NATIONAL SENIOR CERTIFICATE EXAMINATION
SUPPLEMENTARY EXAMINATION – MARCH 2019

INFORMATION TECHNOLOGY: PAPER I

EXAMINATION NUMBER

Time: 3 hours 180 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 28 pages and an Insert of 1 page. Please check that your question paper is complete.
2. Read the questions carefully and make sure that you answer all parts of each question.
3. Answer on the question paper. Please make sure that you write your examination number in the blocks above.
4. Answer ALL questions – there are no options in this paper.
5. Show all working where applicable.
6. A non-programmable calculator may be used.
7. It is in your own interest to write legibly and to present your work neatly.
8. There are two blank pages at the end of this paper. In case you run out of space when answering a question, use these pages. Clearly indicate the number of the question you are working on.

FOR MARKER'S USE ONLY

QUESTION	Q1	Q2	Q3	Q4	Q5	Q6	Q7	TOTAL
TOTAL	10	10	38	53	17	23	29	180
MARK								

SECTION A SHORT QUESTIONS

QUESTION 1 DEFINITIONS

Supply a concise definition for each of the following computing terms. It is insufficient to merely expand an acronym.

1.1 Void method/procedure

1.2 Multitasking

1.3 Virtualisation

1.4 Composite key

1.5 Front-end

[10]

QUESTION 2 MATCHING COLUMNS

For each of the terms in Column A below, you should select the **most correct** definition from Column B, matching the letter to the question number. You should merely write down the appropriate letter. An example is shown as Question 2.0.

Example: 2.0 W

Column A		Column B
2.0 computer term	W	A. Used to connect a LAN to a larger LAN
2.1 intranet		B. A high-level interpreted programming language
2.2 compiler		C. The amount of data that can be transmitted through any medium in a fixed period of time
2.3 backbone		D. An extra digit in a number used to validate the number
2.4 SQL		E. A number of computers infected with a type of malware capable of being controlled remotely
2.5 bandwidth		F. A collection of hard drives for storing databases
2.6 join		G. Converts and executes high-level language code one line at a time
2.7 botnet		H. A private network only available within an organisation
2.8 pharming		I. A keyword which is used to select records that have matching values in two tables
2.9 array		J. Web-based application development
2.10 check digit		K. A scamming practice where web traffic is misdirected to fraudulent websites
		L. A query language used to extract data from a database
		M. A data structure where many values of the same type are associated with one name
		N. Malicious code often spread by social engineering
		O. The speed of an internet connection
		P. A system used for storing large volumes of data
		Q. A programming object
		R. Software which converts source code into object code
		S. A ninth bit inserted to check a data stream

[10]

20 marks

SECTION B SYSTEM TECHNOLOGIES

Consider the following scenario when answering the rest of the examination paper, unless the questions are of a general nature or otherwise stated. If you are provided with additional information regarding the scenario at any point, this should be read in conjunction with, and added to, the original scenario.

DataWize is a computer shop that sells hardware and software items to the public. They sell both individual components for computers as well as assembled PCs, laptops and other similar devices.

QUESTION 3

The owners of **DataWize** are buying some new stock items. Specifically, they need to buy stock of CPUs, RAM, motherboards, graphics cards and general peripheral devices.

The owners have looked at some motherboards and have decided to stock the following two motherboards. The motherboard in Figure 1 is intended for the average PC user and the motherboard in Figure 2 is intended for gamers.

Figure 1
ASRock AMD **FM2A68M** Motherboard

Figure 2
Gigabyte **GA-Z270X** Gaming 9 Extreme Motherboard

The following specifications apply to these motherboards:

Motherboard	**FM2A68M**	**GA-Z270X**
Compatible processors	Athlon 11X2, X4	Intel i3, i5, i7
Chipset	AMD	Intel
Memory supported	2 × DDR3 SDRAM	4 × DDR4 SDRAM
On-board graphics	Maximum shard memory: 2 GB HDMI port	Maximum shared memory: 1 GB HDMI port
USB ports	2 × USB 3.0, 4 × USB 2.0	8 × USB 3.0, 6 × USB 2.0
Storage	4 × SATA (with RAID)	8 × SATA (with RAID)
Price	R900,00	R13 700,00

3.1 The motherboard in Figure 1 uses DDR3 RAM while the one in Figure 2 uses DDR4 RAM.

3.1.1 Is RAM primary or secondary storage?

_____ (1)

3.1.2 Explain the benefit of using DDR SDRAM over using SDRAM.

_____

_____

_____

_____ (2)

3.1.3 Give TWO reasons why the motherboard in Figure 2 needs DDR4 SDRAM.

_____

_____

_____

_____ (2)

3.1.4 (a) How much RAM would you suggest DataWize installs on the motherboard in Figure 1?

