



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

INFORMATION TECHNOLOGY P2

2022

MARKS: 150

TIME: 3 hours

This question paper consists of 17 pages.



INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX sections:

SECTION A: Short Questions	(15)
SECTION B: System Technologies	(25)
SECTION C: Communications and Network Technologies	(25)
SECTION D: Data and Information Management	(25)
SECTION E: Solution Development	(20)
SECTION F: Integrated Scenario	(40)
2. Read ALL the questions carefully.
3. Answer ALL the questions.
4. The mark allocation generally gives an indication of the number of facts/reasons required.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Write neatly and legibly.



SECTION A: SHORT QUESTIONS

QUESTION 1

- 1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 D.

1.1.1 ... is a wireless technology that allows devices to communicate wirelessly over short distances, typically 10 m or less.

- A WAN
 - B Bluetooth
 - C Wi-Fi Mini
 - D GPRS
- (1)

1.1.2 A ... is a small text file used to store customised settings for a website on your local computer.

- A log file
 - B CSV file
 - C blockchain
 - D cookie
- (1)

1.1.3 A rule-based form of artificial intelligence where human experience is coded into a computer to make it possible for the computer to make decisions:

- A Expert system
 - B Professional system
 - C Rule-based system
 - D Learning system
- (1)

1.1.4 A DDoS attack makes a website unusable due to ...

- A 'pop-ups' used to trick the website owner into disconnecting the website server from the internet.
 - B a hacker that breaks the connection between the internet and the server.
 - C extremely high volumes of traffic that request data from the website.
 - D unauthorised access to the website's CSS.
- (1)

1.1.5 Determine the value of **sWord** if the following code is executed:

```
sText := 'abcdefghijklmnopqrstuvwxy';
sWord := '';
for I := length(sText) downto 1 do
    if I Mod 5 = 0 then
        sWord := sWord + sText[I];
```

- A zxvtrpnljhfdb
 - B ytoj
 - C afkpty
 - D ytoje
- (2)

- 1.2 Choose a term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–T) next to the question numbers (1.2.1 to 1.2.9) in the ANSWER BOOK, e.g. 1.2.10 U.

COLUMN A		COLUMN B	
1.2.1	The use of ICT tools and devices to malign, mock, embarrass, threaten or intimidate a person online	A	algorithm
		B	validation
		C	machine code
1.2.2	An operating system for Apple smartphones and tablets	D	hyperlink
		E	RSI
1.2.3	An injury often sustained by computer users due to frequent repetitive actions	F	iOS
		G	adware
1.2.4	Step-by-step approach followed to solve a problem	H	spam
		I	UTF-255
1.2.5	Unsolicited e-mail, usually in the form of advertisements	J	spoofing
		K	cyber bullying
1.2.6	A built-in connection to another related web page, indicated as text underlined in blue, or by a graphic with a blue outline	L	GIGO
		M	ASCII
1.2.7	A specific sequence of steps followed by the CPU when carrying out instructions	N	source code
		O	green computing
1.2.8	Instructions in binary format that the CPU can execute directly	P	Android
		Q	social implications
1.2.9	A concept where it is argued that the quality of the output for any computer system is directly related to the quality of the input	R	machine cycle
		S	Mac OS
		T	Assembler

(9 x 1) (9)

TOTAL SECTION A: 15

SECTION B: SYSTEM TECHNOLOGIES

QUESTION 2

SCENARIO

A transport company is evaluating the computer systems and devices that they are using.

2.1 The following devices are used by the company:

Device A: Desktop	Device B: Laptop	Device C: Tablet
 ➤ GeTEx 7080 graphics card ➤ AMD Ryzen 9 5900X 12 Core 3.7 GHz AM4 ➤ 16 GB RAM ➤ 512 GB M.2 SSD	 ➤ 13.4-inch UHD touch display ➤ Intel Core i7 1185G7 Processor Quad Core ➤ 16 GB RAM ➤ 512 GB SSD Storage ➤ Intel on-board graphics	 ➤ 12.4-inch TFT display ➤ 128 GB storage ➤ Rear and front cameras ➤ 8 GB RAM ➤ Wi-Fi/LTE/5G ➤ Battery 10.090 mAh ➤ SD card reader

2.1.1 Device **A** and **B** each has 16 GB RAM while device **C** has 8 GB RAM.

- Name the slot used to connect RAM to the motherboard of a computer. (1)
- Apart from housing RAM, state TWO other functions of a motherboard. (2)
- Why would device **C** probably have a lower performance rate based on having less RAM than devices **A** and **B**? (2)

2.1.2 Device **A** and device **B** have different numbers of cores. What does a *core* refer to in this context? (1)

2.1.3 Device **C** has 128 GB built-in storage. Analyse the features of device **C** and indicate the type of storage device that can be used to increase the storage space of this device. (1)



