UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1521 (497007) October/November 2012
RCO1521 (476228)

COMPUTER SYSTEMS: FUNDAMENTAL CONCEPTS

Duration 2 Hours

100 Marks

EXAMINERS
FIRST MR S SSEMUGABI
SECOND MRS D BECKER

Closed book examination

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue

This paper consists of 28 pages and the instructions for the completion of a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator

Instructions:

1 All the questions in this paper are **multiple-choice**
2 There are 80 questions in total Your total mark out of 80 will be converted to a final exam mark out of 100
3 Answer all the questions There is also space for rough work
4 Using a pencil, answer all the questions on the mark-reading sheet
5 Remember to fill in the **unique number** (see top of page) on the mark-reading sheet
6 You are not allowed to use a calculator

EVERYTHING OF THE BEST!

[TURN OVER]

This paper consists of 80 multiple-choice questions.
Each question is worthy 1 mark.
Your total out of 80 will be converted to give a final exam mark out of 100.

Mark only one alternative per question with a pencil on the mark-reading sheet.
(Remember to fill in the unique number.)

Section A: Computer background, number systems, data storage, operations on data and logic (27 marks)

QUESTION 1

Which one of the following is a social issue that covers both dependency and social injustice?

1 Computer security
2 The digital divide
3 Privacy
4 Copyright

QUESTION 2

How many computer subsystems are in the Von Neumann model?

1 2
2 3
3 4
4 5

QUESTION 3

Who of the following first brought the idea that described the universal computational device?

1 Alan Turing
2 Von Neumann
3 John Atanasoff
4 Konrad Zuse

QUESTION 4

Convert $(99)_{10}$ to an octal number

1 $(321)_8$
2 $(123)_8$
3 $(431)_8$
4 $(143)_8$

QUESTION 5

Convert $(11011\ 01)_2$ to a hexadecimal number

1 $(1B\ 4)_{16}$
2 $(FB\ 4)_{16}$
3 $(11\ 2)_{16}$
4 $(33\ 2)_{16}$

QUESTION 6

What is the 2's complement representation of -36 using 8 bits?

1 $(00101001)_2$
2 $(11010001)_2$
3 $(00100100)_2$
4 $(11011100)_2$

QUESTION 7

Convert $(10101\ 11)_2$ to normalised form

1 $(0\ 1010111)_2 \times (2^{-5})_{10}$
2 $(0\ 1010111)_2 \times (2^{5})_{10}$
3 $(1\ 010111)_2 \times (2^{4})_{10}$
4 $(1\ 010111)_2 \times (2^{4})_{10}$

Rough work

QUESTION 8
Which of the following statements is NOT TRUE?

1 Real numbers with very large integral parts should not be stored in fixed-point representation
2 Real numbers with very small integral parts should not be stored in fixed-point representation
3 Real numbers with very large integral parts should be stored in fixed-point representation
4 Real numbers with very large integral parts should be stored in floating-point representation

QUESTION 9
Which one of the following refers to the process of selecting a finite number of points on an analog signal, measuring and recording them, when storing an audio signal over an interval?

1 Compression
2 Quantisation
3 Sampling
4 Encoding

QUESTION 10
Which one of the following is an application of the OR operator?

1 To flip specific bits in a bit pattern
2 To set specific bits in a bit pattern
3 To unset specific bits in a bit pattern
4 To complement all the bits in a bit pattern

QUESTION 11
Calculate $(101\ 11)_2 + (111011\ 1)_2$

1 $(1000001\ 01)_2$
2 $(1000011\ 01)_2$
3 $(1000111\ 01)_2$
4 $(1000011\ 11)_2$

Apply Boolean algebra rules in the following THREE questions.

QUESTION 12
What is the simplest form of the Boolean function $y'\ (x + y)$?

1 $y'\ x$
2 $x + y$
3 1
4 x

QUESTION 13

What is the simplest form of the Boolean function $(x' + y)(y' + z)(x + z')'$?

1 1
2 $x'z$
3 $x'y' + yz$
4 $x' + y + z'$

QUESTION 14

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

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

Rough work

QUESTION 15

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

F(x,y,z) = _____?