_____ (1)

(b) Justify your answer.

_____

_____ (1)

3.1.5 (a) How much RAM would you suggest DataWize installs on the motherboard in Figure 2?

_____ (1)

(b) Justify your answer.

_____

_____ (1)

3.2 Both motherboards have on-board graphics cards.

3.2.1 Select ONE motherboard that you believe would best be suited to having an additional graphics card added. Justify your selection with ONE reason.

_____

_____

_____ (2)

3.2.2 Explain what it means if the motherboard has shared memory with respect to the on-board graphics card.

_____

_____

_____ (2)

3.3 **DataWize** stocks various graphics cards to sell as additional cards for motherboards. One of them has a feature called: 'One-click super overclocking'.

3.3.1 Define overclocking.

_____

_____

_____ (2)

3.3.2 Explain TWO negative side-effects of overclocking any PC component.

_____

_____

_____ (2)

3.3.3 Why would a user most likely want to overclock a **GPU** and what effect would the user hope to achieve?

_____

_____

_____ (2)

3.4 The motherboard in Figure 2 provides level 3 (L3) cache.

3.4.1 Is the RAM used in an L3 cache faster or slower than normal SDRAM?

(1)

3.4.2 Why does the motherboard only provide an L3 cache?

(2)

3.4.3 Name TWO types of cache found on modern PCs other than a processor cache.

(2)

3.4.4 Explain the difference between a cache and a buffer.

(2)

3.5 The specifications of both motherboards refer to a chipset.

3.5.1 What is the purpose of a chipset on a motherboard?

(2)

3.5.2 Why can these two motherboards NOT use the same chipset?

(2)

3.6 A customer wants **DataWize** to make up a system for her based around the motherboard in Figure 2. She wants to have two hard drives in her system: one for the operating system, and one for her applications and data. She is going to use this computer mainly for playing games, but will also use it for some general computing applications.

3.6.1 **DataWize** suggests that the drive for the operating system should be an SSD.

Give TWO reasons for this recommendation.

_____

_____

_____

_____ (2)

3.6.2 The motherboard in Figure 2 specifies 8 × SATA (with RAID).

(a) What is RAID? (Do not merely expand the acronym.)

_____

_____

_____

_____ (2)

(b) How many additional hard drives would be needed to implement RAID level 0 in this machine?

_____

_____ (2)

(c) Justify your answer.

_____

_____

_____

_____ (2)

38 marks

SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES

QUESTION 4

DataWize has opened a repair section in their store, and they have employed three technicians. Customers are able to bring their PCs and laptops in for repair or just to ask questions and advice. At the same time, **DataWize** has installed a cabled network in the shop, using a star topology. Connected to the network are:

- a server on which all their data about customers, stock, etc. is stored
- two desktop PCs – one for sales and one for administration
- three laptops used by the technicians
- two networked printers – one used to print sales slips, the other for general printing needs

4.1 The description above refers to a star topology.

4.1.1 List TWO advantages and TWO disadvantages of a star topology.

(4)

4.1.2 Name ONE other network topology often used in combination with a star topology.

(1)

4.1.3 A star topology requires a network hub or switch to allow all nodes to connect to the network.

Explain how the main functional difference between a hub and a switch has an effect on network performance.

(3)

4.2 A customer has brought in a laptop. He is having problems using this on his network at home. Sometimes the laptop connects to the network, but not always. When it does, the speed of data transmission over the network is very poor. He has brought his laptop and the cable he uses to connect to the network. Put yourself in the position of one of the technicians who is helping with this problem.

4.2.1 Name TWO types of copper cable.

(2)

4.2.2 You discover that the on-board cabled network card is faulty.

Is it likely that the on-board cabled network card will be able to be replaced? Explain your answer.

(2)

4.2.3 The customer asks if he will be able to connect wirelessly to his home network.

Write down TWO questions that you would ask the customer in order to be able to answer his question correctly. These questions can refer to any relevant pieces of hardware or software.

(4)

4.3 The **DataWize** technical team also offer remote support for customers. They make use of remote access software for this purpose.

4.3.1 Remote access software packages generally allow the following functions:

- remote control of the keyboard/mouse
- file uploads and downloads
- the ability to execute commands

Choose TWO of these and explain how they are useful when assisting customers via a remote support session.