2.1.4 The company is experiencing a shortage of handheld scanners.

Give TWO reasons why device **C** would be the most suitable device to scan QR codes. (2)

2.1.5 The motherboard of device **A** contains a zero insertion force (ZIF) socket. Which component will be housed in this socket? (1)

2.1.6 Except for gaming needs, what other motivation might there be for having a dedicated graphics card installed, as on device **A**? (1)

2.2 Some computers are built using a modular design.

2.2.1 Explain the term *modular design*. (1)

2.2.2 State why modular design is used. (1)

2.3 CPU caching improves the performance of a computer.

2.3.1 What is *CPU cache memory*? (2)

2.3.2 Name TWO other types of caching that is used on a computer system. (2)

2.4 Devices on a company's network are vulnerable to malware.

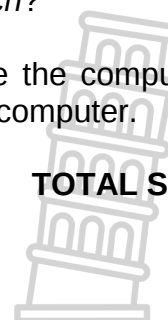
2.4.1 Explain how Trojan malware gains access to a user's computer. (2)

2.4.2 Explain how a firewall can be used to safeguard against threats on a network. (2)

2.5 The company regularly installs updates and patches for their software. What is the difference between a *software update* and a *patch*? (2)

2.6 When a computer's storage is depleted, it can cause the computer to slow down. State TWO ways to free up storage space on a computer. (2)

TOTAL SECTION B: 25



SECTION C: COMMUNICATIONS AND NETWORK TECHNOLOGIES

QUESTION 3

A transport company has a central depot from where they run their operations.

3.1 The company has decided to use a wired LAN for the computers in the control room and one wireless connection point for all other devices at the depot.

3.1.1 Name the type of cable that is commonly used in a wired LAN. (1)

3.1.2 What media is used to transmit data in a WiMAX network? (1)

3.1.3 Name the wireless technology widely used to transmit data in LAN networks. (1)

3.2 Managers from other depots can access the central network's resources over the internet, with the same security as that of the manager at the central depot.

3.2.1 What is this type of secure network called? (1)

3.2.2 A DNS works with IP addresses.

(a) What is an *IP address*? (1)

(b) What is the purpose of a DNS? (1)

3.2.3 What is the function of a network interface card (NIC) in a network? (2)

3.2.4 Explain what an *intranet* is. (2)

3.3 Internet Protocol Television (IPTV) is used at the company depots to stream activities for security purposes.

3.3.1 What does *streaming* entail? (1)

3.3.2 How could the company prevent unauthorised users from viewing the content? (1)

3.4 The company's website uses secure socket layer (SSL) technology.

3.4.1 How can a URL be used to determine whether the site uses SSL technology or not? (1)

3.4.2 SSL technology includes encryption and the use of a certificate authority.

(a) Explain how the encryption process works. (2)

(b) What is the role of the certificate authority in the process of encryption with SSL technology? (1)

3.5 Routers and modems are key components that make an internet connection possible from a network.

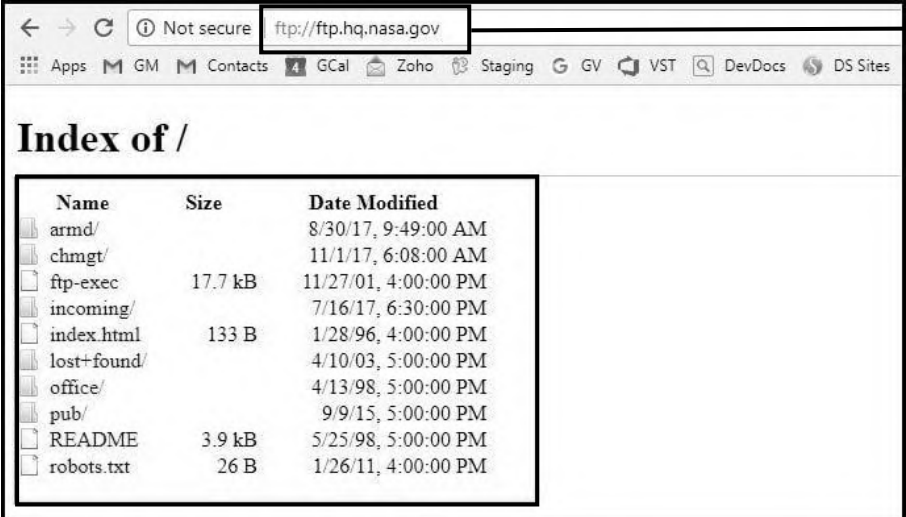
Explain the difference between the functions of a router and a modem. (3)

3.6 The developers of the company website have been debating on concepts related to online searching and about making the company website easily accessible to online users.

