UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1521 (489584) October/November 2011
RCO1521 (468845)

COMPUTER SYSTEMS: FUNDAMENTAL CONCEPTS

Duration 2 Hours

100 Marks

EXAMINERS
FIRST MR S SSEMUGABI
SECOND MRS D BECKER

This paper consists of 29 pages and instructions on how to complete a mark-reading sheet

Please complete the attendance register on the back page, tear off and hand 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 examination mark out of 100
3 Answer all the questions There is also space for rough work
4 Answer all the questions on the mark-reading sheet in **pencil**
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.

GOOD LUCK!

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

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

QUESTION 1
According to the von Neumann model, memory subsystem is responsible for storing _____

1 only data
2 only programs
3 programs and data
4 programs and processes

QUESTION 2
Since 1950, historians have divided computer software and hardware into generations Which generation witnessed the appearance of laptops and the use of multimedia?

1 Third
2 Fourth
3 Fifth
4 Sixth

QUESTION 3
Convert $(38)_{16}$ to a decimal number

1 26
2 38
3 40
4 56

QUESTION 4
Convert $(1001\ 01)_2$ to an octal number
1 $(11\ 2)_8$
2 $(12\ 2)_8$
3 $(22\ 2)_8$
4 $(14\ 6)_8$

QUESTION 5

What is the normalised form of $(1111\ 101)_2$?

1 $(1\ 111101)_2 \times (2^{-2})_{10}$
2 $(1\ 111101)_2 \times (2^{2})_{10}$
3 $(1\ 111101)_2 \times (2^{3})_{10}$
4 $(1\ 111101)_2 \times (2^{4})_{10}$

QUESTION 6

What is the signed-and-magnitude representation of – 20 using 8 bits?

1 $(00010100)_2$
2 $(10010100)_2$
3 $(00000010)_2$
4 $(10000010)_2$

Rough work

QUESTION 7

Which of the following unsigned integer will cause an overflow in a *n*-bit memory location?

1 0
2 $2^n - 1$
3 2^n
4 2^{n-1}

QUESTION 8

Samples are taken if all the values of an audio signal cannot be recorded The number of samples needed to retrieve a replica of the original image depends on _____

1 quantisization
2 encoding
3 the number of bits assigned to each sample
4 the maximum number of changes in the analog signal

QUESTION 9

Which of the following is NOT TRUE of computer images?

1 JPEG (Joint Photographic Experts Group) uses the indexed colour scheme
2 Raster graphics is used when we need to store an analog image (e g a photograph)
3 The number of bits used to represent a pixel depends on how a pixel's colour is handled by different encoding techniques
4 The scanning rate in image processing is called resolution

QUESTION 10

What is the result of $(1101\ 0111)_2$ AND $(0101\ 0101)_2$?

1 11010111
2 01010101
3 10100100
4 11111111

QUESTION 11

Calculate $(101011\ 1)_2 + (11001\ 01)_2$

1 $(1110010\ 10)_2$
2 $(1000010\ 01)_2$
3 $(10010011\ 11)_2$
4 $(1000100\ 11)_2$

Rough work

Apply Boolean algebra rules to determine the simplest forms of the given Boolean functions in the following THREE questions:

QUESTION 12

What is the simplest form of the Boolean function $(x'y + 1)'$?

1. $x + y'$
2. $(xy') + 1'$
3. 1
4. 0

QUESTION 13

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

1. x'
2. $xx + yx'$
3. $x' + y$
4. x

QUESTION 14

What is the simplest form of the Boolean function $x'y'z + xy'z' + xy'z + xyz' + xyz$?

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

Rough work

QUESTION 15

Consider the following Boolean function

$$F(x,y,z) = m_0 + m_3 + m_5 + m_7$$

Which one of the following four Karnaugh diagrams represents the given function?