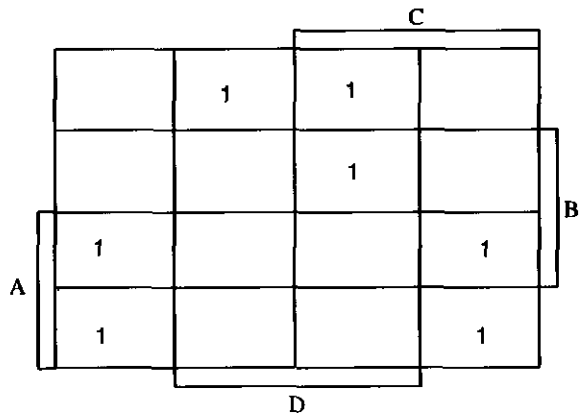
	y'z'	y'z	yz	yz'
x'		1		1
x	1			1

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

Rough work

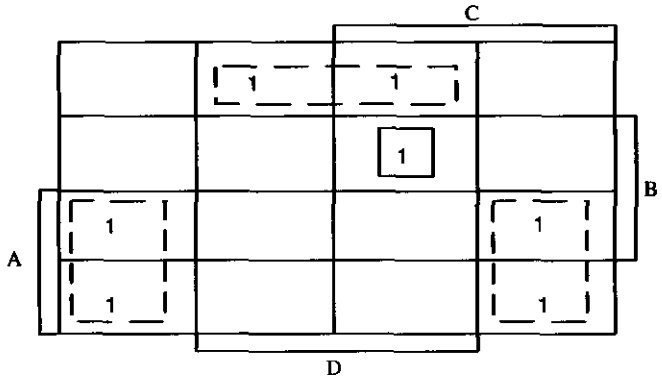
QUESTION 16

Consider the following Karnaugh map

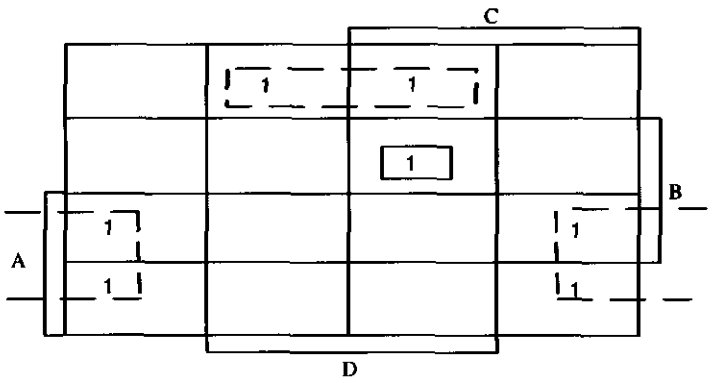


Which one of the following four Karnaugh maps reflects the correct forming of groups?

1



2



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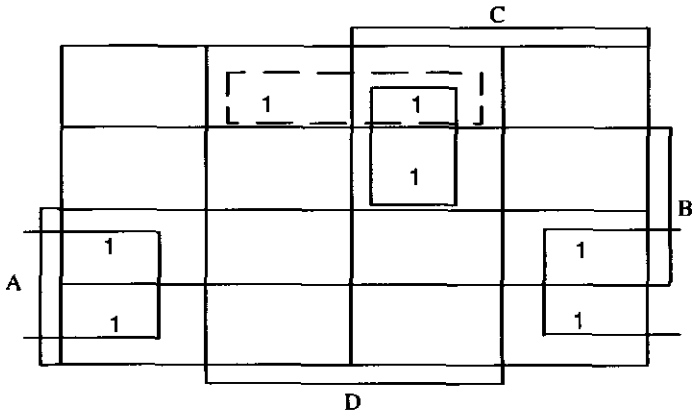