3.6.1 Name the type of search where the search is based on the meaning of the words, rather than using the words as keywords only. (1)

3.6.2 One of the developers suggested using search engine optimisation (SEO). Explain the purpose of using SEO by the company. (2)

3.7 The screenshot below shows a site that is used to make files available to users for downloading.



The screenshot shows a web browser window with the address bar displaying 'ftp://ftp.hq.nasa.gov'. The browser's address bar is highlighted with a box, and an arrow points from this box to the label '(3.7.1)'. The main content area of the browser shows an 'Index of /' page. Below the title, there is a table listing files and directories. The table has three columns: 'Name', 'Size', and 'Date Modified'. The files listed are: 'armd/' (8/30/17, 9:49:00 AM), 'chmgt/' (11/1/17, 6:08:00 AM), 'ftp-exec' (17.7 kB, 11/27/01, 4:00:00 PM), 'incoming/' (7/16/17, 6:30:00 PM), 'index.html' (133 B, 1/28/96, 4:00:00 PM), 'lost+found/' (4/10/03, 5:00:00 PM), 'office/' (4/13/98, 5:00:00 PM), 'pub/' (9/9/15, 5:00:00 PM), 'README' (3.9 kB, 5/25/98, 5:00:00 PM), and 'robots.txt' (26 B, 1/26/11, 4:00:00 PM).

3.7.1 Identify the protocol used by this site by studying the information provided in the address bar. (1)

3.7.2 What other popular type of file sharing services has largely replaced this type of site? (1)

3.7.3 Name ONE benefit of using file storage services that are available on the internet. (1)

TOTAL SECTION C: 25

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

The MMA (Motorist Monitoring Agency) keeps a database on all motorist information and their offences.

The following screenshots show the structure of two tables in the database:

tblMotorists

Field Name	Data Type	Description
 IDNumber	Short Text	Maximum 13 characters, ID number
NameAndSurname	Short Text	Maximum 50 characters, person name and surname
ContactNumber	Short Text	Maximum 10 characters, cell number
DateOfBirth	Date/Time	Date on which the motorist was born

tblOffences

Field Name	Data Type	Description
 OffenceNumber	AutoNumber	Unique number for each offence
OffenceDate	Date/Time	Date when offence took place
IDNumber	Short Text	ID number of the offender
VehicleRegNumber	Number	Example: YK4 JY0 EC
OffenceType	Short Text	Maximum 50 characters, description of type of offence

Study the layout of the database and answer the following questions:

- 4.1 What does the key symbol to the left of the **IDNumber** field indicate? (1)
- 4.2 State TWO distinct requirements of a field designated with the key symbol, as indicated in the example above. (2)
- 4.3 A database analyst advised that a relationship must be created between the tables **tblMotorist** and **tblOffences**.

Which field in the **tblOffences** table would be best suited to establish a one-to-many relationship between the two tables? (1)
- 4.4 Provide a more suitable data type for the **VehicleRegNumber** field AND motivate your answer. (2)
- 4.5 It has been suggested that the name and surname of a motorist (in the **tblMotorists** table) should be captured in two fields (**Name** and **Surname**), rather than in one field (**NameAndSurname**).

Provide a motivation to defend this suggestion. (1)

4.6 A poorly designed table structure may lead to data redundancy.

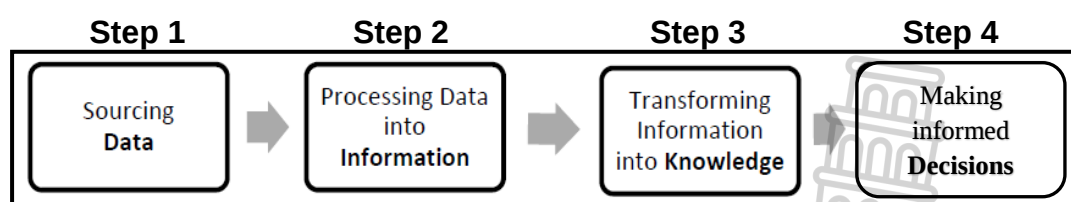
4.6.1 What is *data redundancy*? (1)

4.6.2 Name the process during which the design of a database is changed to prevent anomalies from occurring due to problems, like data redundancy. (1)

4.7 The following screenshot provides a display of offences during a certain time period:

OffenceDate	OffenceType
2019-05-25	Speeding
2019-05-25	Illegal parking
2019-05-25	Skipping stop
2019-05-26	Skipping stop
2019-05-26	Illegal parking
2019-05-26	Skipping stop
2019-05-26	Speeding
2019-05-26	Skipping stop
2019-05-27	Skipping stop
2019-05-28	Illegal parking
2019-05-27	Skipping stop
2019-05-28	Speeding
2019-05-27	Skipping stop
2019-05-28	Illegal parking

The following diagram shows the progression from data to informed decisions:



Use the data provided and diagram above to answer the following questions:

