubmit the assignment as soon as myUnisa is up again.
- The mark that you achieve out of a possible 50 marks will be converted into a **percentage** and will contribute 60% towards your semester mark.

FIRST-SEMESTER ASSIGNMENT 02

QUESTION 1

Which one of the following statements regarding an address space of memory is FALSE?

1. The total number of uniquely identifiable memory locations is referred to as the address space.
2. A memory address is represented as a bit pattern.
3. Data is transferred from and to the memory space in units called frames.
4. Memory addresses cannot be stored as signed integers.

QUESTION 2

Which one of the following types of ROM (read-only memory) can be user-programmed, and then also erased by ultraviolet light?

1. EEPROM
2. EPROM
3. PROM
4. ROM

QUESTION 3

Which one of the following statements describes a property of RISC computer architecture?

1. Micromemory holds the set of operations for each complex instruction in the instruction set.
2. RISC is easier than other designs because there is a single instruction for both simple and complex tasks.
3. A small set of instructions does a minimum number of simple operations.
4. The circuitry of the CPU in a RISC design is very complicated.

QUESTION 4

Which one of the following statements is TRUE for the *fetch* cycle of the CPU during program execution?

1. The instruction in the instruction register is decoded by the fetch cycle.
2. The control unit orders the system to copy the next instruction into the instruction register during the fetch cycle.
3. The CPU executes commands such as ‘load a data item from memory’ during the fetch cycle.
4. The fetch cycle provides the binary code for the next operation to be performed.

QUESTION 5

Why is it easier to program CISC-based computers than to program other designs?

1. A small set of instructions will do a minimum number of simple operations.
2. CISC has a low overhead due to micro-processing.
3. There is a single instruction for both simple and complex tasks.
4. Programming is done on one level.

QUESTION 6

Which one of the following statements is NOT true for the transport layer of the TCP/IP protocol?

1. The transport layer is located between the application layer and the data-link layer.
2. The transport layer provides services to the application layer.
3. The transport layer is a process-to-process connection.
4. The transport layer is considered the heart of the TCP/IP protocol.

QUESTION 7

Which one of the following statements is NOT true about the User Datagram Protocol (UDM)?

1. The UDM is connectionless.
2. The UDM is unreliable.
3. The UDM uses a minimum overhead.
4. The UDM is used by the network layer.

QUESTION 8

Which of the following statements is NOT true for the network layer of the TCP/IP protocol?

1. The network layer provides services to the transport layer.
2. The network layer carries the payload of data from source to destination without changing it.
3. If a data packet gets fragmented along the way, the network layer sends the fragments as they arrive.
4. Data packets in the network layer can be lost, get corrupted or get duplicated.

QUESTION 9

Which one of the following is not a form of guided media?

1. Plastic cable
2. Twisted-pair cable
3. Coaxial cable
4. Fibre-optic cable

QUESTION 10

Which one of the following statements is NOT true for unguided media (wireless communication)?

1. Signals are broadcast through free space.
2. Radio waves with a frequency between 3 kHz and 1 GHz are used for radio communication.
3. Infrared waves with frequencies between 300 GHz and 400 THz are used for long-range communication.
4. Microwaves are bi-directional.

QUESTION 11

What name is given to the situation where computer programs are in memory at the same time and are executed concurrently?

1. Multiprocessing
2. Multiprogramming
3. Synchronised processing
4. Batch processing

QUESTION 12

Which one of the following is NOT one of the operating system's components?

1. Memory manager
2. Hardware manager
3. File manager
4. Process manager

QUESTION 13

Which one of the following statements is NOT true about paging?

1. It improves the efficiency of partitioning.
2. In paging, memory is divided into frames and programs are divided into pages.
3. Each program page is loaded into a frame in memory.
4. Contiguous pages of programs must occupy contiguous frames in memory.

QUESTION 14

Which one of the following is not a necessary condition for deadlock to occur?

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

QUESTION 15

An OS can be programmed in such way that *the code is independent of the machine language of a computer on which it runs.* This property refers to the _____ of the OS.

1. extensibility
2. reliability
3. compatibility
4. portability

QUESTION 16

A list contains the following elements:

8 15 21 37 41 47 51 56 60 69 71 75 83

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 75?

1. 7 10 13
2. 10 11 13
3. 10 12 13
4. 11 12 13

QUESTION 17

Suppose a list contains the following elements:

91 19 99 39 93 49 97 79

What is the order of the elements in the list after three passes when selection sort is used?

1. 19 39 99 91 93 49 97 79
2. 19 39 49 91 93 99 97 79
3. 19 39 49 79 93 99 97 91
4. 19 39 49 91 99 93 97 79

QUESTION 18

A graphic representation of an algorithm that hides the details of the algorithm and shows how the algorithm flows from beginning to end, is called a _____.

1. Pseudocode
2. UML
3. Subroutine
4. Gantt chart

QUESTION 19

Which construct is represented by the pseudocode below?

```
get our number
set our initial count to 0
while our number is greater than 1
  divide the number 2
  increase our count by 1
end
```

1. Sequence
2. Decision
3. Repetition
4. Generalisation

QUESTION 20

Which one of the following statements is TRUE regarding searching algorithms?

1. Binary search should be used if the list to be searched is unsorted.
2. The bigger the list to be sorted, the more efficient sequential search becomes.
3. A binary search starts by examining the element in the beginning of the list.
4. Binary search is quicker than sequential search.

QUESTION 21

Which of the following statements is NOT TRUE regarding sub-algorithms?

1. A structured algorithm is broken down into sub-algorithms.
2. Sub-algorithms perform specific functions and are thus more understandable.
3. Sub-algorithms are written once in the program, and can be executed multiple times.
4. A sub-algorithm cannot further be divided into more sub-algorithms.

QUESTION 22

Which one of the following options is NOT a sorting algorithm?

1. Bubble sort
2. Selection sort
3. Binary sort
4. Insertion sort

QUESTION 23

Which one of the following statements regarding computer languages is NOT true?

1. Machine language is the only language understood by computer hardware.
2. Machine language is also referred to mnemonic language.
3. Assembly languages are also referred to as symbolic languages.
4. High-level languages allow the programmer to concentrate on the application rather than hardware requirements.