1

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

2

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

3

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

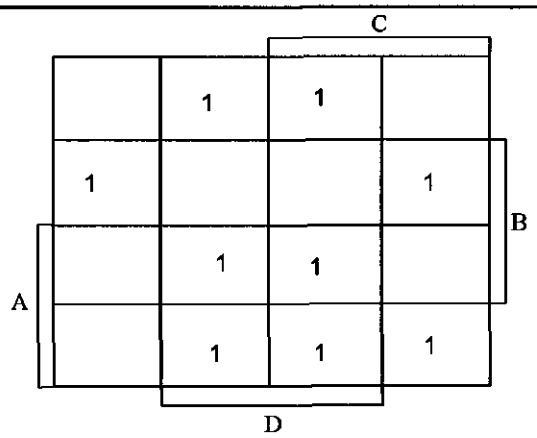
4

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

Rough work

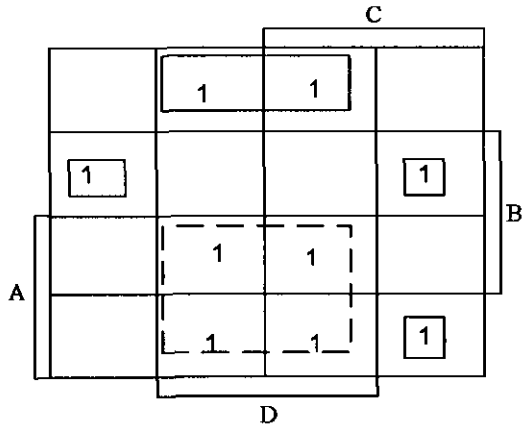
QUESTION 16

Consider the following Karnaugh map

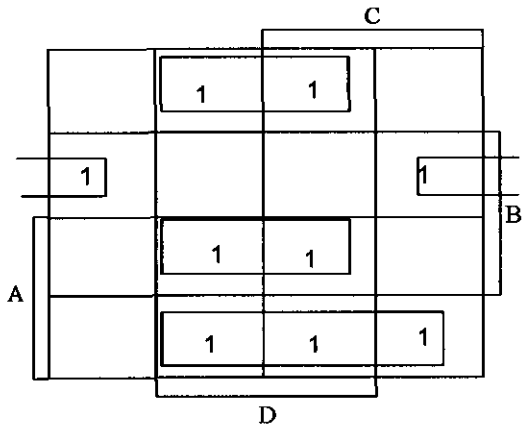


Which one of the following four Karnaugh maps reflects the correct forming of groups?

