UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1521 (476940) RCO1521 (492881)

May/June 2014

COMPUTER SYSTEMS: FUNDAMENTAL CONCEPTS

Duration 2 Hours

100 Marks

EXAMINERS .
FIRST MR S SSEMUGABI
SECOND MR ME BOGOPA

Closed book examination

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 worth 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

According to the Turing, the output data of a computer depends on which factor (s)?

1 Input only
2 CPU speed and input
3 Input and program
4 Program and CPU speed

QUESTION 2

Since 1950, historians have divided computer software and hardware into generations Which of them is referred to as the 'open-ended generation'?

1 Fifth
2 Sixth
3 Third
4 Fourth

QUESTION 3

Convert $(77)_{10}$ to a hexadecimal number

1 $(43)_{16}$
2 $(4D)_{16}$
3 $(54)_{16}$
4 $(5F)_{16}$

QUESTION 4

Convert $(10111\ 01)_2$ to an octal number

1 $(25\ 01)_8$
2 $(52\ 2)_8$
3 $(27\ 2)_8$
4 $(53\ 1)_8$

QUESTION 5

Which one of the following number representations is NOT correct?

1 $(11\ 1)_{10}$
2 $(18\ 3)_{8}$
3 $(11\ A)_{16}$
4 $(100\ 0)_{2}$

QUESTION 6

What is the 2's complement representation of –37 using 7 bits?

1 $(0101100)_2$
2 $(1010011)_2$
3 $(1011011)_2$
4 $(0100101)_2$

QUESTION 7

Convert $(101\ 1101)_2$ to normalised form

1 $(0\ 1011101)_2 \times (2^{-4})_{10}$
2 $(1\ 011101)_2 \times (2^{4})_{10}$
3 $(1\ 011101)2 \times (22)_{10}$
4 $(0\ 1011101)_2 \times (2^{3})_{10}$

Rough work

QUESTION 8

Currently, computers store data in different forms Which one of the following is not a *type of data* for computers?

1 Audio
2 Video
3 Byte
4 Numbers

QUESTION 9

Which one of the following refers to the process of converting quantized samples values to bit patterns when storing audio?

1 Sampling
2 Quantisation
3 Compression
4 Encoding

QUESTION 10

Which one of the following is an application of the XOR operator?

1 To set specific bits in a bit pattern
2 To flip 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 $(101001)_2$ - $(1111)_2$

1 $(11001)_2$
2 $(11110)_2$
3 (11010)2
4 $(11101)_2$

Apply Boolean algebra rules in the following THREE questions.

QUESTION 12

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

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

QUESTION 13

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

1 0
2 x′yz′ + x′y z
3 x′y
4 1

QUESTION 14

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

1 x′y
2 x + y
3 x′ + y′
4 x′y′

Rough work

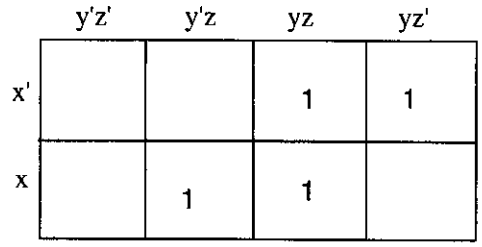
QUESTION 15

Consider the following Boolean function

$$F(x,y,z) = m_1 + m_2 + m_5 + m_7$$

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

1



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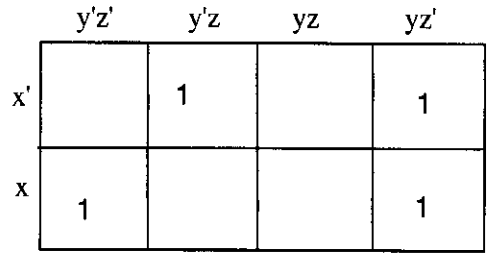

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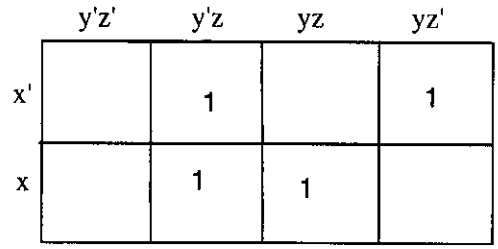