QUESTION 24

Which one of the following statements regarding the translation of a program is FALSE?

1. High level languages such as C++ must be translated into machine language before it can be executed on a computer.
2. The program in the high level language is called the source, and the translated version is called the object code.
3. A large program should be interpreted while small programs should rather be compiled.
4. Compilation and interpretation are the two translation methods used for high level languages.

QUESTION 25

Which part of the translation process of a program uses tokens to, for example, create an assignment statement such as x = 1?

1. Lexical analyser
2. Syntax analyser
3. Semantic analyser
4. Code generator

QUESTION 26

Polymorphism used in object-oriented programming can be described as the process of …

1. …defining many classes to represent objects.
2. …defining many methods to perform different functions.
3. …allowing an object to inherit characteristics from other objects.
4. …defining several operations with the same name that can perform different things in related classes.

QUESTION 27

Which one of the following is NOT a characteristic of the object-oriented programming paradigm?

1. Methods
2. Schemes
3. Inheritance
4. Polymorphism

QUESTION 28

Consider statements A and B below. Which one of the options is true for the incremental model software lifecycle?

A. Software is developed in a series of steps.

B. The developers do not add more functionality until the existing system works properly.

1. Both A and B are false.
2. A is false and B is true.
3. A is true and B is false.
4. Both A and B are true.

QUESTION 29

Which diagram CANNOT be used as a modelling tool during the analysis phase of the software development lifecycle (SDLC)?

1. Data flow diagram
2. Program code diagram
3. Entity-relationship diagram
4. State diagram

QUESTION 30

Coupling is _____.

1. …the encapsulation of data and methods.
2. …the division of a large program into smaller parts that can communicate with each other.
3. …a measure of how tightly two modules are bound to each other.
4. …a measure of how closely the modules in a system are related.

QUESTION 31

Tightly coupled modules are less independent than loosely coupled modules. Which one of the following is not an advantage of loosely coupled modules?

1. They are more likely to be reusable.
2. They are less likely to create errors.
3. Modification to one module is less likely to affect other modules.
4. They are more likely to have minimum cohesion.

QUESTION 32

Which one of the following testing methods is used in glass-box testing?

1. Basis path
2. Exhaustive
3. Random
4. Boundary-value

QUESTION 33

Documentation in the software lifecycle is an ongoing process. Which one of the following statements regarding documentation is NOT TRUE?

1. User documentation shows step by step how to use the software.
2. System documentation defines software.
3. System documentation describes the servicing of a software system.
4. Technical documentation describes the installation of a software system.

QUESTION 34

Which one of the following statements is FALSE about arrays? (We assume array indexes start at 1).

1. The 10th element of an array *testing*, can be referred to as *testing*[10].
2. If we want to set the 5th element of array *what* to 6, it can be done as follows: *what*[6] ← 5.
3. If *scores* is the name of an array, *scores*[3] would be the name of one of its elements.
4. *Marks*[2][3] would be an element of a two-dimensional array *Marks*.

QUESTION 35

Consider the following three statements, and then choose the correct option about statements A, B and C:

A. The elements in a record can be of the same or different types, but all elements in the record must be related.
B. An array is a suitable structure when a small number of insertions and deletions are required, but a lot of searching and retrieval is needed.
C. A linked list is a suitable structure if a large number of insertions and deletions are needed, but searching a linked list is slower than searching an array.

1. Statements A and B are true, but statement C is false.
2. Statements A and C are true, but statement B is false.
3. Statements B and C are true, but statement A is false.
4. Statements A, B and C are true.

QUESTION 36

We want to assign the value *2016* to a field called *date* in a record called *exam*. Which of the following options would be the correct way?

1. date[exam] ← 2016
2. exam[date] ← 2016
3. date.exam ← 2016
4. exam.date ← 2016

QUESTION 37

Which one of the following statements regarding linked lists is FALSE?

1. Each element of a linked list consists of at least a data portion and a link.
2. A link contains the address of the next element in the linked list.
3. Two different links can point to the same element.
4. Each element in the list, including the last element, points to its successor.

QUESTION 38

State whether the two statements below are True or False with regard to the retrieval of elements.

A. Retrieving means randomly accessing an element for the purpose of inspecting or copying the data contained in the element.
B. Retrieving is a difficult operation when a data structure is an array.

1. A and B are false.
2. A is false and B is true.
3. A is true and B is false.
4. A and B are true.

QUESTION 39

In which one of the following cases would a linked list NOT be suitable to use?

1. A large number of insertions and deletions are needed.
2. Data must be searched very often.
3. Lists can start with no nodes and can grow as nodes are needed.
4. Lists are read sequentially via linked addresses and updated accordingly.

QUESTION 40

In a sequential file, the end of the file is indicated by…

1. …a counter containing the number of records in the file.
2. …an end-of-file marker at the end of all the records.
3. …an address of the last record stored in the beginning of the file.
4. …zero in the last record.

QUESTION 41

Which one of the following statements regarding updating of sequential files is FALSE?

1. If minor changes are needed the transaction file is not necessary.
2. The new master file always contains the most current updates.
3. The old master file is normally kept for referencing, even after the new master file has successfully been created.
4. The error report file is necessary to take corrective action after errors occurred during an update process.

QUESTION 42

Which one of the following statements regarding indexed and hashed files is NOT TRUE?

1. An indexed file consists of a data file and an index file.
2. An indexed file can be accessed from disk if a data record needs to be accessed or changed.
3. A hashed file does not need an index file.
4. Data in a hashed file is reached via a mathematical function.

QUESTION 43

In file processing, collision occurs when…

1. ...the file is not big enough to hold all the data records.
2. …two files are open in memory at the same time.
3. …the data in the file contains two synonyms, i.e. two keys collide at the home address.
4. …the prime area is inaccessible.

QUESTION 44

Which one of the following statements regarding directories is NOT TRUE?