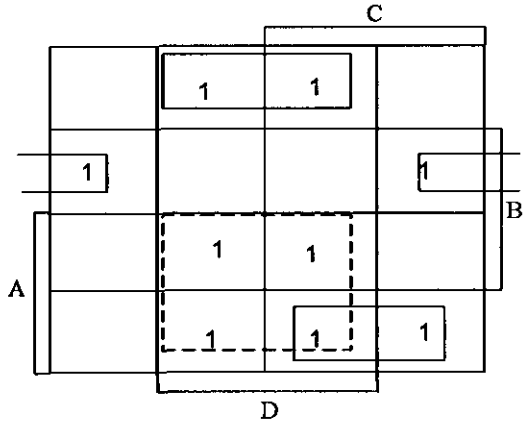
1



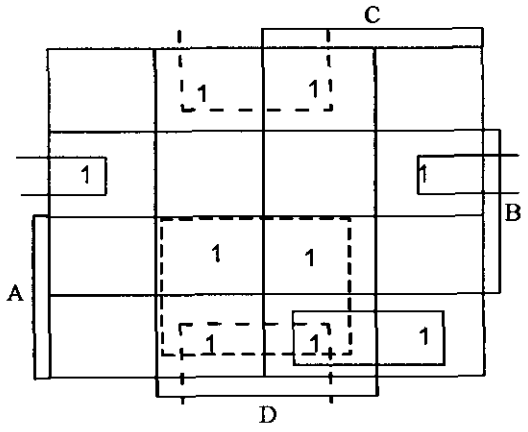
2



3

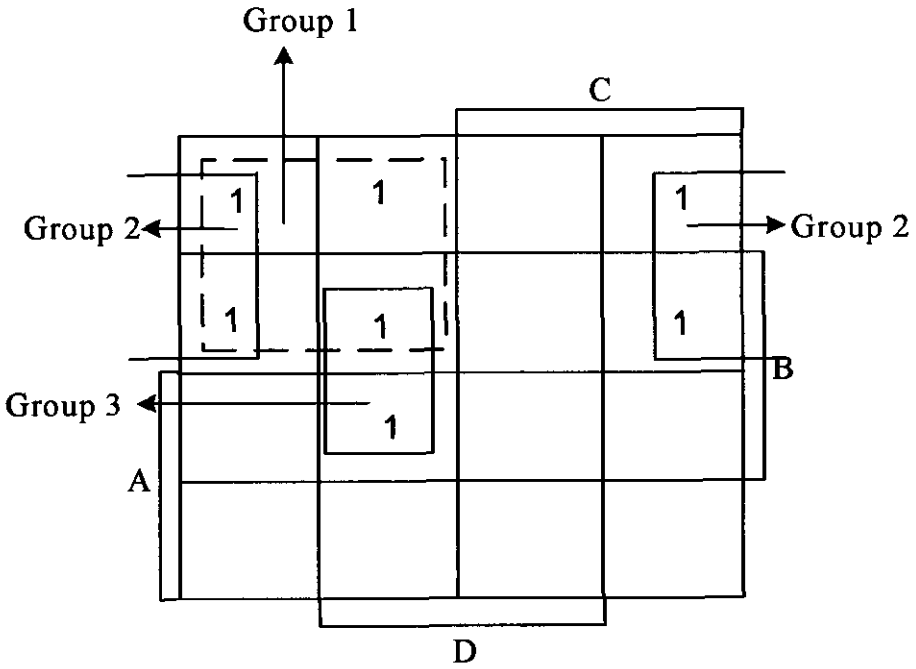


4



Rough work

The following THREE questions refer to the Karnaugh map below:



QUESTION 17

Which term represents Group 1?

1 A′BD′
2 A′C′
3 A′D′
4 A′B

QUESTION 18

Which term represents Group 2?

1 BC′
2 AC′
3 A′D′
4 A′C′

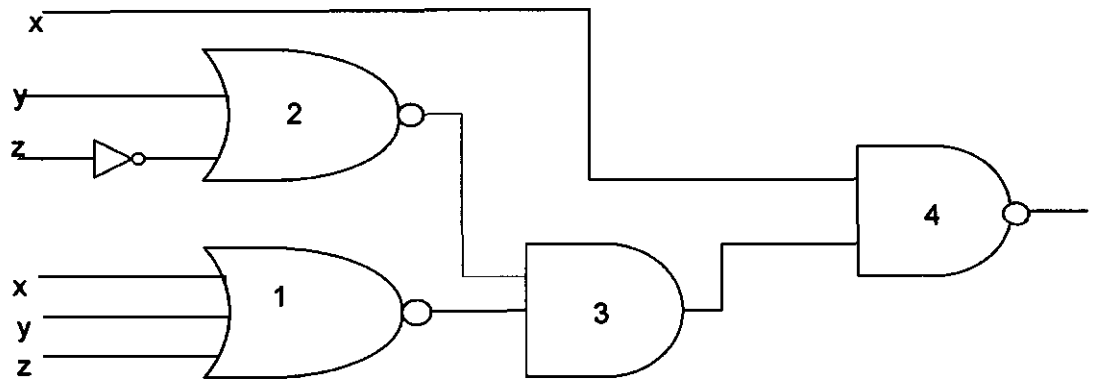
QUESTION 19

Which term represents Group 3?