4.7.1 Give an example of useful information that can be extracted from the data provided. (1)

4.7.2 Explain how Step 3 and Step 4 in the data progression diagram may be applied in practice using the information that you identified in the answer to QUESTION 4.7.1. (2)

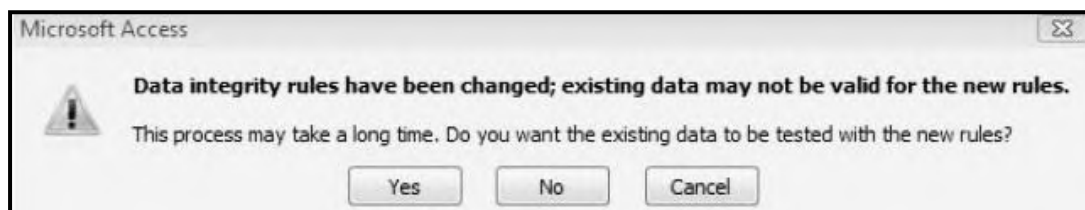
4.7.3 Explain what *fuzzy logic* is and give an example, applicable to this scenario, to explain your answer. (2)

4.8 A study of audit trails revealed that criminal elements have been using SQL injection to gain access to and change data in the database.

4.8.1 What is an *SQL injection*? (2)

4.8.2 What is an *audit trail*? (2)

4.9 The following message is displayed when trying to close a database:



4.9.1 (a) Identify the type of data integrity that is referred to in the diagram. (1)

(b) What does *physical integrity of data* entail? (1)

4.9.2 Data validation is one way of ensuring data integrity.

Name TWO different ways in which a programmer can ensure that the date of an offence is entered in the correct format. (2)

4.10 A power outage may occur when traffic offenders attempt to transfer money from their accounts to pay their fines.

Explain how transaction processing is used to maintain data integrity while transactions take place. (3)

TOTAL SECTION D: 25



SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

5.1 Binary and hexadecimal systems are two number systems used in computing.

5.1.1 What is the base number of the binary number system? (1)

5.1.2 Give ALL the digits/characters that the hexadecimal number system consists of. (2)

5.2 Arrays are frequently used to store data in a program.

5.2.1 When does it become necessary to use an array instead of a variable? (1)

5.2.2 The names and ages of learners must be stored in an array.

```
arrData : array [1..30] of Integer;
```

Motivate why the names and ages cannot be stored in the array provided. (1)

5.2.3 You have been provided with the following array, called **arrNum**:

Values:	46	82	23	54	12	36	41	7	3	
Index:	1	2	3	4	5	6	7	8	9	10

Write an algorithm using a loop to insert an additional value of 92 at index position 6 in the **arrNum** array.

The contents of the array after the algorithm has been executed should be as follows:

Values:	46	82	23	54	12	92	36	41	7	3
Index:	1	2	3	4	5	6	7	8	9	10

5.3 OOP is the abbreviation for object-oriented programming.



5.3.1 State whether the following statements are TRUE or FALSE:

- (a) A **toString** method is used to change the value of an attribute to a string for display purposes. (1)
- (b) It is possible to instantiate an object without writing/creating your own constructor method for the object class. (1)
- (c) The number of parameters received in a constructor must be equal to the number of attributes of the object class. (1)

5.3.2 Differentiate between an *accessor method* and a *mutator method*. (2)

5.4 Prime numbers are numbers with only two factors.

A factor is a number that divides into another number without a remainder.

The following pseudocode determines whether an input number is a prime number or not, and displays the outcome/result:

```

1  Input Number
2  Factor ← 0
3    for Loop ← 2 to Number
4      if Number mod Loop = 0
5        Factor ← Factor + 1
6  if Factor = 1
7    Output Number + ' is a prime number '
8  Else
9    Output Number + ' is NOT a prime number '
```

Redraw the trace table below in the ANSWER BOOK. Complete the trace table for the code provided above if the value of **4** is entered for Number.

Number	Factor	Loop	Number mod Loop = 0	Factor = 1	Output

(5)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

A large transport company wants to incorporate information communication technology in their many areas of business in light of the 4th industrial revolution.

6.1 The company wants to computerise the business.

6.1.1 Due to the large funds required up front, the company decides to utilise crowd funding.

Briefly explain what *crowd funding* is. (1)

6.1.2 The company also manufactures new vehicles and incorporates technology in this process to move towards automation.

(a) State TWO advantages of using technology to automate the assembly of new vehicles. (2)

(b) A learning algorithm could be used to improve the manufacturing and sales of new vehicles.