1. In most operating systems directories are organised like a tree abstract data type in which each directory has a parent directory.
2. Directories are provided by most operating systems for organising files.
3. A directory performs the same function as a folder in a filing cabinet.
4. In most operating systems a directory is represented as a special type of file that holds information about other files.

QUESTION 45

Which one of the following is NOT a level in the database three-level architecture developed by ANSI/SPARC?

1. External level
2. Procedural level
3. Conceptual level
4. Internal level

QUESTION 46

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

1. network
2. distributed
3. relational
4. hierarchical

QUESTION 47

Which one of the following is not a valid level in database architecture?

1. Internal level
2. Conceptual level
3. User view level
4. External level

QUESTION 48

Which one of the following statements regarding operations on relations in a database is TRUE?

1. While the *select* and *join* operations are unary operations, the *intersection* and *difference* operations are binary operations.
2. While the *insert* and *delete* operations are unary operations, the *intersection* and *union* operations are binary operations.
3. While the *select* and *update* operations are unary operations, the *project* and *join* operations are binary operations.
4. While the *insert* and *union* operations are unary operations, the *join* and *difference* operations are binary operations.

QUESTION 49

Which one of the following statements regarding operations on relations in a database is FALSE?

1. The *difference* operation is applied to two relations that do not necessarily have the same attributes.
2. The difference between the *join* and *union* operations is that with the *join* operation the two relations are combined based on common attributes, while with the *union* operation, the two relations must have exactly the same attributes.
3. The *project* operation creates another relation in which each tuple in the resulting relation has fewer attributes than the corresponding tuple in the original relation.
4. The *intersection* operation creates a new relation from two relations with the same attributes, where the new relation contains tuples which are members of both original relations.

QUESTION 50

Which one of the following is NOT TRUE about XML?

1. It stands for ‘Extensible Markup Language’.
2. It is the language normally used for object-oriented databases.
3. It has replaced all previous database query languages.
4. It can represent data with a nested structure.

II---oooOooo---II

SECOND-SEMESTER ASSIGNMENTS

14.4 SECOND SEMESTER: ASSIGNMENT 01

Due date: **23 August 2018**

Study material: **(1) Forouzan: chapters 1–4; Appendices A and E (prescribed book)**

(2) Tutorial Letter 102:

Part I: units 1–4

Part II: ALL (pages 24–74)

Part III: solution to self-assessment assignment

Do the relevant exercises in Forouzan, Tutorial Letter 102 and the self-assessment assignment before attempting this assignment. See more information about Tutorial Letter 102 in section 2.3 of the tutorial letter.

Submission procedure: Via myUnisa (see section 9.4)

Contribution to semester mark: 40%

Unique assignment number: **731793**

This assignment is compulsory. To be admitted to the **examination** for this module, you must submit this assignment by 23 August 2018.

- Each multiple-choice question has four possible answers. Select the option you consider to be the most appropriate.
- Submit your assignment via myUnisa by the due date. Do not be concerned if myUnisa is down on the due date. If this happens, we are notified about the situation and will take this type of delay into consideration. Try to resubmit the assignment as soon as myUnisa is up again.
- The mark that you achieve out of a possible 40 marks will be converted into a **percentage** and will contribute 40% towards your semester mark.

Second semester: Assignment 01

QUESTION 1

Which of the following statements regarding the von Neumann model is FALSE?

1. Programs are stored in the memory of a computer.
2. The computer hardware is divided into memory, arithmetic logic unit, control unit and input/output.
3. The control unit fetches one instruction at a time from memory and executes it.
4. The control unit does not allow jumping to an instruction that is not the next sequential instruction.

QUESTION 2

In which computer generation did the first desktop calculator, the Altair 8800, become available?

1. Second generation
2. Third generation
3. Fourth generation
4. Fifth generation

QUESTION 3

In which century was the machine called the Jacquard loom invented?

1. 16th century
2. 17th century
3. 18th century
4. 19th century

QUESTION 4

Who invented a machine that could solve polynomial equations, called the Difference Engine?

1. Blaise Pascal
2. Gottfried Leibnitz
3. Herman Hollerith
4. Charles Babbage

QUESTION 5

During which computer generation were the higher level languages COBOL and FORTRAN invented?

1. Second generation
2. Third generation
3. Fourth generation
4. Fifth generation

QUESTION 6

Which of the following is NOT a subsystem of the von Neumann model?

1. Memory
2. Arithmetic logic unit
3. File handling unit
4. Input/output

QUESTION 7

Social issues created by the development of computers are:

1. Dependency, computer crime and digital divide.
2. Dependency, privacy and digital divide.
3. Dependency, social justice and privacy.
4. Dependency, social justice and digital divide.

QUESTION 8

Convert the decimal number $(67.125)_{10}$ into a binary number.

1. $(1100001.001)_2$
2. $(1100001.100)_2$
3. $(1000011.001)_2$
4. $(1000011.100)_2$

QUESTION 9

Convert the binary number $(1111101.11)_2$ into a hexadecimal number.

1. $(1F.7)_{16}$
2. $(7D.C)_{16}$
3. $(7D.3)_{16}$
4. $(FA.C)_{16}$

QUESTION 10

Which of the following is NOT a valid number?

1. $(FA.DE)_{16}$
2. $(76.678)_{8}$
3. $(00.000)_{2}$
4. $(1F2F3F)_{16}$

QUESTION 11

Convert the number $(F1FA)_{16}$ to binary.

1. $(1111000111111010)_{2}$
2. $(1010111100011111)_{2}$
3. $(1111100011111100)_{2}$
4. $(1100111101110000)_{2}$

QUESTION 12

Convert $(9999)_{10}$ into an octal number.

1. $(71432)_{8}$
2. $(203417)_{8}$
3. $(23417)_{8}$
4. $(714302)_{8}$

QUESTION 13

Which of the following is FALSE?

1. $(F1)_{16}$ is not greater than $(11110001)_{2}$
2. $(11110001)_{2} = (361)_{8}$
3. $(241)_{10}$ is less than $(361)_{8}$
4. $(361)_{8}$ is not less than $(F1)_{16}$

QUESTION 14

Which of the following is not TRUE regarding the 1s complement and 2s complement notation?