1 ABC
2 B'CD
3 BC'D
4 BC'D'

Rough work

The following FOUR questions refer to the following combinational logic circuit:



QUESTION 20
What is the output of Gate 1?

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

QUESTION 21
What is the output of Gate 2?

1 y + z '
2 (y + z ') '
3 y z '
4 (y z')'

QUESTION 22
What is the output of Gate 3?

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

QUESTION 23
What is the output of Gate 4?

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

Rough work

Consider the following scenario:

On a university building construction site, various people deliver different colours of paint containers to the colour mixing machine as follows

Person A red & blue, **Person B** green & black, **Person C** blue & white

When a person delivers two containers of different colours (as mentioned above), the output is 1 For example, if A = 1, B = 1 and C = 0, person A delivers red and blue, and person B delivers green and black, so the group of three persons delivers only 4 (four) different colours

A Boolean function F(A,B,C) outputs a 1 if a group of three persons delivers more than 3 (three) different colours

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

QUESTION 24

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

QUESTION 26

			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	0	1	1	0

QUESTION 27

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

Rough work

QUESTION 28
In which one of the following subsystems do we find registers?

1 Storage subsystem
2 Main memory
3 Central processing unit (CPU)
4 Input / output subsystem

QUESTION 29
A computer has RAM of 1024 MB (1 GB) Each word in this computer is eight bytes long How many bits are needed to address any single word in memory?

1 3
2 27
3 6
4 30

QUESTION 30
Arrange the following computer components in terms of speed – from the slowest to the fastest

- Cache memory
- CPU
- Main memory

1 Cache memory, CPU, Main memory
2 CPU, Cache memory, Main memory
3 CPU, Main memory, Cache memory
4 Main memory, Cache memory, CPU

QUESTION 31
Which of the following CANNOT be held in a register?

1 data
2 programs
3 instructions
4 program counter values

QUESTION 32
On which of the following storage devices can a user write information only once?

1 CD-R
2 CD-W
3 CD-RW
4 CD-ROM

QUESTION 33
The smallest storage area on a magnetic disk that can be accessed at one time is called a _____

1 head
2 segment
3 track
4 sector

QUESTION 34
What is the main criterion related to the time needed to recover from a computer network failure?

1 Performance
2 Reliability
3 Security
4 Usability

QUESTION 35
Which of the following does NOT refer to a computer network topology?

1 Hub
2 Star
3 Ring
4 Mesh

QUESTION 36
A company builds a network of computers located in its different offices in an office park This network would best be described as _____

1 a WAN
2 a LAN
3 a MAN
4 a WIN

QUESTION 37
A cable in a bus LAN with 100 stations is broken How many stations are affected by this damage?

1 All 100 stations are affected
2 50 stations are affected
3 Only the stations on the damaged portion of the network are affected
4 No station is affected

QUESTION 38

If you wanted to get connected to the internet, you would get in contact with _____

1 an ISP
2 a TCP
3 an IP
4 an HTTP

QUESTION 39

According to the prescribed textbook, how many layers does TCP / IP protocol suite have?

1 3
2 4
3 5
4 6

QUESTION 40

Which of the following facilitates as the interface between the computer hardware and the computer programs?

1 Operating system
2 Application system
3 Interaction software
4 end-user software

QUESTION 41

An operating system (OS) can be programmed in a modular architecture with several layers such that higher layers can be changed without affecting the lower layers This property refers to the _____ of the OS

1 reliability
2 extensibility
3 compatibility
4 portability

QUESTION 42

Multiprogramming requires _____operating system

1 an online
2 a batch-processing
3 a time-sharing
4 a parallel

QUESTION 43

In which category or technique can only one program reside in memory for execution?

1 Paging
2 Partitioning
3 Monoprogramming
4 Multiprogramming

QUESTION 44

Modern operating systems use three different terms that refer to a set of instructions program, job and process Which of the following states are applicable for a process?