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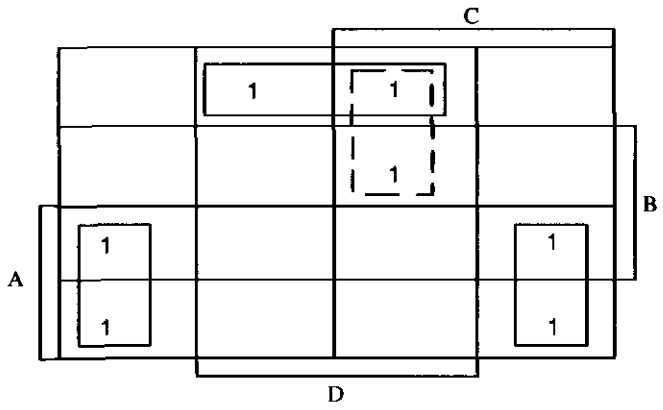
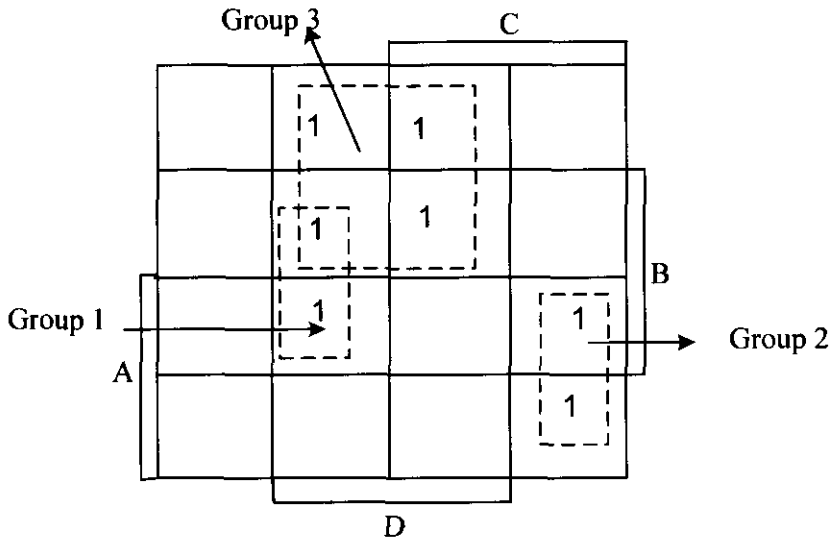


Rough work

The next THREE questions refer to the Karnaugh map below:



QUESTION 17
Which term represents Group 1?

1 AC′
2 AB′C
3 BCD′
4 BC′D

QUESTION 18
Which term represents Group 2?

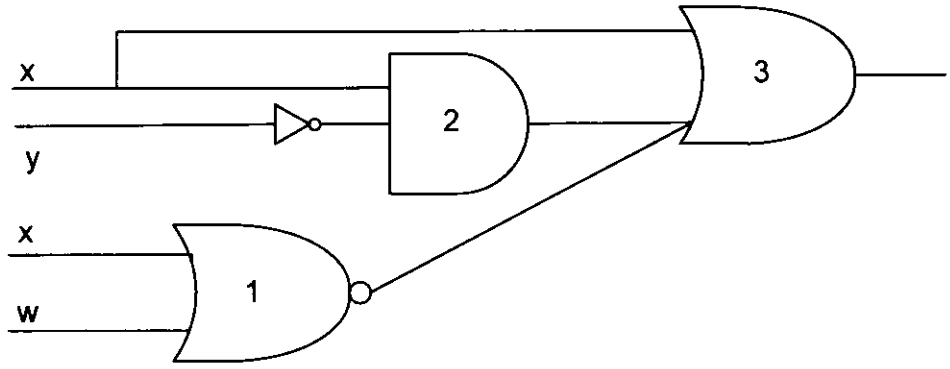
1 AD
2 ACD′
3 BC'D
4 ACD

QUESTION 19
Which term represents Group 3?

1 D
2 A′D
3 ACD′
4 B'C

Rough work -

The next THREE questions refer to the following combinational logic circuit:



QUESTION 20
What is the output of Gate 1?

1 x w
2 x + w
3 (x + w)′
4 x′ + w′

QUESTION 21
What is the output of Gate 2?

1 x + y
2 x y′
3 (x + y)′
4 (x y)′

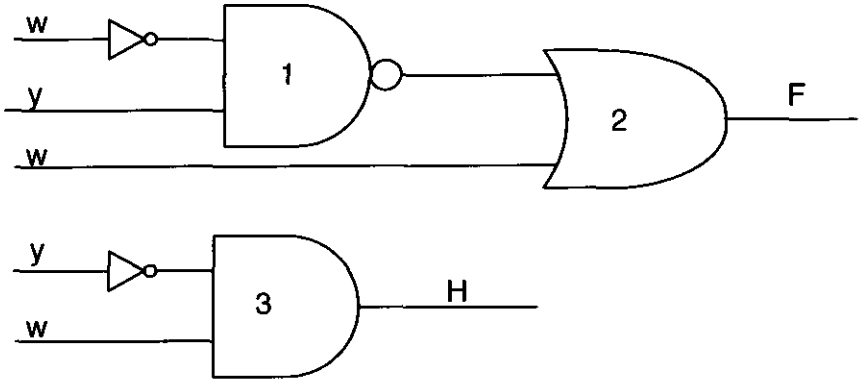
QUESTION 22
What is the output of Gate 3?