1. If we take 2s complement of an integer, and repeat the process on the result, we end up with the original integer.
2. If we take 1s complement of an integer, and repeat the process on the result, we end up with the original integer.
3. Almost all computers use 2s complement to store signed integers.
4. An alternative method of taking the 1s complement of an integer is to take the 2s complement and add 1 to the result.

QUESTION 15

Which one of the following statements regarding bits and bit patterns is FALSE?

1. A bit is the smallest unit of data stored in a computer.
2. We use a string of bits (or bit pattern) to represent different types of data.
3. An example of a bit pattern is 00102102.
4. A byte normally consists of 8 bits.

QUESTION 16

What decimal integer is stored in memory (8 bits) as 10110011 in 2s complement representation?

1. -197
2. 197
3. -77
4. 77

QUESTION 17

Which one the following statements regarding the storage of images is FALSE?

1. The higher the resolution of an image, the less discontinuity in reproduced images can be recognised by the human eye.
2. The disadvantages of vector graphics are that the file size is big and rescaling is difficult to do.
3. GIF and JPEG are two standards for image encoding.
4. While a True-Colour scheme uses more than a million colours, an indexed colour scheme normally uses about 256 colours.

QUESTION 18

Convert $(10110.11)_2$ into normalised form:

1. $(0.1011011)_2 \times (2^{-5})_{10}$
2. $(0.1011011)_2 \times (2^{5})_{10}$
3. $(1.011011)_2 \times (2^{-4})_{10}$
4. $(1.011011)_2 \times (2^{4})_{10}$

QUESTION 19

What would the result be if the 8-bit mask 10011010 is applied to the input bit pattern 01100011? (*Hint:* The OR operation is performed).

1. 00000010
2. 11111101
3. 11111111
4. 11111011

QUESTION 20

If the input is 11001010, which of the following would be the correct mask to apply if we want to set bits 0, 2, 4 and 6, resulting in the output pattern 11011111?

1. 01010101
2. 00000000
3. 11111111
4. 10101010

QUESTION 21

Calculate: $(101101.101)_2 + (1011)_2$.

1. $(101111.000)_2$
2. $(110111.101)_2$
3. $(111000.101)_2$
4. $(111001.101)_2$

QUESTION 22

Calculate: $(11010010)_2$ XOR $(10011101)_2$.

1. $(11011111)_2$
2. $(01001111)_2$
3. $(10010000)_2$
4. $(01101111)_2$

QUESTION 23

If the input pattern is 11001011, and a shift-left operation is performed, followed by a shift-right operation, followed by another shift-right operation, what would the result be?

1. $(00100101)_2$
2. $(01100101)_2$
3. $(11001011)_2$
4. $(10010100)_2$

QUESTION 24

Which one of the following statements regarding storing text is FALSE?

1. Alphabetical characters, punctuation marks and newline characters are stored using bit patterns.
2. ASCII and Unicode are two sets of codes used to represent text symbols.
3. ASCII uses 7 bits to represent each symbol.
4. Unicode uses 16 bits to represent each symbol.

QUESTION 25

Calculate the simplest form of the Boolean function (x + yzw)' by applying de Morgan's rule twice.
(*Hint:* See Tut 102, p42). Which of the following options give the simplified form?

1. x' + y' + z' + w'
2. x'y'z'w'
3. x'(y' + z' + w')
4. x' + (y'z'w')

QUESTION 26

What is the simplest form of the Boolean function ABC' + A'BC' + A'BC + ABC?
(*Hint:* Use a combination of the identity, distributive and complement rules on pp.41-42 of Tut 102).

1. B
2. A + B + C
3. BC' + BC
4. A + C'

QUESTION 27

What is the simplest form of the Boolean function x + (xy) + [x(x + y) + x']? Use the Boolean rules in Tut 102, pp.41-42.

1. x
2. xy
3. 0
4. 1

QUESTION 28

The following question refers to the incomplete truth table below for the expression

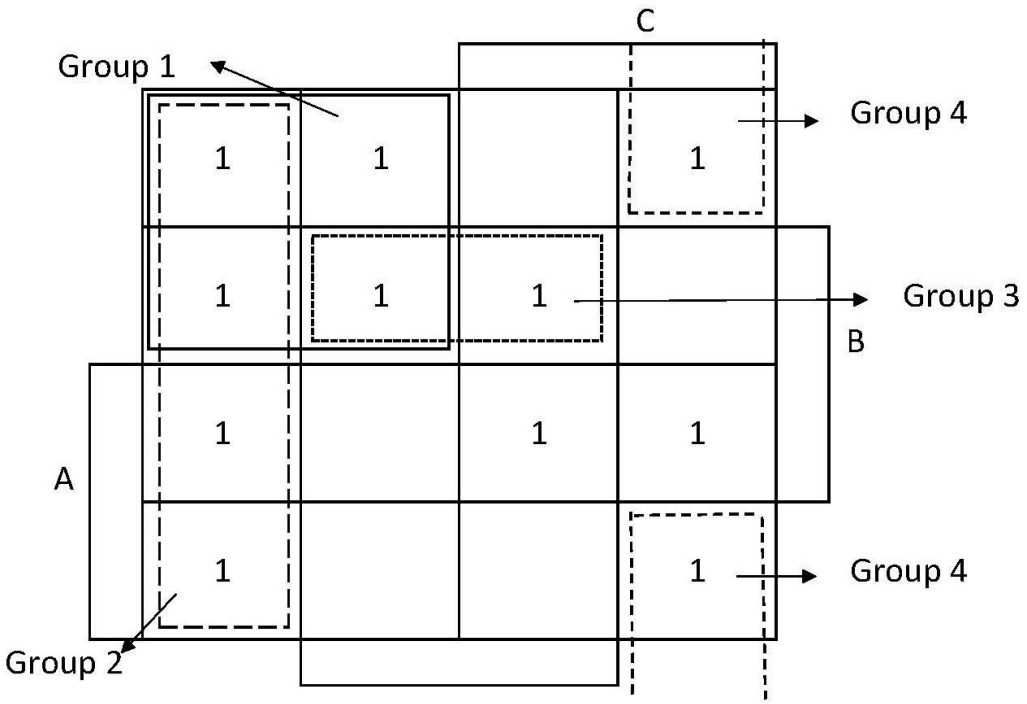
G = B'C + AB'

What is the expression G in sum of minterms form?