1 Ready, running and terminate
2 Waiting, running and terminate
3 Hold, ready and running
4 Ready, waiting and running

QUESTION 45

What name is given to a situation that occurs when an operating system does NOT put resource restrictions on processes?

1 starvation
2 deadlock
3 queue
4 delay

QUESTION 46

A list contains the following elements

5 10 15 21 33 47 52 61 88 99 100

At the beginning, first = 1, mid = 6 and last = 11 If the goal is 61, what are the values of first, mid and last respectively after one more iteration of the binary search algorithm?

1 1, 3, 5
2 6, 8, 10
3 7, 8, 9
4 7, 9, 11

QUESTION 47

Suppose a list contains the following elements

48 96 20 9 91 5

If bubble sort is used, what is the order of the elements in the list after three passes?

1 5 9 20 48 91 96
2 5 9 20 96 91 48
3 5 9 20 48 96 91
4 5 9 48 96 98 91

QUESTION 48

Which of the following BASIC algorithms can BOTH be used in computer programs?

1 Searching and repetition
2 Repetition and sorting
3 Sorting and searching
4 Searching and looping

QUESTION 49

Which of the following is NOT TRUE of a structured chart?

1 It is used at the design level
2 It is used at the programming level
3 It shows the relationships between algorithms and subalgorithms
4 It is a high-level tool

QUESTION 50

Which of the following is NOT a list sorting algorithm?

1 Placement
2 Bubble
3 Selection
4 Insertion

QUESTION 51

Which one of the following statements regarding an algorithm is NOT TRUE?

1 It shows how a problem can be solved
2 It accepts input data
3 It creates output data
4 It can only be shown using a diagram

QUESTION 52
Which of the four options is best described by the definition below?
"A set of predefined words that combine into a program according to predefined rules "

1 Computer language
2 Computer process
3 Computer task
4 Algorithm

QUESTION 53
To which form of program does a compiler translate the whole source program?

1 Target
2 Symbolic
3 High-level
4 Object

QUESTION 54
During the source code translation process, the source file goes through a series of sub-processes to its final output In which sub-process is a list of tokens created?

1 syntax analysis
2 lexical analysis
3 code generation
4 semantic analysis

QUESTION 55
What are the two most common programming paradigms in use today? (This can be deduced by the number of computer languages developed to support each of these paradigms)

1 Declarative and Object-oriented
2 Functional and procedural
3 Procedural and object-oriented
4 Declarative and functional

QUESTION 56
Which one of the following languages is totally class-oriented?

1 Java
2 C++
3 Prolog
4 C

QUESTION 57

In the Scheme version of LISP, if S = (17 23 65 80 97 98 105 205), then (car (cdr (cdr S))) would give a result of

1 17
2 23
3 65
4 80

QUESTION 58

In what phase of the waterfall model of software development is the emphasis on *what* the software will do without specifying *how* it will be done?

1 Analysis
2 Design
3 Implementation
4 Testing

QUESTION 59

Which one of the following diagrams is commonly used during the analysis phase of the object-oriented analysis?

1 Data flow diagram
2 entity-relationship diagram
3 use-case diagrams
4 Structured chart

QUESTION 60

Which one of the following is NOT considered to be an attribute of transferability when considering software quality?

1 Portability
2 Changeability
3 Interoperability
4 Reusability

QUESTION 61

Which of the following is NOT TRUE of the coupling of modules in a system?

1 Coupling is a measure of how tightly two modules are bound to each other
2 The more tightly coupled the modules are, the less dependent they are
3 Coupling between modules must be minimised
4 Loosely coupled modules are more likely to be reusable

QUESTION 62

Basis path testing is a method in which each statement in the software is executed _____

1 only once
2 at least once
3 at least twice
4 at least three times

QUESTION 63

Which one of the following statements regarding documentation in the software lifecycle is NOT TRUE?