1 x + x y′ + (x+w)′
2 x w + x y ′ + x
3 x ′+ w′ + x + y ′
4 x + y′ + z

Rough work

QUESTION 23

Consider the following two logic circuits



These two logic circuits are not equivalent $F = (w'y)' + w$ and $H = y'w$ One of the three gates can be changed so that the circuits can become equivalent Which gate can be changed and what kind of gate must it become?

1 Gate 3 must change to an OR gate
2 Gate 1 must change to an OR gate
3 Gate 2 must change to a NAND gate
4 Gate 3 must change to a NOR gate

Rough work

Consider the following scenario:

Three family members, father, mother and daughter, go for the end-of-year holiday at a national park

The father's phone, **Cell Phone A**, can only access Facebook and LinkedIn The mother's phone, **Cell Phone B**, can only access LinkedIn and MySpace, and the daughter's phone, **Cell Phone C**, can only access Facebook and Twitter This means that each phone can access only two social networking sites

If the father does not forget and takes his Cell Phone A along for the holiday, then variable A = 1 (A = 0 if he forgets it) Likewise variable B = 1 if the mother takes her Cell Phone B along, and variable C = 1 if the daughter takes her Cell Phone C along Nobody can take another's cell phone For example, if A = 1, B = 1 and C = 0, it means that the father takes Cell Phone A along (there is access to Facebook and LinkedIn), and the mother takes Cell Phone B along (there is access to LinkedIn and MySpace) In this case the family will have access to only Facebook, LinkedIn and MySpace

A Boolean function F(A,B,C) is defined as follows **F(A,B,C) = 1 when the family (Father, Mother and daughter together) have access to <u>at least</u> Facebook, Twitter and LinkedIn** when on holiday, otherwise F(A,B,C) = 0

Different combination inputs for A, B and C are given in the tables in the following FOUR questions. The question that should be answered in each case is: Which alternative shows the correct outputs for F?

QUESTION 24

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

QUESTION 25

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

QUESTION 26

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

QUESTION 27

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

Rough work

Section B: Computer systems, organisation and networks (18 marks)

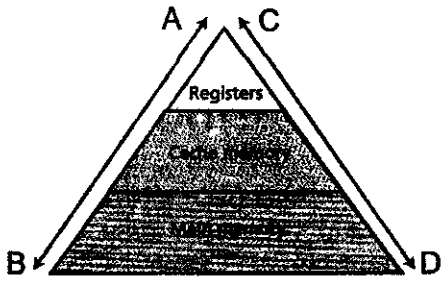
QUESTION 28

Which of the following is NOT one of the operations the ALU performs on data?

1 Logic
2 Decode
3 Shift
4 Arithmetic

QUESTION 29

In the following figure the hierarchical levels of memory are provided The costliness (A and B) and speed (C and D) with regard to the memory hierarchy are indicated by the arrowed lines in the figure Choose the alternative that gives the correct information for A, B, C and D



1	A less costly,	B more costly,	C slowest,	D fastest
2	A less costly,	B more costly,	C fastest,	D slowest
3	A more costly,	B less costly,	C fastest,	D slowest
4	A. more costly,	B less costly;	C slowest,	D fastest

QUESTION 30

Controllers bridge the gap between the nature of the I/O device and the CPU and memory What type of device must the controller be if several bits need to be transferred at a time?

1 A serial device
2 A parallel device
3 A multiple device
4 An address device

QUESTION 31

Which of the following statements regarding storage devices is NOT TRUE?

1 They can be referred to as auxiliary storage devices
2 They are cheaper than main memory
3 Their contents are volatile
4 They are classified as I/O devices

QUESTION 32

In the decode phase of the machine cycle, an instruction in an instruction register is decoded by the _____

1 memory
2 control unit
3 ALU
4 programmed I/O

QUESTION 33

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

1 A small set of instructions do a minimum number of simple operations
2 Complex instructions are simulated by using a subset of simple instructions
3 There is a single instruction for both simple and complex tasks
4 Programming is done on one level

QUESTION 34

Network performance can be measured by _____

1 accuracy of delivery
2 the frequency of failure
3 response time
4 the network's robustness in a catastrophe

QUESTION 35

There are four basic network topologies Which network topology has the following advantage and disadvantage?