A	B	C	G	minterms	m-notation
0	0	0			m_0
0	0	1	1		m_1
				A'BC'	
0	1	1			m_3
1	0	0			
1	1	1			

1. $m_2 + m_5 + m_6$
2. $m_0 + m_4 + m_5$
3. $m_0 + m_2 + m_3$
4. $m_1 + m_4 + m_5$

Questions 29-31 refer to the following Karnaugh diagram:



QUESTION 29

Which term represents Group 2?

1. D'
2. C'D'
3. BC'D'
4. B'C'D'

QUESTION 30

Which term represents Group 3?

1. A'
2. A'B
3. A'D
4. A'BD

QUESTION 31

Which term represents Group 4?

1. A'D'
2. B'CD'
3. CD'
4. C

QUESTION 32

Which one of the Karnaugh diagrams below represents the expression X = A'BC + BC'?

1.

	B'C'	B'C	BC	BC'
A'	0	0	1	0
A	0	1	1	1

2.

	B'C'	B'C	BC	BC'
A'	0	1	0	0
A	1	1	0	0

3.

	B'C'	B'C	BC	BC'
A'	0	0	1	0
A	0	1	0	1

4.

	B'C'	B'C	BC	BC'
A'	0	0	1	0
A	0	1	1	0

The following 4 diagrams refer to question 33:

Diagram 1:

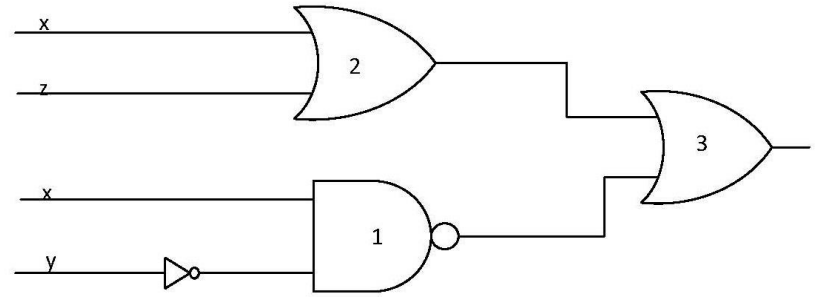


Diagram 2:

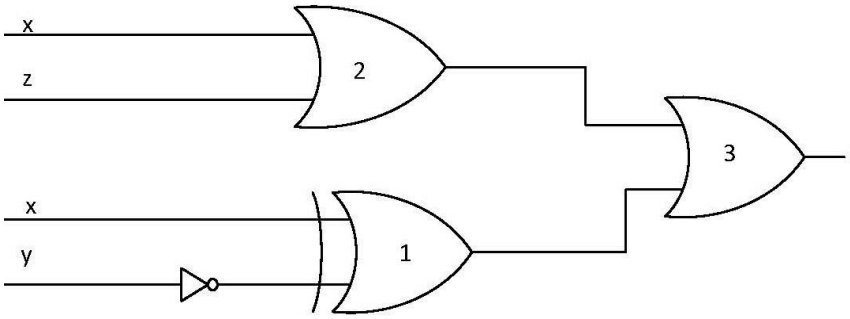


Diagram 3:

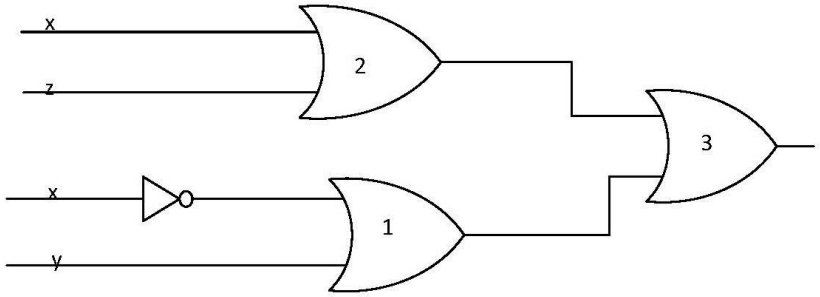
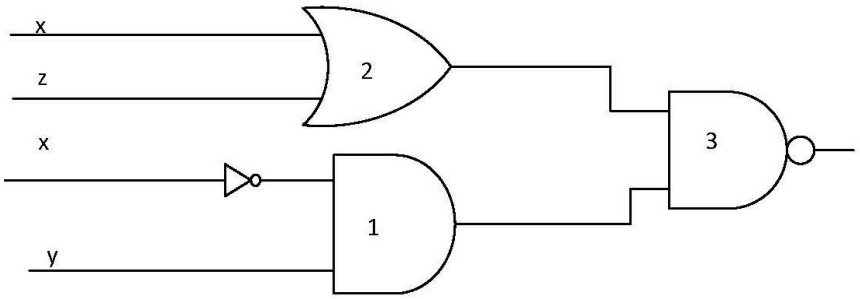