1 Documentation should be written for expert but not novice users
2 Service documentation defines how the system should be maintained and updated if necessary
3 System documentation shows us, step by step, how to use the software
4 Technical documentation describes the installation and servicing of a software system

QUESTION 64

Which of the following best describes an array?

1 It is a collection of fields that are all related to one object
2 It is a linear collection of objects
3 It is a sequenced collection of elements, normally of the same data type
4 It is a collection of elements called fields

QUESTION 65

Which of the following is NOT a possible dimension of an array?

1 0
2 1
3 2
4 5

QUESTION 66

Which of the following operations are BOTH lengthy and time consuming when the operation has to be done in the middle of an array?

1 Insertion and deletion of elements
2 Insertion and retrieval of elements
3 Deletion and searching of elements
4 Retrieval and searching of elements

QUESTION 67
Which algorithm must be applied to a linked list before an item is inserted into it?

1 Deletion
2 Searching
3 Transversal
4 Retrieval

QUESTION 68
Which two pointers are used when trying to find an element in a linked list?

1 Previous (Pre) and next (Nex)
2 Current (Cur) and Nex
3 Pre and Cur
4 Nex and Null (NuL)

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 Each node in a linked list has an explicit name
3 The same operations defined for an array can be applied to a linked list
4 The name of a linked list is the name of the head pointer that points to the first node of the list

QUESTION 70
The following files are associated with the update program of sequential files
A a new master file
B an old master file
C a translation file
D an error report file

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

QUESTION 71

Records can be accessed randomly in the following file structure(s)

A indexed
B hashed
C sequential

Alternatives

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

QUESTION 72

One of the advantages of an indexed file is that you can have more than one index, each with a different key What name is usually given to this kind of file?

1 Inverted
2 Text
3 Sequential
4 Hashed

QUESTION 73

In direct hashing, _____

1 the key is divided by the file size and the address is the remainder plus 1
2 the key is the address and no algorithm manipulation is necessary
3 the address is composed of digits selected from the key
4 each record must be accessed sequentially

QUESTION 74

In the open addressing collision resolution method, _____

1 the first record is stored in the home address, but contains a pointer to the second record
2 bucket hashing is used
3 each collision resolution decreases the probability of future collisions
4 data that cannot be stored in the home address can be stored in the next address

QUESTION 75

What name is given to the total number of rows in a relation in a relational database?

1 Attribute
2 Tuple
3 Multiplicity
4 Cardinality

QUESTION 76

Consider the following statements

A The distributed database model is based on the relational database model

B In a fragmented distributed database data are localised

C In a replicated distributed database, each site holds an exact replica of another site

D An object-oriented database tries to keep the advantages of the relational model and, therefore, it does not allow applications to access structured data

Alternatives

1 Only A and B are false

2 Only C and D are false

3 Only A, B and C are true

4 Only A, C and D are true

QUESTION 77

In a relational database several operations can be defined in order to create new relations out of the existing ones Select the statement that is NOT TRUE regarding operations on relations within the relational database management system (RDBMS) context

1 The insert operation is a unary operation

2 The select operation is a unary operation

3 The join operation is a binary operation

4 The update operation is a binary operation

QUESTION 78

What language is used in the definition and manipulation of relational databases?

1 ANSI

2 SQL

3 ISO

4 RDB

QUESTION 79

Which of the following statements is TRUE?

1 A database management system (DBMS) defines, creates and maintains a database and allows controlled access to users

2 A database is a collection of data that is always logically and physically coherent

3 A DBMS is exclusively composed of software, data, users and procedures

4 A DBMS has four levels internal, conceptual, hierarchical and external

QUESTION 80

What name is given to the person who has the maximum level of privileges and controls other users' access to a DBMS?

1 Database administrator
2 Expert user
3 End user
4 Technical administrator

UNIVERSITY OF SOUTH AFRICA UNISA university of south africa UNIVERSITEIT VAN SUID-AFRIKA

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
20	55	90	125
21	56	91	126
22	57	92	127
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