(2)

4.3.2 In the context of the scenario, list AND explain THREE things that a technician could fix on a client's computer by remote access. Do not rewrite any of the above functions.

(6)

4.3.3 How is data for the remote session secured from intrusion by a third party?

(1)

4.3.4 A client is unhappy about using the remote access service provided by **DataWize**. She wants to know how she can be certain that she is dealing only with a technician from **DataWize**, and is worried about security of data.

(a) Explain ONE way in which she can be sure that the person gaining access to her computer is in fact someone from **DataWize**.

_____

_____

_____

_____ (2)

(b) List and explain ONE way the user ensures that any of her personal data is not viewed or copied by the technician when he is working on her machine remotely.

_____

_____

_____

_____ (2)

(c) Name TWO social engineering techniques.

_____

_____ (2)

4.3.5 An alternative solution to providing remote access could be making use of a VPN (virtual private network).

(a) Define a VPN.

_____

_____

_____

_____ (2)

(b) What is the purpose of a VPN?

(2)

(c) Justify whether, in this scenario, making use of a VPN would be a viable alternative to the remote access service currently being offered.

(2)

4.4 The owner of **DataWize** is concerned about data loss with all data being stored on one server. His main concerns are:

- power outages
- multiple hard drive failures on the server

To assist with power outages, the owner has bought a generator for the shop. However, it takes two minutes for the generator to supply electricity. The technicians have advised the owner to install UPSs to help in the two-minute period.

4.4.1 What is a UPS? It is insufficient to merely expand the abbreviation.

(2)

4.4.2 'Data loss' refers to a situation where information is either destroyed, corrupted or stolen.

Explain THREE consequences for **DataWize** in the event that they suffer data loss as defined above.

(3)

4.4.3 The technicians have said that not all components of the network need to have UPS power. The owner has asked you to rank the computer devices listed below in order of priority (highest to lowest) to help him.

Number	Component
1.	Technician laptops
2.	Admin printer
3.	Admin PC
4.	Server
5.	Sales PC
6.	Sales printer
7.	Network switch

(a) Write down the priority order that you would suggest to the owner. You merely need to write down the numbers of the components in the format shown in the example below.

Example: 1 ; 3 ; 2 etc.

(3)

(b) Justify to the owner why you chose the components listed first, second, sixth and seventh on YOUR list. In other words, the two most important and the two least important, based on the details of the scenario.

(4)

4.4.4 List TWO causes of hard drive failure.

(2)

4.4.5 Explain ONE procedure the owner can implement to protect against data loss from multiple drive failures.

(2)

53 marks

SECTION D SOCIAL IMPLICATIONS

QUESTION 5

A customer has brought their PC to **DataWize** for repairs. The PC is connected to the LAN at the workshop and booted up for diagnosis.

5.1 The technician who is working on the PC suspects it may be infected with malware.

5.1.1 Define the term 'malware'.

_____

_____

_____

_____ (2)

5.1.2 Select one of the following forms of malware and then answer the questions that follow:

Worm; Trojan Horse; Spyware

(a) List ONE characteristic of the form of malware that you chose, other than how it deploys or replicates.

_____

_____ (1)

(b) Describe how the form of malware you chose deploys and replicates. You must mention TWO factors in your answer.

_____

_____

_____

_____

_____

_____ (2)

5.1.3 It has now been discovered that the PC actually has a second infection – a rootkit infection.

(a) Answer TRUE or FALSE to each of the following statements:

(i) Rootkit software can be used in intercept data from a computer keyboard.

_____ (1)

(ii) There are no positive uses of rootkit software.

_____ (1)

(b) Explain why it is often very difficult to detect a rootkit infection.

_____

_____

_____

_____ (2)

5.2 While working on the PC, one of the technicians notices that there are a large number of MP3 files on the hard drive.

5.2.1 The MP3 files on the PC are all audio files. Is this file format used for any other type of data?

_____ (1)

5.2.2 Most MP3 files that are found on the Internet have been placed there illegally.

(a) Why is it illegal to distribute copies of audio tracks in this manner?

_____

_____ (1)

(b) Explain ONE way in which MP3 files can be legally down-loaded from the Internet and stored on a PC.

_____

_____ (1)

(c) Other than downloading from the Internet, name TWO other processes whereby MP3 files might be accumulated on a PC.

(2)

5.2.3 One of the technicians who work at **DataWize** has written his own anti-virus program. He wants to know which software-licensing model he should use when distributing his program. He has the following three options in mind: proprietary; open-source; freeware.