Explain how a learning algorithm would be used to achieve this goal. (3)

6.2 Employees travelling to work use RFID tags to pay the toll fees for the road they travel on.

6.2.1 Expand the acronym *RFID*. (1)

6.2.2 Explain how passive tags, that are used to pay toll fees, work. (2)

6.2.3 The company uses satellite tracking on their vehicles.

(a) Name the technology that is used to determine the location of a vehicle. (1)

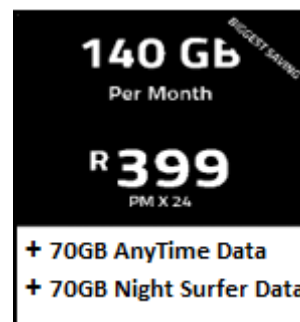
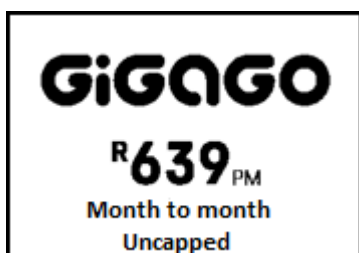
(b) Why will active tags be needed for satellite tracking? (1)

6.3 The company needs to renew their internet package.

Study the two advertisements of internet packages below and then answer the questions that follow.

Package A: FTTH internet

Package B: Mobile LTE internet



6.3.1 Package **A** is uncapped. What does this refer to? (1)

6.3.2 FTTH means 'fibre to the home'. Why would you install fibre rather than mobile LTE in a home? (1)

6.3.3 Which hardware device, besides cabling, would you need to connect to the internet using the FTTH service? (1)

6.3.4 Will the '70GB Night Surfer Data' from package **B** hold any benefit to the company?

Motivate your answer. (2)

6.4 A security consultant working at the company warns of security threats that employee computers will be exposed to, when connecting to the internet.

6.4.1 A rootkit was found on the server in the administration office.

(a) What is a *rootkit*? (1)

(b) Give ONE security implication of the rootkit that installed itself on the computer. (1)

6.4.2 Social engineering is also a big concern regarding the privacy of employee data.

Define what *social engineering* entails. (2)

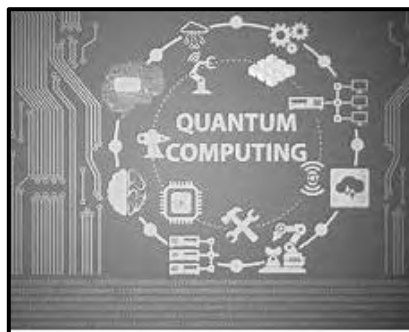
6.4.3 How does antivirus software identify malware? (1)

- 6.5 Big data regarding all the customers' information and transportation routes is stored by the company.
- 6.5.1 State TWO ways in which artificial intelligence can be used when working with big data. (2)
- 6.5.2 It has been suggested that a distributed database will be an ideal solution for the company which has many different branches all over the country.
- Differentiate between the *duplication model* and the *partitioning model* regarding the storage of data for each branch. (2)
- 6.5.3 Part of data maintenance in a database includes purging.
- (a) What does the process of purging data in a database involve? (1)
- (b) Why would records need to be purged? (1)
- 6.6 Virtualisation allows for more efficient utilisation of physical computer hardware.
- 6.6.1 Define the concept of *virtualisation*. (2)
- 6.6.2 Give ONE benefit for the user of virtualisation as used in this context. (1)
- 6.6.3 Is it compulsory for the company to pay for the additional proprietary operating system installed or can it be used for free?
- Justify your answer. (2)
- 6.6.4 The new generation of online services, with millions of users, also uses virtualisation in a different context to make their services scalable.
- Describe briefly the TWO ways in which virtualisation is applied here in order to make scalability of these services possible. (2)
- 6.7 The company forces all the employees with an e-mail account to change passwords every 60 days.
- 6.7.1 Why is it important to frequently change a password? (1)
- 6.7.2 One of the employees, Mfundu Mnumzana, uses the following password: **mfundi**.
- Give TWO reasons why this example is NOT a strong password. (2)



6.7.3

Quantum and Edge computing are two of the many technologies used to prevent the spread of viruses and to develop potential vaccines against viruses.



- (a) State how Quantum computing can be used in the statistical process of preventing the spread of a virus. (1)
- (b) State TWO problems of cloud computing which are solved by the use of Edge computing. (2)

TOTAL SECTION F: 40
GRAND TOTAL: 150





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INFORMATION TECHNOLOGY P2

2022

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 13 pages.