Advantage If one link becomes faulty, it does not put the entire network out of action

Disadvantage The large amount of cabling and number of input/output ports required

1 Star
2 Mesh
3 Bus
4 Ring

QUESTION 36

There are several layers in the Internet TCP/IP protocol suite What is the network layer responsible for?

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

QUESTION 37

Error and flow control can be applied by some data-link layer protocols in the data-link layer of the Internet TCP/IP protocol suite However, error checking at this layer does not cover errors that might happen inside routers At which other layer will error control detect router errors?

1 Application
2 Network
3 Transport
4 Physical

QUESTION 38

In the basic model for FTP (file transfer protocol), the client does NOT have a _____ component

1 decoding process
2 user interface
3 control process
4 data transfer process

QUESTION 39

Hypertext is a concept used by the WWW whereby information is stored in a set of documents that are connected together by using the concept of _____

1 multiplexing
2 port addresses
3 links
4 IP addresses

QUESTION 40

An operating system (OS) is an interface between the hardware of a computer and the user The word 'user' in this definition refers to _____

1 humans only
2 programs only
3 programs or humans
4 software applications only

QUESTION 41

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 42

Which form of memory management is best described by the following?

- The entire program does not need to be in memory
- A program is divided into pages, loaded into memory one by one, executed and replaced by another page.

1 Segmentation
2 Demand segmentation
3 Paging
4 Demand paging

QUESTION 43

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 is selected for execution.

QUESTION 44

A deadlock can occur when an operating system (OS) does not put resource restrictions on processes There are four necessary conditions for a deadlock to occur Which one of the following is the correct description for the 'NO PREEMPTION' condition?

1. The OS cannot temporarily relocate a resource
2 Two or more processes can hold a resource
3 A process holds a resource even though it cannot use it until other resources are available
4 All processes and resources involved form a loop

QUESTION 45

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

Section C: Computer algorithms, programming and software development

(18 marks)

QUESTION 46

A list contains the following elements

6 10 17 19 36 40 48 69 76 83 85 100 123

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 36?

1 4, 5, 6
2 4, 5, 7
3 1, 4, 7
4 1, 3, 6

QUESTION 47

Suppose a list contains the following elements

26 30 40 17 59 11 107

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

1 11 17 40 30 59 26 107
2 11 17 26 30 40 59 107
3 107 59 40 30 26 17 11
4 11 17 26 30 59 40 107

QUESTION 48

Which of the following is not considered to be a basic algorithm in computer programs?

1 Summation
2 Loop
3 Product
4 Search

QUESTION 49

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

1 Bubble
2 Selection
3 Division
4 Insertion

QUESTION 50

In computer science, what name is given to a step-by-step solution that expresses a logical solution to a particular problem?

1 Computer program
2 Process
3 Program structure
4 Algorithm

QUESTION 51

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 52

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

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

QUESTION 53

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 executing it
4 is a slow process in comparison to interpretation

QUESTION 54

The two methods that are used for translating a program to machine language both follow the same translation process What is the SECOND step in the process?

1 Semantic analysis
2 Lexical analysis
3 Syntax analysis
4 Code generation

QUESTION 55

The following statement 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 56

Which computer programming language is known for using INHERITANCE?

1 Declarative
2 Object-oriented
3 Functional
4 Procedural

QUESTION 57

In the Scheme version of LISP, if S = (5 8 13 20 33 57 99), then (car (cdr (cdr (cdr S)))) would give a result of

1 20
2 13
3 8
4 5

QUESTION 58

Which stage of waterfall model for software development results in the creation of a specification document?

1 Design
2 Analysis
3 Testing
4 Implementation

QUESTION 59

Which diagram CANNOT be used as 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 60

In the testing phase of the SDLC errors are located What type of testing is used if the internal structure of the software is not known?

1 Black-box
2 White-box
3 Basis
4 Control

QUESTION 61

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 62

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

1 Basis path
2 Exhaustive
3 Random
4 Boundary-value

QUESTION 63

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.