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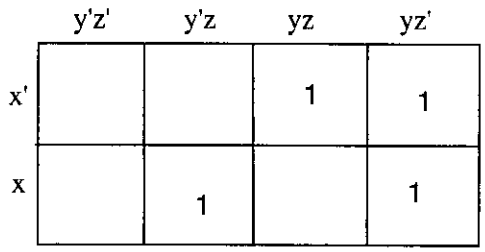
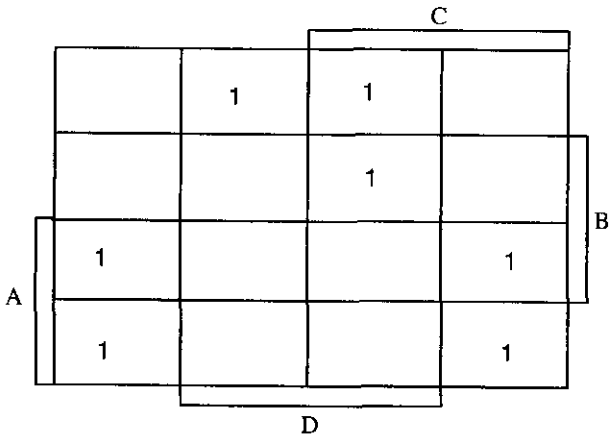


Rough work

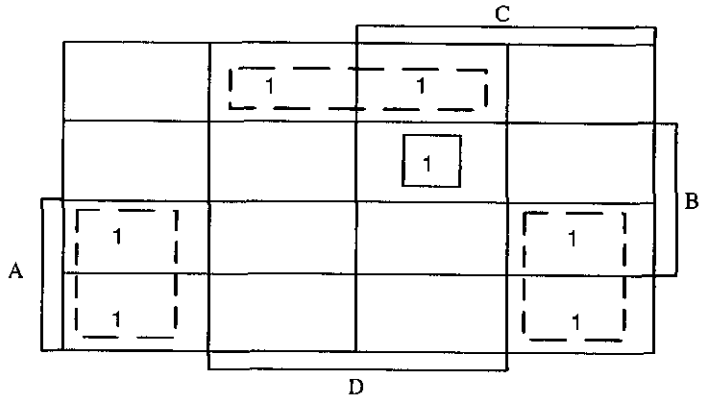
QUESTION 16

Consider the following Karnaugh map

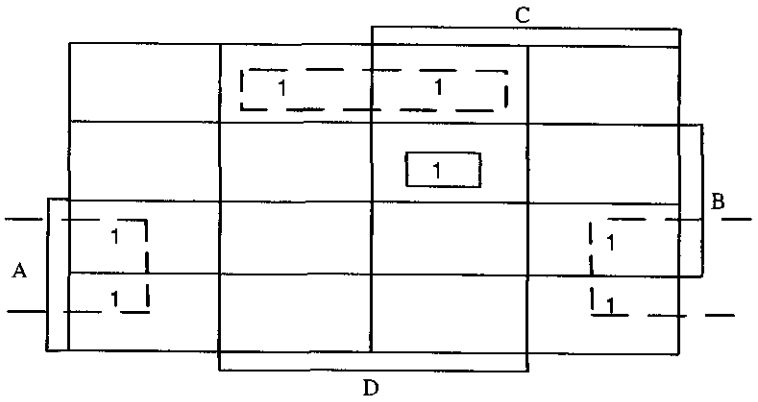


Which one of the following four Karnaugh maps reflects the correct forming of groups?