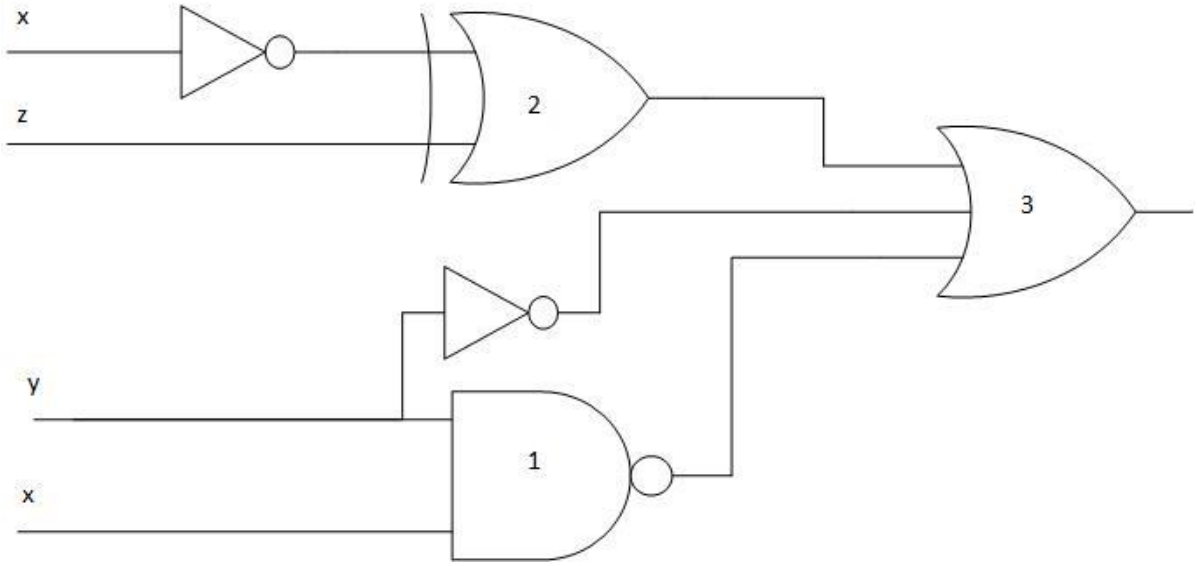
Diagram 4:



QUESTION 33
Which two of the above diagrams have exactly the same output? (*Hint*: Write down the expressions that represent each of the diagrams and simplify them using the Boolean rules in Tut 102, pp.41-42, and then compare the results).

1. Diagram 2 and Diagram 4
2. Diagram 1 and Diagram 4
3. Diagram 1 and Diagram 3
4. Diagram 2 and Diagram 3

Questions 34, 35 and 36 refer to the following combinational logic circuit:



QUESTION 34
Which type of gate is Gate 2?

1. OR
2. NOR
3. XOR
4. NAND

QUESTION 35
What is the output of Gate 2?

1. $(x \oplus z)'$
2. $x' \oplus z$
3. $(x' + z)'$
4. $x'.z$

QUESTION 36
What is the output of Gate 3? Simplify your answer as far as possible.

1. (x' + z) + x + y
2. (x' + z) + x'.y'
3. (x ⊕ z)' + x' + y'
4. (x' ⊕ z) + x' + y'

Questions 37-40 refer to the following scenario:

Four students want to enter a computer gaming competition as a group. To qualify, they need to have the following computer games installed on their computers:

1. Minecraft
2. League of legends
3. Team Fortre
4. Hearthstone

They do not necessarily all have to take computers, but amongst them, they must have all the games installed. Student A has games 1 and 3 installed. Student B has games 1 and 2 installed. Student 3 has game 4 installed, and Student 4 has games 3 and 4 installed.

A Boolean function F(A,B,C,D) is defined as follows: F(A,B,C,D) = 1 when all games are installed amongst them (which means they can enter as a group), and 0 otherwise (ie they cannot enter the competition). For example, A = 1 when student A has both games 1 and 3 installed and he takes his computer along, otherwise A = 0. Different combinations inputs for A, B, C and D are given in the tables provided in the following FOUR questions. Which alternative shows the correct outputs for F in EACH of the following FOUR questions?

QUESTION 37

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
1	0	1	1	1	0	0	1
1	1	0	0	0	0	1	1

QUESTION 38

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
0	1	0	1	1	0	0	1
1	0	0	1	0	0	1	1

QUESTION 39

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
1	1	1	0	1	0	0	1
0	1	0	1	0	0	1	1

QUESTION 40

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**D**	**F**	**F**	**F**	**F**
0	1	1	0	1	0	0	1
1	1	0	1	0	0	1	1

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14.5 SECOND SEMESTER: ASSIGNMENT 02

Due date: **27 September 2018**

Study material: **(1) Forouzan: Chapters 5–14, but excluding Chapter 12**

(2) Tutorial Letter 102: Part I: Units 5–14

Please read the relevant study material in Forouzan and Tutorial Letter 102 before you begin this assignment. See more information about Tutorial Letter 102 in section 2.3 of this tutorial letter.

Submission procedure: Through myUnisa (see section 9.4)

Contribution to semester mark: 60%

Unique assignment number: **835274**

This assignment is compulsory. The mark you obtain for it contributes to your semester mark.

- Each multiple-choice question has four possible answers. Please select the answer you consider to be the most appropriate.
- Submit your assignment through myUnisa by the due date. Do not be concerned if myUnisa is down on the due date. If this happens, we are notified about the situation and we will take this type of delay into consideration. Try to resubmit the assignment as soon as myUnisa is up again.
- The mark that you achieve out of a possible 50 marks will be converted into a **percentage** and will contribute 60% towards your semester mark.

Second semester: Assignment 02

QUESTION 1
Which of the following is not part of the Central Processing Unit (CPU) of a computer?

1. Registers
2. Main memory
3. Arithmetic Logic Unit (ALU)
4. Control unit

QUESTION 2
Registers facilitate the operation of the CPU. Which of the following is NOT a CPU register?

1. Data register
2. File register
3. Instruction register
4. Program counter

QUESTION 3
Which statement is NOT true about RAM (Random access memory)?

1. It makes up most of the main memory in a computer.
2. In some devices it is possible to access data items using their addresses.
3. RAM can be read from, and written to.
4. Information in RAM is never lost when the computer is powered off.

QUESTION 4
Which one of the following statements regarding magnetic disks is FALSE?

1. The transfer time of a magnetic disk defines the time it takes to move data from the CPU back to the disk.
2. The smallest storage area that can be accessed is a sector.
3. A block of data can be stored over more than one sector.
4. The disk surface is divided into tracks.

QUESTION 5 1
Which one of the following statements regarding LANs and WANs is NOT true?

1. Point-to-point WANs and switched WANs are two distinct examples of WANs.
2. A switched WAN connects two communicating devices through a transmission medium.
3. LANs are for example spanning an office, a building or a campus.
4. A LAN interconnects hosts.

QUESTION 6
At which layer of the protocol suite do we work with email addresses such as somebody@networkmail.com ?