SECTION A: SHORT QUESTIONS

QUESTION 1

- 1.1 1.1.1 B - Bluetooth ✓ (1)
- 1.1.2 D - cookie ✓ (1)
- 1.1.3 A - Expert system ✓ (1)
- 1.1.4 C - extremely high volumes of traffic that request data from the website. ✓ (1)
- 1.1.5 D - ytoje ✓✓ (2)
-
- 1.2 1.2.1 K ✓ Cyberbullying (1)
- 1.2.2 F ✓ iOS (1)
- 1.2.3 E ✓ RSI (1)
- 1.2.4 A ✓ Algorithm (1)
- 1.2.5 H ✓ Spam (1)
- 1.2.6 D ✓ Hyperlink (1)
- 1.2.7 R ✓ Machine Cycle (1)
- 1.2.8 C ✓ Machine code (1)
- 1.2.9 L ✓ GIGO (1)

TOTAL SECTION A: 15

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

2.1.1 a) DIMM slot ✓ (1)

b) Any TWO functions of a motherboard: ✓✓

- Houses components (also accept specific components)
 - Connects components / communication
 - Provides power/distributes power to components
- (2)

c) Increased use of virtual memory will result in data being accessed at a slower/lower rate ✓
Instructions and data are fetched at a slower rate from storage than from RAM ✓

OR

Decreased use of virtual memory/more instructions and data can be stored in RAM
Instructions and data are fetched faster from RAM than from storage (2)

2.1.2 A core is a single/separate processor on a CPU chip ✓ (1)

2.1.3 Any ONE type of storage device used to increase storage space: ✓
• SD card / memory card (1)

2.1.4 Why would device C would be the most suitable device to scan QR codes:
Mobility/portability ✓
Access to camera/ front and rear facing camera/built in camera ✓ (2)

2.1.5 Central Processing Unit (CPU) ✓ (1)

2.1.6 Any ONE motivation for having a dedicated graphics card: ✓
• Needed for graphics intensive applications (Video editing / CAD)
• Improve overall performance
• Reduce the processing load on the CPU
• Crypto mining (1)

2.2.1 Any ONE for what is modular design: ✓
• Computer is built up from separate modules/ parts
• An indication that the computer consists of individual components (1)

2.2.2 Any ONE reason for using modular design: ✓
• Components can be combined according to your needs
• Easy to upgrade/replace
• Easy to repair (1)

- 2.3.1 Any *TWO* properties of CPU cache memory: ✓✓
• High speed memory/static memory
• Memory on the CPU
• Stores frequently used instructions/stores instructions likely to be used next (2)
- 2.3.2 Any *TWO* other types of caching that is used on a computer system:
Web caching ✓
Disk caching ✓ (2)
- 2.4.1 A Trojan is malware disguised as useful software ✓
A user is tricked into installing ✓ the Trojan with the assumption that they are installing useful/legitimate software
- CONCEPTS:
• Malware disguised as useful/legitimate software
• Activated by action from the user (installing/downloading) (2)
- 2.4.2 A firewall monitors/controls/filters traffic ✓ (incoming & outgoing) on a network/internet and prevents unauthorised communication/access ✓ (2)
- 2.5 *Difference between software update and patch:*

An update fixes code/adds new features/enhances security to software ✓
A patch removes software bugs/replacing incorrect code/removes vulnerabilities in code ✓ (2)
- 2.6 Any *TWO* ways to free up storage space: ✓✓
• Use a disk clean-up tool/example of disk clean-up
• Remove duplicate files
• Uninstall/remove unused software/applications
• Empty the recycle bin
• Compress data not frequently used
• Archive files/data
• Move data/files to cloud storage/external device (2)

TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

- 3.1 3.1.1 Any ONE type of cable used in wired LAN: ✓
• UTP/Ethernet cable (CAT 5/6/7)
• Fibre (1)
- 3.1.2 Any ONE type of media used to transmit in WiMAX: ✓
• Radio waves
• Electromagnetic waves (1)
- 3.1.3 Wi-Fi ✓ (1)
- 3.2 3.2.1 VPN (Virtual Private Network) ✓ (1)
- 3.2.2(a) IP address:
A unique address/code that identifies a device ✓ on a network. (1)
- 3.2.2(b) Purpose of a DNS:
To obtain the correct IP-address for a specific URL/linking URL's to IP-addresses ✓ (1)
- 3.2.3 The NIC encodes/decodes data ✓ that is transmitted across a network ✓
- OR
- Provides a network hardware port for the computer to allow for data transmission over a network (2)
- 3.2.4 Intranet is a network similar to the Internet/browser based network ✓ of which the access is limited to a specific organisation ✓ (2)
- 3.3 3.3.1 Any ONE characteristic of streaming: ✓
• The immediate and real-time delivery of media content to a receiving device
• The file is not saved to the storage devices media, but only played on the device
• Live viewing/ Video on demand (1)
- 3.3.2 Any ONE way to prevent unauthorised viewing: ✓
• Use on a closed channel/do not connect to a larger network
• Use a login/password to control access the content (1)