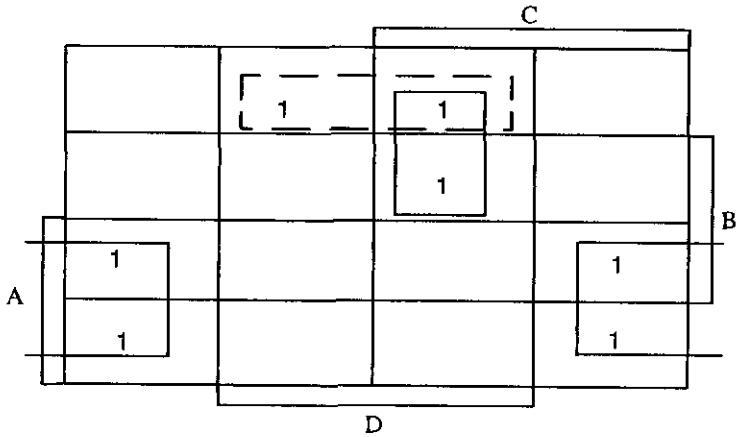
1



2



3



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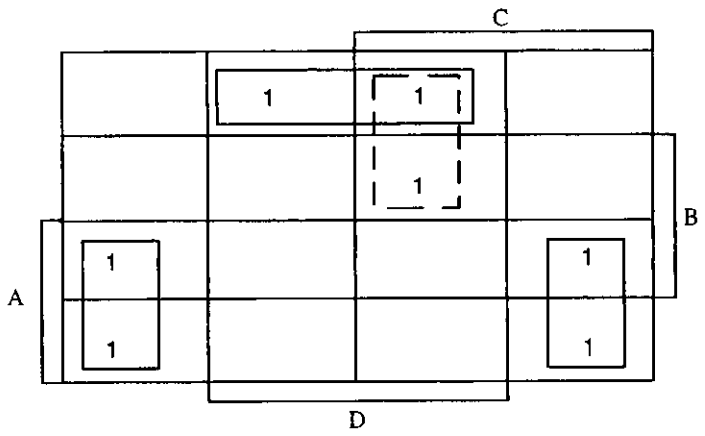
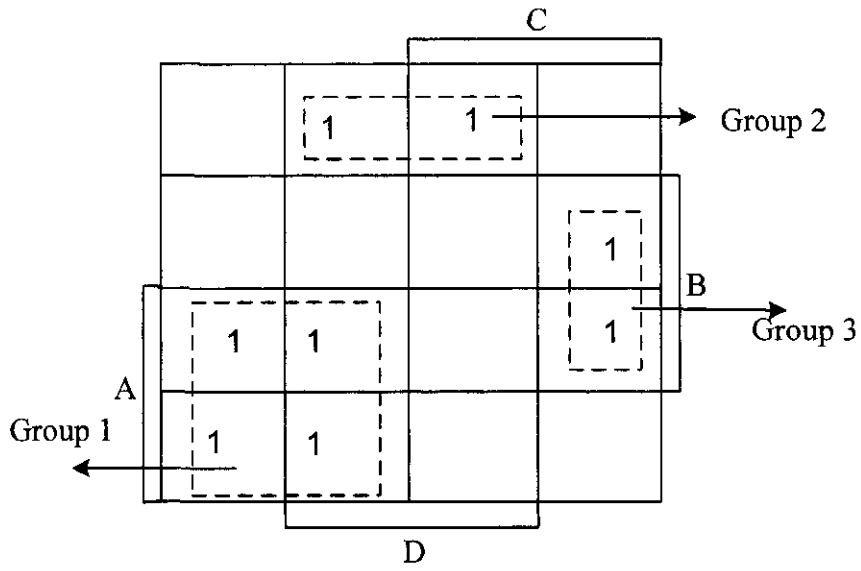


Rough work

The next THREE questions refer to the Karnaugh map below:



QUESTION 17
Which term represents Group 1?

1 A′C′
2 AC
3 AC′
4 A′

QUESTION 18
Which term represents Group 2?

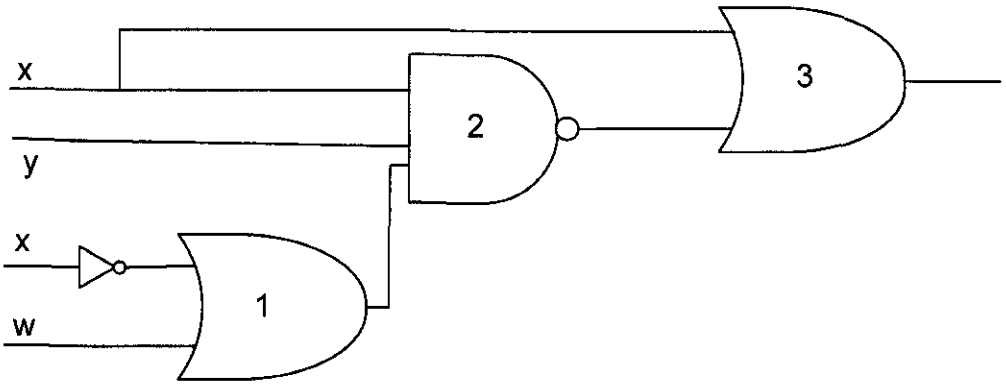
1 A′B′D
2 A′BD
3 BC′D
4 CD

QUESTION 19
Which term represents Group 3?