1. Application layer
2. Transport layer
3. Network layer
4. Data-link layer

QUESTION 7
At which layer of the protocol suite do we work with port numbers?

1. Application layer
2. Transport layer
3. Network layer
4. Data-link layer

QUESTION 8
Which of the following is NOT true for the client-server application layer paradigm?

1. In this paradigm a client program can run as a server program and vice versa.
2. In this paradigm you need a powerful computer as a server, due to the concentration of communication load.
3. In this paradigm the service must always return income for the server to assist the service provider with costs.
4. This paradigm is still used in the World Wide Web, and its HTTP and FTP protocols.

QUESTION 9
There are several layers in the internet TCP/IP suite. What is the transport layer responsible for?

1. Node-to-node delivery of frames
2. Delivery of individual packets from the source host to the destination host
3. Providing services to the user
4. Logical delivery of a message between client and server processes

QUESTION 10
Which one of the following statements is NOT true for the physical layer of the protocol suite?

1. It converts bits received from the network layer to electromagnetic signals.
2. It delivers signals to transmission media.
3. Signals delivered by this layer can be analog or digital.
4. At this layer the communication is node-to-node.

QUESTION 11
Which one of the following is NOT true for the operating system of a computer?

1. It uses computer programs to solve user problems.
2. It is an interface between computer hardware and the user.
3. It is a set of programs that facilitates execution of other programs.
4. It supervises each component in a computer system.

QUESTION 12
Which operating system is expected to do a task within a specific time-constraint?

1. Batch system
2. Real-time system
3. Distributed system
4. Personal system

QUESTION 13
Which one of the following statements is NOT true about the shell (or the window)?

1. It manages the hardware devices.
2. It communicates outside of the operating system.
3. It is called the user interface.
4. It is menu-driven and has a graphical user interface.

QUESTION 14
Which one of the following statements is NOT TRUE regarding the partitioning technique in multiprogramming?

1. Memory is divided in fixed-length sections.
2. Each section holds one program.
3. The CPU switches between programs.
4. CPU time allocated to each program can be controlled with priority levels.

QUESTION 15
Modern operating systems use three different terms that refer to a set of instructions: program, job and process. Which one of the following statements is NOT true about these terms?

1. A program is a non-active set of instructions stored on a storage medium such as a disk.
2. A program might or might not become a job.
3. A process is a program that is waiting to be executed.
4. A program becomes a job when it is selected for execution.

QUESTION 16

A list contains the following elements:

1 7 9 11 13 21 25 28 31 33 37 40 42

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 13?

1. 1 3 6
2. 3 5 6
3. 4 5 6
4. 4 5 7

QUESTION 17

Suppose a list contains the following elements:

77 72 57 71 87 67 17 47

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

1. 17 47 57 71 87 67 77 47
2. 17 47 57 71 87 67 77 72
3. 17 47 57 67 87 71 77 72
4. 17 47 57 77 72 71 87 67

QUESTION 18

Which of the following is NOT a construct used in programming for a structured program?

1. Structure chart
2. Sequence
3. Decision (selection)
4. Repetition (loop)

QUESTION 19

Which one of the following statements is NOT TRUE regarding pseudocode?

1. Pseudocode is an English-like representation of an algorithm.
2. A syntax like Pascal is often used in pseudocode.
3. Pseudocode is a pictorial representation of an algorithm.
4. There is no standard for pseudocode – some people use a lot of detail, others use less.

QUESTION 20

Which one of the following statements is FALSE regarding the requirements for an algorithm?

1. An algorithm must be a well-defined, ordered set of instructions.
2. Each step in an algorithm must be clear and unambiguous.
3. An algorithm must terminate in finite time.
4. An algorithm need not necessarily produce a result.

QUESTION 21

Which one of the following statements is TRUE regarding searching algorithms?

1. Binary search should be used if the list to be searched is unsorted.
2. The bigger the list to be sorted, the more efficient sequential search becomes.
3. A binary search starts by examining the element in the beginning of the list.
4. Binary search is quicker than sequential search.

QUESTION 22

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

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

QUESTION 23

Which one of the following statements regarding the interpretation translation method is FALSE?

1. Interpretation refers to the process of translating each line in the source program into object code and executing the line.
2. In the first approach to interpretation, a program is aborted if a line of interpreted code contains an error when it executes.
3. In second approach interpretation a program in Java for example, is first compiled into Java bytecode. The bytecode is then interpreted by a computer that runs a JVM emulator.
4. BASIC and APL are also examples of programming languages using the second approach to interpretation.

QUESTION 24

Which of the following is NOT true for the procedural paradigm of programming?

1. A procedural paradigm is also called an imperative paradigm.
2. In the procedural paradigm the program can be seen as an agent, manipulating passive objects.
3. Passive objects in the procedural paradigm are referred to as data or data items.
4. Data items in a procedural paradigm are stored in classes.

QUESTION 25

Which one of the following statements regarding functional programming languages is NOT TRUE?

1. A program is considered a mathematical function.
2. Summation is an example of functional programming with *n* inputs and one output.
3. A functional language allows a programmer to combine basic functions to create other functions.
4. Java is an example of a functional language.

QUESTION 26

Which one of the following statements is NOT true for the declarative programming paradigm?

1. The declarative paradigm uses the principle of logical reasoning to answer queries.
2. The declarative paradigm is based on first-order predicate logic.
3. Ada is an example of a programming language that uses the declarative approach.
4. In the declarative paradigm logic rules are defined, from which the program then deduces facts.

QUESTION 27

Compilation _____.

1. …is used in the first approach to interpretation.
2. …translates and executes the source code one line at a time.
3. …translates the whole source program into the object module before it is executed.
4. …is a slow process in comparison to interpretation.

QUESTION 28

Which one of the following statement is FALSE for the incremental model for the software life cycle?

1. Software is developed in a series of steps.
2. A simplified version of the complete system is first developed.
3. In the second version more functionality is added, while some are left unfinished.
4. When the complete system has been developed, the testing phase starts.

QUESTION 29

Which stage of the software life cycle results in the creation of a specification document?