Section D: Computer data and file structure, and databases (17 marks)

QUESTION 64
In an array named SCORE, SCORE [2] refers to the second _____ of the array

1 name
2 index
3 element
4 field

QUESTION 65
Which of the following is TRUE?

1 An array is a collection of fields that are all related to one object
2 An array can only be two-dimensional
3 A data structure uses a collection of related variables that can only be accessed individually
4 A data structure represents a set of data items that share a specific relationship

QUESTION 66
Which of the following operations CANNOT be defined on arrays structures?

1 Addition
2 Deletion
3 Retrieval
4 Transversal

QUESTION 67
Which algorithm must first be done before putting a new node in a linked list?

1 Addition
2 Searching
3 Deletion
4 Retrieving

QUESTION 68
The first step in traversing a linked list is to _____

1 check for the last node
2 allocate a node
3 create a walking pointer to the first node
4 set up a loop

QUESTION 69
Which one of the following statements regarding linked lists is NOT TRUE

1 A linked list is a suitable structure if a large number of insertions and deletions are needed
2 A linked list can grow infinitely and shrink to an empty list
3 The name of a linked list is the name of the head pointer that points to the first node of the list
4 Each node in a linked list has a unique name

QUESTION 70
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 71
Which one of the following is NOT a collision resolution method for hashed files?

1 Prime area hashing
2 Open addressing
3 Linked list resolution
4 Bucket hashing

QUESTION 72
What name is given to the address produced by a hashing algorithm when a collision occurs?

1 Index
2 Prime
3 Synonym
4 Home

QUESTION 73
Which collision resolution method for hashed files uses a node that can accommodate more than one record?

1 Bucket hashing
2 Open addressing
3 Prime area hashing
4 Linked list resolution

QUESTION 74
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 75
What view of data does the conceptual level of a database define?

1 Logical
2 User
3 Internal
4 External

QUESTION 76
Which of the following database models are obsolete?

1 Hierarchical and distributed
2 Network and relational
3 Network and distributed
4 Network and hierarchical

QUESTION 77
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 database query languages
4 It can represent data with nested structure

QUESTION 78
Which three terms best describe the functions of a database management system (DBMS) in relation to a database?

1 Define, create and delete
2 Define, create and maintain
3 Create, read and write
4 Read, write and update

QUESTION 79

In a fragmented distributed database for the internet, _____

1 data are localised
2 each site holds an exact replica of another site
3 objects and their relations are defined
4 any modification to data stored in one site is repeated exactly at every site

QUESTION 80

Which one of the following statements regarding an object-oriented database is NOT TRUE?

1 It keeps the advantages of the relational model
2 It allows applications to access structured data
3 Each object has attributes that are expressed as classes
4 Objects and their relations are defined

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EXAMINATION MARK READING SHEET EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

STUDY UNIT e.g PSY100-X
STUDIE-EENHEID bv PSY100-X

1

PAPER NUMBER
VRAESTELNOMMER

2

INITIALS AND SURNAME
VOORLETTERS EN VAN

3

DATE OF EXAMINATION
DATUM VAN EKSAMEN

4

EXAMINATION CENTRE (E G PRETORIA)
EKSAMENSENTRUM (BV PRETORIA)

5

STUDENT NUMBER
STUDENTENOMMER

6

7

UNIQUE PAPER NO
UNIEKE VRAESTEL NR

8

9

For use by examination invigilator

Vir gebruik deur eksamenopsiener

IMPORTANT

1 USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2 MARK LIKE THIS ➡
3 CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4 ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5 CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
6 CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7 CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
8 DO NOT FOLD

BELANGRIK

1 GEBRUIK SLEGS N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
2 MERK AS VOLG ➡
3 KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
4 VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5 KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6 KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
7 MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
8 MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

10

1	36	71	106
2	37	72	107
3	38	73	108
4	39	74	109
5	40	75	110
6	41	76	111
7	42	77	112
8	43	78	113
9	44	79	114
10	45	80	115
11	46	81	116
12	47	82	117
13	48	83	118
14	49	84	119
15	50	85	120
16	51	86	121
17	52	87	122
18	53	88	123
19	54	89	124
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23	58	93	128
24	59	94	129
25	60	95	130
26	61	96	131
27	62	97	132
28	63	98	133
29	64	99	134
30	65	100	135
31	66	101	136
32	67	102	137
33	68	103	138
34	69	104	139
35	70	105	140