1 BCD′
2 BC′D′
3 A′BD
4 B′CD′

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 $[(x' + w')\ y'\ x]'$

2 $[(x' + w)\ y\ x]'$

3 $(x' + w) + y' + x$

4 $[(x.w) + y' + x]'$

QUESTION 22
What is the output of Gate 3?

1 $[(x' + w)\ y\ x]' + x$

2 $[(x' + w')\ y'\ x]' + x$

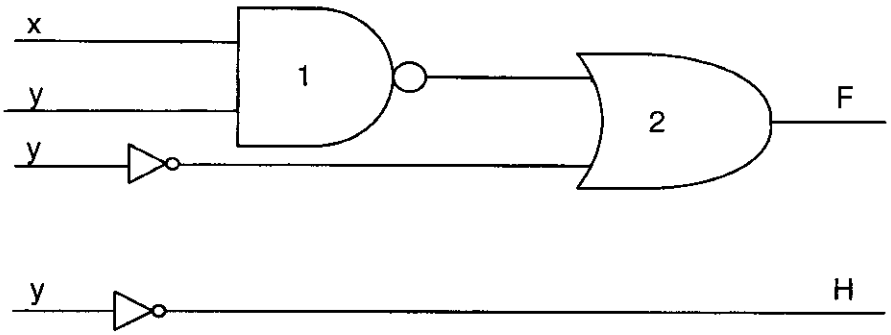
3 $[(x + w)\ y'\ x]' + x$

4 $[(x' + w) + y' + x] \cdot x'$

Rough work

QUESTION 23

Consider the following two logic circuits



These two logic circuits are not equivalent $F = (xy)' + y'$ and $H = y'$ One of the two 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 2 must change to an AND gate
2 Gate 1 must change to an AND gate
3 Gate 2 must change to a NAND gate
4 Gate 1 must change to an OR gate

Rough work

Consider the following scenario:

Three people go to a farm to gather apples They can choose containers that can hold 10 or 15 or 17 or 20 apples The containers are numbered C10, C15, C17 and C20 where the numbers indicate the number of apples that a container can hold (E g C20 can hold 20 apples)

Person A can fill **C10 & C15**, **Person B** can fill **C10 & C17**, and **Person C** can fill **C17 & C20**

If a person fills two containers with apples, then the output for that person is 1 For example, if A = 1, B = 1 and C = 0, then it means that only A and B fill their containers

A Boolean function F(A,B,C) is defined as follows **F(A,B,C) = 1 when a group of three persons A, B and C gathers more than 50 apples,** 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	0	1	1	0

QUESTION 26

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

QUESTION 27

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

Rough work

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

QUESTION 28

Which one of the following is NOT a register in a CPU?

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

QUESTION 29

Which one of the following statements is NOT true about cache memory?

1 It is faster than main memory
2 It is slower than the CPU
3 It is faster than the registers
4 It contains a copy of a portion of main memory

QUESTION 30

What is the *third* step in the procedure when the CPU needs to access a word in main memory?

1 The CPU checks the cache
2 The CPU accesses the cache and copies the word
3 The CPU displays the word
4 The CPU checks the registers

QUESTION 31

A computer has 1024 MB of memory Each word in this computer is 64 bytes How many bits are needed to address any single word in memory?

1 25
2 26
3 23
4 24

QUESTION 32

In the fetch stage of the machine cycle used by the CPU, _____

1 instructions are decoded by the control unit
2 the address of the instruction to be copied is held in the program counter
3 the task order is sent to a component in the CPU
4 the contents of two input registers are added

QUESTION 33

Which one of the following is NOT part of the three phases the CPU uses in its cycle to execute instructions in a program

1 Decode
2 Execute
3 Run
4 Fetch

QUESTION 34

Which one of the following is NOT a network topology?

1 Ring
2 Star
3. Bus
4. Bridge

QUESTION 35

What is the name of a central controller on which all the other computer network devices are connected using dedicated point-to-point links?

1 A backbone
2 A ring
3. A hub
4 A workstation

QUESTION 36

There are several layers in the Internet TCP/IP protocol suite Each performs a different function What is the data link 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 37

Which of the following is NOT a component of email architecture?

1 MTA server
2 MAA client
3 FTP protocol
4 UA

QUESTION 38
Which one of the following is NOT part of the client in the FTP model?