1. Design
2. Analysis
3. Testing
4. Implementation

QUESTION 30

Which one of the following diagrams is NOT used during the analysis phase of the procedure-oriented analysis?

1. Data flow diagram
2. Entity-relationship diagram
3. Use-case diagram
4. State diagram

QUESTION 31

Which of the following best describes a measure of how closely the modules in a software system are related?

1. Modularity
2. Adhesion
3. Cohesion
4. Coupling

QUESTION 32

Which one of the following factors is NOT part of the transferability aspect of software quality?

1. Flexibility
2. Portability
3. Inoperability
4. Reusability

QUESTION 33
Glass-box testing is also referred to as_____.

1. Data flow testing
2. Black-box testing
3. White-box testing
4. Graph-based testing

QUESTION 34
Consider the following operations, and then select the option that describes which of these operations can be defined on array structures?

A. Searching
B. Deletion
C. Retrieval
D. Insertion

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

QUESTION 35
Which one of the following statements best describes an array?

1. It is a collection of fields that are all related to one object.
2. It can only be a two-dimensional structure consisting of rows and columns.
3. It is a sequenced collection of elements of the same type.
4. It is a collection of elements called fields.

QUESTION 36
What is an ordered collection of data in which each element contains the location of the next element?

1. An array
2. A record
3. A linked list
4. A node

QUESTION 37
Which one of the following statements regarding arrays and linked lists is FALSE?

1. Both arrays and linked lists are representations of a list of items in memory.
2. The elements of arrays need not be stored contiguously, because we can get hold of the value of an element via the index.
3. The nodes of linked lists need not be stored contiguously, because each node contains the address of the next node.
4. Link lists can only be searched sequentially.

QUESTION 38
The first step in traversing a linked list, is to _____?

1. Check that the last node has a null pointer.
2. Create a walking pointer to the first node.
3. Count the number of nodes to determine how many iterations are necessary.
4. Set the address of where in the linked list the traversing must start.

QUESTION 39
Before inserting a new node in a linked list, a(n)_____ algorithm is applied.

1. searching
2. deletion
3. insertion
4. retrieval

QUESTION 40
In which type of file are records only accessed one after another from beginning to the end?

1. Random
2. Indexed
3. Sequential
4. Hashed

QUESTION 41
Which one of the following statements regarding files is FALSE?

1. Files are stored in RAM or in secondary storage devices.
2. Files can be read from, and written to.
3. Files can be accessed randomly or sequentially.
4. For randomly accessing of files, the file structure should be indexed or hashed.

QUESTION 42

Which one of the following statements regarding sequential files is FALSE?

1. Records can only be accessed sequentially – either from front to back, or from back to front.
2. Records are stored one after the other, with an EOF (end-of-file) marker after the last record.
3. The operating system does not need to have information about the record addresses.
4. Sequential files are used when all records in a file needs to be accessed from beginning to end.

QUESTION 43

Which one of the following statements is NOT true regarding hashing methods for file searching?

1. In modulo division hashing, the key is divided by the file size and the remainder plus one is used for the address of the record.
2. In digit extraction hashing, selected digits are extracted from the key and used as the address of the record.
3. In direct hashing, no algorithmic manipulation is done, so the file must contain a record for each possible key.
4. Modulo division hashing guarantees no collisions or synonyms.

QUESTION 44

Consider the following 4 files involved in updating a sequential file:

A. The old master file.
B. The new master file.
C. The transaction file.
D. The error report file.

Which of the following options regarding files A to D is TRUE?

1. File C contains a record of each successful write operation to file B.
2. File A is deleted as soon as file B is closed after the update.
3. File A can be updated directly, which makes file B unnecessary.
4. File D is updated with all errors that occur during the update process.

QUESTION 45

Which one of the following statements is NOT an advantage of databases?

1. Less redundancy
2. Efficiency
3. Consistency avoidance
4. Data integrity

QUESTION 46

What view of data does the conceptual level of a database define?

1. Logical
2. User
3. Internal
4. External

QUESTION 47

Which one of the following is TRUE regarding the levels of database architecture?

1. The internal level defines the logical view of the data.
2. The conceptual level determines how and where data will be stored on storage devices.
3. The external level interacts directly with end users and application programs.
4. Data is prepared for the external level by the internal level.

QUESTION 48

Which one of the following is NOT a database model?

1. Hierarchical database model.
2. Structural database model.
3. Network database model.
4. Relational database model.

QUESTION 49

Which one of the following statements regarding database models is FALSE?

1. The hierarchical database model is obsolete, but the relational and network database models are still in use.
2. The hierarchical database model is organised as an inverted tree with the top of the tree being called the root.
3. In the network model, entities are organised in a graph where certain entities can be accessed through several paths.
4. In the relational database model, data is organised in two-dimensional tables called relations.

QUESTION 50

Which one of the following is FALSE for the attributes of a relation in a relational database model?

1. Each column in a relation is called an attribute.
2. Each attribute has a unique name within the scope of the relation.
3. The total number of attributes for a relation is called the depth of the relation.
4. The conceptual level of the database model uses the attributes to give meaning to each column.

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Appendix A

STEPS FOR DOWNLOADING THE CAI TUTORIAL FROM THE WEB

A web-link is available so that you can access the optional CAI tutorial. The tutorial deals with logic circuits, Boolean algebra and Karnaugh diagrams.

Here is the link:

http://osprey.unisa.ac.za/TechnicalReports/cos1521/cos1521.zip

To download the tutorial:

Go to the given web-link.

Save cos1521.zip to your computer (Choose C drive *Documents* or wherever you want to save it) and then double-click on the saved cos1521.zip.

Choose ***extract*** from the top row of buttons on the opened page. Then click on ***extract*** **to the right** of the open window.

Double-click on the cos1521 folder that appears, and then double-click on the karnaugh.exe icon (it looks like a round ball with a red ribbon around it).

You can now navigate through the tutorial.

We have tested these steps without experiencing any problem. Depending on your browser and operating system, there may be a slight variation in these steps. If you need to, ask someone more experienced with computers to help you. Also note that you should have WINZIP installed on your computer. Find it free on the internet.

This CAI tutorial is optional.