Which of the three models listed above would you advise the technician to use? Justify your answer with TWO facts that support the model you chose.

(3)

17 marks

SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 6

6.1 An essential part of any database is a DBMS (Database Management System).

6.1.1 Define a DBMS.

(2)

6.1.2 Security and data integrity are two functions that a DBMS provides.

Explain the importance of these two items for the proper functioning of a database. It is insufficient to merely define the terms.

(4)

6.2 **DataWize** has created a database to store details of stock items. The structure and some sample data are shown below. Study these carefully and then answer the questions that follow.

tblHardware

Item_ID	Item_Name	Item_Category	Cost_Price	Stock_Level	Last_Sale
1	GPZ-188	Motherboard	388.00	5	2 December 2018
2	ST500DL	HDD	520.00	10	4 December 2018
3	ST1500DX	HDD	850.00	10	29 November 2018
4	DDR3 DIMM	RAM module	420.00	50	6 December 2018
5	DDR3 DIMM	RAM module	600.00	25	4 December 2018
6	ZK-110K	Motherboard	890.00	2	4 November 2018
7	MX10FX	SSD	1 400.00	4	8 December 2018

6.2.1 The field **Item_ID** has been chosen as the primary key.

(a) What is the function of a primary key?

_____

_____

_____

_____ (2)

(b) In this example, would *Item_Name* be a suitable primary key? Justify your answer.

_____

_____

_____

_____ (2)

6.2.2 The database table has not been normalised.

(a) Define database normalisation.

_____

_____

_____

_____ (2)

(b) You are required to normalise the table above into the following TWO relations: **tblStock** and **tblCategory**. Ignore the field *Last_Sale* in this process.

Write down your answer in the standard relation format: tablename(field1, field2, ……) Underline all primary keys.

(6)

6.2.3 Now consider the field *Last_Sale*.

(a) Explain why this field needs to be extracted into its own relation rather than being included in the **tblStock** relation.

(2)

(b) Write out a new relation to include the *Last_Sale* field. Name this relation **tblSales**.

(3)
[23]

QUESTION 7

7.1 **DataWize** is considering writing an OOP application to manage their stock and sales. The program will instantiate **Stock** objects.

The Stock class will be used to instantiate **Stock** objects.

The class will have the following fields:

- **name** – the name of each stock item
- **category** – the hardware category each item belongs to
- **costPrice** – the price in rands and cents paid by **DataWize** when they purchase stock items
- **stockLevel** – the number of each item in stock

The individual fields of any one object should not be accessible from outside the Stock class.

The class will need the following methods:

- a constructor method to initialise the fields of the object
- accessor methods for the **name**, **costPrice** and **stockLevel** fields
- a mutator method for the **stockLevel** field
- a **toString()** method to display all the fields of an object

You are required to draw a class diagram for the **Stock** class according to the specification shown above in the standard format. Choose appropriate field types for each field.

(10)

7.2 The **Stock** class makes use of accessor and mutator methods.

Explain why these methods are needed in this class.

(2)

7.3 Assume a further class has been coded. This class has an array called **stockArr** that will hold a number of **Stock** objects. There are many methods in this class, one of which is called **changeStock()**. The code for this method is shown on the Insert included with this question paper.

7.3.1 What specific term is used to describe the item **name** in the header of the method?

(1)

7.3.2 What is the purpose of the variable **pos** in this method?

(1)

7.3.3 Examine the statement and its associated action line and explain what this code will achieve in the context of the **Stock** class.

(3)

7.4 While using the **Stock** class, it has been discovered that there are some stock items that have duplicate names in the data file which has been used to populate **stockArr**. The owners of **DataWize** have asked for your assistance in this regard.

7.4.1 You are required to write an **algorithm** which can be used by either a Java or Delphi programmer to write a method which will read through the populated array and identify any duplicate stock item names. Your algorithm should achieve the following:

- Loop through the array **stockArr**.
- Check for stock items with duplicate names.
- Should a duplicate be found, the **name** and **stockLevel** of both the original and the duplicate should be written away to a text file called "**duplicates.txt**".

NB: Algorithms are NOT written in a high-level programming language. Marks will be deducted for any solutions presented in Java or Delphi.

(10)

7.4.2 Explain ONE test that could have been used to ensure that no items with duplicate names were entered into **stockArr**.

_____

_____

_____

_____ (2)
[29]

52 marks

Total: 180 marks

Extra page

Extra page