1 Control connection
2 User interface
3 Control process
4 Data transfer process

QUESTION 39
Which of the following is NOT a basic requirement for the WWW?

1 Web server
2. Host name
3 Browser
4 HTTP

QUESTION 40
Which of the following is NOT TRUE about Operating system?

1 An Operating system is an interface between the hardware of a computer and the user
2 An Operating system is a program (or set of programs) that facilitates the execution of other programs
3 An Operating system acts as general manager supervising the activity of each component
4 An Operating system is a collection of devices that allows a computer to communicate with the outside world

QUESTION 41
Which of the following techniques belongs to the *non-swapping* category?

1 Demand paging and demand segmentation
2 Partitioning and demand paging
3 Paging and demand segmentation
4 Partitioning and paging

QUESTION 42
Which of the following is NOT a component of Modern Operating system?

1 File manger
2 Memory manager
3 User manager
4 Device manager

QUESTION 43

What is the name of the technique in which the memory is divided into variable-length sections, each section holding one program and CPU switches between them?

1 Partitioning
2 Paging
3 Demand paging
4 Demand segmentation

QUESTION 44

Which one of the following is FALSE about the file manager?

1 It is responsible for archiving and backups
2 It supervises the creation, deletion, and modification of files
3 It controls access to files
4 It monitors every input/output device

QUESTION 45

Which major component of UNIX is regarded as the heart of the system and contains the most basic part of the operating system?

1 Kernel
2 Shell
3 Utilities
4 Applications

Section C: Computer algorithms, programming and software development

(18 marks)

QUESTION 46

A list contains the following elements

10 12 19 23 38 42 55 65 77 82 85 100 119 163 170

At the beginning, first = 1, mid = 8 and last = 15 What are the values of first, mid and last respectively after two more iterations of the binary search algorithm if the goal is 163?

1 8, 11, 15
2 9, 10, 11
3 9, 12, 15
4 13, 14, 15

QUESTION 47

Suppose a list contains the following elements

55 71 16 33 65 48 83 24

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

1 16 24 33 55 65 48 83 71
2 16 71 55 33 65 48 83 24
3 16 24 55 33 65 48 83 71
4 16 24 33 55 48 65 71 83

QUESTION 48

In which Sorting algorithms is the list to be sorted divided in to two sublists – sorted and unsorted, and separated by an imaginary wall?

1 Selection sort
2 Bubble sort
3 Insertion sort
4 Deletion sort

QUESTION 49

Which one of the following is a pictorial representation of an algorithm?

1 Loop
2 Repetition
3 UML
4 Class

QUESTION 50

Which construct is represented by the below Pseudocode?

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

1 Sequence
2 Decision
3 Repetition
4 Generalization

QUESTION 51
Which one of the following is NOT a logical parts of the 'Summation' algorithm?

1 Swap the selection
2 Initialization of the sum at the beginning
3 A Loop, which in each iteration adds a new integer to the sum
4 Return of the result after exiting from the loop

QUESTION 52
Compilation _____

1 is a form of interpretation
2 translates and executes the source code a line at a time
3 translates the whole source program into the object module before executing it
4 is used in the first *approach* to interpretation

QUESTION 53
Which translation analyzer parses a set of tokens to find instructions?

1 Lexical
2 Syntax
3 Semantic
4 Code generator

QUESTION 54
Which one of the following programming paradigm is considered to be imperative?

1 Declarative
2 Functional
3 Procedural
4 Object-oriented

QUESTION 55
In which two forms can a final program in Java be?

1 An application or a function
2 A function or a procedure
3 A procedure or an applet
4 An application or an applet

QUESTION 56

Which of the following operators compares data to see if a value is greater than, less than, or equal to another value?

1 Arithmetic operators
2 Relational operators
3 Logical operators
4 Control operators

QUESTION 57

In the Scheme version of LISP, if Names = (John Mathi Sipho Ruth Kali Busi Jonah), then (car (cdr (cdr Names))) would give a result of

1 Mathi
2 Sipho
3 Ruth
4 Kali

QUESTION 58

One very popular model for the software development process is known as the waterfall model Which one of the following statements is NOT TRUE about this model?

1 The developers add more functionality until the existing system works properly
2 The development process flows in only one direction
3 The analysis phase of the whole project should be completed before its design phase is started
4 Each phase is completed before the next phase starts

QUESTION 59

Which one of the following is regarded as disadvantage of Waterfall model?