- 3.4 3.4.1 You will find “HTTPS” in the URL ✓ (1)
- 3.4.2 (a) Changing the format of data ✓ using a mathematical formula/key to prevent unauthorised access ✓
- OR
- Any TWO properties of encryption (SSL):*
- The public key is used to encrypt the data.
 - The data can only be decrypted using the specific private key.
 - The private and public unique matching keys are provided by complex mathematical algorithms.
 - The private key never travels on network and therefore cannot be intercepted. (2)
- 3.4.2 (b) The CA verifies that the business or organisation is valid. ✓ (1)
- 3.5 *Difference between functions of a router and modem:*
- A modem converts the format of a signal for a specific communication medium. ✓
- A router determines the best/correct route ✓ for the transmission of a message/communication between two points on a network. ✓ (3)
- 3.6 3.6.1 Semantic Search ✓ (1)
- 3.6.2 *Purpose of using SEO:*
- To ensure that a search engine ✓ will place the company’s site higher up in the order of search results. ✓ (2)
- 3.7 3.7.1 FTP (File Transfer Protocol) ✓ (1)
- 3.7.2 *Any ONE type of file sharing service: ✓*
- Cloud storage
 - BitTorrent
 - Git/Git hub
- Also accept examples of Cloud Storage like Google Drive, One Drive etc. (1)
- 3.7.3 *Any ONE benefit of using online file storage services: ✓*
- accessible from many devices/places
 - collaboration/sharing
 - Saving on local storage space
 - Servers take responsibility for creating a backup of the files (1)

TOTAL SECTION C: 25

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

- 4.1 It is the primary key. ✓ (1)
- 4.2 *Primary key:*
Must be unique ✓
Cannot be empty/have a null value/required field ✓ (2)
- 4.3 IDNumber ✓ (1)
- 4.4 *Suitable data type for the VehicleRegNumber and motivation:*
Short Text (any text data type) ✓
A vehicle registration number contains numbers and letters ✓ (2)
- 4.5 *Why should name and surname be split into two fields:*
There is more than one piece of information in the field ✓
OR
Any indication that it might be necessary to separately work with the name and surname values (1)
- 4.6 4.6.1 Data redundancy refers to the unnecessary repetition of data ✓ (1)
- 4.6.2 Normalisation ✓ (1)
- 4.7 4.7.1 *Example of useful information extracted from the data:*

Establishing the frequency of offences/most common offence/least common offence ✓

Accept any relevant or correct answer of information gained from the table (1)
- 4.7.2 *How can step 3 & 4 in the data progression diagram be applied:*

A logical solution ✓ linked to the information obtained ✓
Example - Increase policing at stop signs

Also accept other correct examples based on the information from QUESTION 4.7.1 (2)
- 4.7.3 Fuzzy logic deals with reasoning that works with probabilities. ✓

Drivers not stopping at stops are reckless drivers/there are many reckless drivers in the community ✓

Also accept any other correct example (2)

- 4.8 4.8.1 *SQL injection:*
A hacking technique where SQL statements are entered ✓ into data input fields ✓ instead of data. (2)
- 4.8.2 *Audit trail:*
A record or 'trail' that is made to keep track of who ✓ made changes to a database and when ✓ those changes were made. (2)
- 4.9 4.9.1 (a) Logical integrity ✓ (1)
- 4.9.1 (b) Physical integrity - ensuring that data is protected against damage from power surges, natural disasters, theft, etc. ✓ (1)
- 4.9.2 *Any TWO ways to ensure the date is entered in the correct format: ✓✓*
- Provide a list/component to select from/date picker/calendar
 - Specify format in input component/ghost text
 - Format/Data type check/applying a validation rule
 - Input mask
- (2)
- 4.10 *How is transaction processing used to maintain data integrity:*
- In transaction processing, transactions that are dependent on one another to work are grouped together. ✓
 - The transaction will only be completed if all the individual transactions are successful. ✓
 - If any one of the parts/instructions are unsuccessful, everything will be rolled back. ✓
- (3)

TOTAL SECTION D: 25



SECTION E: SOLUTION DEVELOPMENT

5.1 5.1.1 2 ✓ (1)

5.1.2 0-9 ✓ A-F ✓ (2)

5.2 5.2.1 Any ONE reason for using an array vs variable: ✓
 • When working with a large number of values/variables
 • An array can store multiple values
 • A variable can store only one value (1)

5.2.2 Any ONE reason why names and ages cannot be stored in array provided: ✓
 • An array can only store values of one specific data type
 • Names and ages are represented by two different data types
 • The provided array can only store integer values (1)

5.2.3 Loop k index 10 ✓ down to 7 ✓
 arrNum[k] ✓ ← arrNum[k-1] ✓ OR Loop k index 9 down to 6
 arrNum[6] ← 92 ✓ arrNum[k+1] ← arrNum[k]
 arrNum[6] ← 92 (5)

5.3 5.3.1 (a) FALSE ✓ (1)

(b) TRUE ✓ (1)

(c) FALSE ✓ (1)

5.3.2 An accessor returns the value of an attribute ✓ of an object and a mutator changes the value of an attribute ✓ of an object. (2)