1 The testing team can test the whole system
2 The group that works on design phase needs complete results from analysis phase
3 If there is a problem in part of the process, then the entire process must be checked
4 The development process involves four phases only

QUESTION 60

Which of the following is NOT a symbol of data flow diagrams?

1 Data storage
2 Process
3 Data flow
4 Start

QUESTION 61

_____ between modules in a software system must be maximised

1 Modularity
2 Cohesion
3 Coupling
4 Procedures

QUESTION 62

Transferability is one of the measures for software quality Transferability includes _____

1 reusability, interoperability and portability
2 Changeability, usability and correctability
3 Changeability, flexibility and testability
4 Reliability, flexibility and timeliness

QUESTION 63

What is the other name for Glass-box testing?

1 Exhaustive testing
2 Random testing
3 Black-box testing
4 White-box testing

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

QUESTION 64

Which of the following is NOT TRUE of a loop in an array?

1 Can be used to read and write the elements in an array
2 Loops can be used to process elements
3 If there are 10, 100, or 1000 elements to be processed, loops make it easy to handle them all
4 performs operations on data

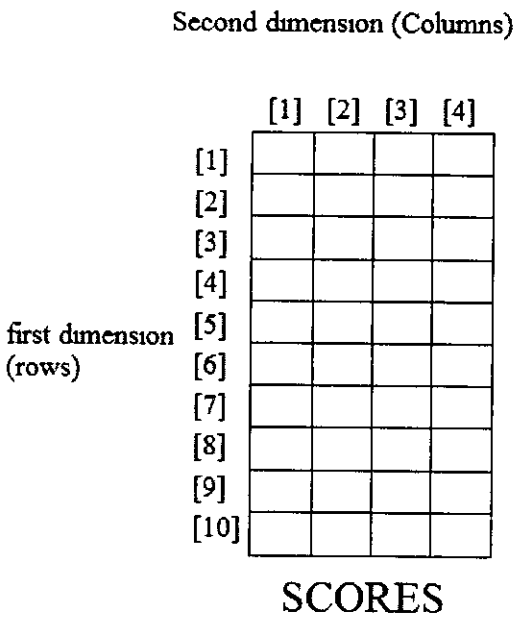
QUESTION 65

The common operations on arrays of structures are_____

1 searching, updating, deletion, insertion and retrieval (lower case)
2 copying, searching, deletion, retrieval, and traversal
3 searching, insertion, deletion, retrieval, and traversal
4 updating, searching, copying, deletion, insertion, and traversal

QUESTION 66

The below figure shows two-dimensional array, which holds the scores of students in a class There are 10 students in the class and each student has four different scores for four quiz
Which of the following variable scores represent the score of the 3rd student in the 2nd quiz?



1 SCORES [3] [2]
2 SCORES [2] [3]
3 SCORES [2] [2]
4 SCORES [3] [3]

QUESTION 67

Which one of the following best describes a record?

1 A collection of data in which each element contains the location of next element
2 A file containing data, such as s file created within an application program
3 A collection of different elements that can be stored on different locations
4 A collection of related elements, possible of different types, having a single name

QUESTION 68
In an array we have two identifiers, name them·

1. Data and link
2 Class and node
3 The Array of records and the data type
4 The name of the array and the name of each individual element

QUESTION 69
A linked list is a suitable structure if -

1 A small number of insertions and deletions are required
2 A large number of insertions and deletions are needed
3 A lot of searching and retrieval is needed
4 Collection of related elements is required

QUESTION 70
Which of the following best describe what a file?

1 It is always sequential, hashed and indexed
2 It is a very small record which is loaded in to main memory
3 It is how you retrieve information
4 It is an external collection of related data treated as a unit

QUESTION 71
Which one of the following is NOT one of Hashing methods?

1 Direct hashing
2 Bucket hashing
3 Modulo division hashing
4 Digit extraction hashing

QUESTION 72
One of the disadvantages of open addressing is _____?

1. The first record is stored in the home address, but contains a pointer to the second record
2 The bucket hashing accommodates more than one record
3 Each collision resolution increases the probability of future collisions
4 It uses multiple approaches when collision occurs

QUESTION 73
Which UNIX directory is the highest level in the file system hierarchy?

1 Root directory
2 Home directory
3 Working directory
4 Parent directory

QUESTION 74
What is binary file?

1 A randomly accessible sequence of file
2 A collection of related files stored in a secondary device
3 A collection of data of data stored in the internal format of the computer
4 A file of characters

QUESTION 75
Which of the following is NOT a necessary component of a DBMS?

1 Hardware
2 Data
3 Software
4 Graphs

QUESTION 76
The database system has the following advantages as compared to the flat-file system EXCEPT

1 In a flat-file system there is a lot of redundancy
2 A database system is usually more efficient than a flat file system, because a piece of information is stored in fewer locations
3 In a database system it is easier to maintain data integrity, because a piece of information is stored in fewer locations
4 In a flat-file it is easier to maintain the confidentiality of the information

QUESTION 77
In a replicated distributed database_____

1 data is localised
2 each site holds an exact copy of another site
3 each relation need to have a key
4 data is stored in external device

QUESTION 78

What does retrieving a node means in linked lists?

1 Randomly accessing a node for the purpose of inspecting or copying the data in the node
2 Copying a node at the middle or end of a linked list
3 Representing a list of items in memory
1 Checking a walking pointer to the first node

QUESTION 79

What is a declarative language which is used on relational databases called?

1 ISO
2 SQL
3 LES
4 OO

QUESTION 80

Which one of the following is NOT classified as database model?

1 Distributed database
2 Relational databases
3 Normalised databases
4 Object-Oriented databases

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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	2 3 4 5	36	2 3 4 5	71	2 3 4 5	106	2 3 4 5
2	2 3 4 5	37	2 3 4 5	72	2 3 4 5	107	2 3 4 5
3	2 3 4 5	38	2 3 4 5	73	2 3 4 5	108	2 3 4 5
4	2 3 4 5	39	2 3 4 5	74	2 3 4 5	109	2 3 4 5
5	2 3 4 5	40	2 3 4 5	75	2 3 4 5	110	2 3 4 5
6	2 3 4 5	41	2 3 4 5	76	2 3 4 5	111	2 3 4 5
7	2 3 4 5	42	2 3 4 5	77	2 3 4 5	112	2 3 4 5
8	2 3 4 5	43	2 3 4 5	78	2 3 4 5	113	2 3 4 5
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11	2 3 4 5	46	2 3 4 5	81	2 3 4 5	116	2 3 4 5
12	2 3 4 5	47	2 3 4 5	82	2 3 4 5	117	2 3 4 5
13	2 3 4 5	48	2 3 4 5	83	2 3 4 5	118	2 3 4 5
14	2 3 4 5	49	2 3 4 5	84	2 3 4 5	119	2 3 4 5
15	2 3 4 5	50	2 3 4 5	85	2 3 4 5	120	2 3 4 5
16	2 3 4 5	51	2 3 4 5	86	2 3 4 5	121	2 3 4 5
17	2 3 4 5	52	2 3 4 5	87	2 3 4 5	122	2 3 4 5
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19	2 3 4 5	54	2 3 4 5	89	2 3 4 5	124	2 3 4 5
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21	2 3 4 5	56	2 3 4 5	91	2 3 4 5	126	2 3 4 5
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23	2 3 4 5	58	2 3 4 5	93	2 3 4 5	128	2 3 4 5
24	2 3 4 5	59	2 3 4 5	94	2 3 4 5	129	2 3 4 5
25	2 3 4 5	60	2 3 4 5	95	2 3 4 5	130	2 3 4 5
26	2 3 4 5	61	2 3 4 5	96	2 3 4 5	131	2 3 4 5
27	2 3 4 5	62	2 3 4 5	97	2 3 4 5	132	2 3 4 5
28	2 3 4 5	63	2 3 4 5	98	2 3 4 5	133	2 3 4 5
29	2 3 4 5	64	2 3 4 5	99	2 3 4 5	134	2 3 4 5
30	2 3 4 5	65	2 3 4 5	100	2 3 4 5	135	2 3 4 5
31	2 3 4 5	66	2 3 4 5	101	2 3 4 5	136	2 3 4 5
32	2 3 4 5	67	2 3 4 5	102	2 3 4 5	137	2 3 4 5
33	2 3 4 5	68	2 3 4 5	103	2 3 4 5	138	2 3 4 5
34	2 3 4 5	69	2 3 4 5	104	2 3 4 5	139	2 3 4 5
35	2 3 4 5	70	2 3 4 5	105	2 3 4 5	140	2 3 4 5