5.4

Number	Factor	Loop	Number mod Loop = 0	Factor = 1	Output
4					
	0				
		2			
			True/Yes		
	1				
		3			
			False/No		
		4			
			True/Yes		
	2				
				False/No	
					4 is NOT a prime number
	✓	✓	✓	✓	✓

Notes:

- Values may be placed in the same line as long as progression of algorithm is clear.
- Mark with fault by penalising for the faulty value in that column only. (5)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

6.1 6.1.1 *Crowd funding:*
The practice of funding a project or venture by raising money from a large number of people ✓ who each contribute a small amount, typically via the internet/social networks. (1)

- 6.1.2 (a) *Any TWO reasons of using technology to automate the assembly of new vehicles: ✓✓*
- Safer work environment
 - Fewer people employed/cost saving
 - Greater precision/consistency of repetitive tasks
 - Greater efficiency
 - Improved productivity

Also ACCEPT other valid answers. (2)

- (b) *How could a learning algorithm be used to improve the manufacturing and sale of new vehicles:*

A learning algorithm observes the current processes/trends that are followed ✓, for example, colour preference of vehicles, also extras that are popular, creates a set of rules based on the observation ✓ and creates an optimal process that can be implemented. ✓

CONCEPTS:

- Studying/observing current processes/trends
- Creating a set of rules
- Creating an optimal process (3)

6.2 6.2.1 Radio Frequency Identification ✓ (1)

- 6.2.2 *Any TWO ways how passive tags work: ✓✓*
- Energy from reader's radio signal at tollgate powers the tag
 - Tag sends a signal that the reader uses to identify the specific tag
 - Amount is automatically deducted from tag holder's account (2)

6.2.3 (a) GPS ✓ (1)

- (b) *Any ONE reason why active tags will be needed for satellite tracking: ✓*
- The signal needs to be transmitted over longer distances
 - Stronger signal needed to communicate with satellite
 - Signal needs to be transmitted continuously (1)

- 6.3 6.3.1 *Uncapped:*
Unlimited amount of data that can be used in a month ✓
OR
No limit on amount of data used. (1)
- 6.3.2 *Any ONE reason for installing fibre rather than mobile LTE: ✓*
 - Fixed location internet has a lower cost per GB than mobile LTE
 - Fibre might have faster connection speeds depending on the speed of the package
 - Using a lot of data
Also ACCEPT other valid answers. (1)
- 6.3.3 Router/ONT ✓ (1)
- 6.3.4 *Will the 70GB Night Surfer Data hold a benefit for the company:*
Yes, backup/update procedures can be done overnight ✓✓
OR any other applicable motivation

OR

No. Outside office hours
OR any other applicable motivation (2)
- 6.4 6.4.1 (a) *Rootkit:*
Software designed to obtain administrator rights to a computer for unauthorised access. ✓ (1)
- (b) *Any ONE risk to data due to rootkit: ✓*
 - Opens the computer for hacking/illegally accessing data files
 - Creating backdoors for other malware
 - Used as a bot for launching attacks on other computers and networks.
Also ACCEPT other valid answers. (1)
- 6.4.2 *Social engineering:*
An attempt to manipulate or con someone ✓ into installing malware or giving out sensitive personal information. ✓ (2)
- 6.4.3 *Any ONE way that anti-virus software identifies malware: ✓*
 - The anti-virus software scans the files to identify known threats using virus signatures/definitions
 - Looks for pieces of code that is unique to specific viruses. (1)

- 6.5 6.5.1 Any *TWO* ways that AI can be used when working with big data: ✓✓
- Find possible connections among datasets
 - Recognize knowledge using natural language processing
 - Can be used to automate and accelerate data preparation tasks
 - Can learn common human error patterns
 - Detect and resolve potential flaws in information
 - Can learn by watching how the user interacts with an analytics program
 - Can identify data types
 - It can alert users to anomalies or unexpected patterns in data
 - Identify potential threats from system logs or social networking data

Also ACCEPT other valid answers. (2)

- 6.5.2 With the duplication model, each separate site has a complete copy of the entire database stored. ✓
With the partitioning model, each site stores and manages only the part of the database it works with. ✓ (2)

- 6.5.3 (a) *Purging*:
Deleting/removing records ✓ permanently from a database. (1)
- (b) Any *ONE* reason why records will need to be purged: ✓
- To limit the size of the database file.
 - Remove obsolete/redundant/outdated records
 - Improve the performance of the database (1)

- 6.6 6.6.1 Virtualisation is the use of software ✓ to create an entity that only exist for as long as the software is being run. ✓ (2)

- 6.6.2 Any *ONE* benefit of virtualisation: ✓
- Saving on hardware
 - Can run software written for other platforms
 - Convenience of not having to keep multiple devices (1)

- 6.6.3 Is it compulsory for the company to pay for the additional proprietary operating system:
- Yes, ✓ the user must pay for the operating system to avoid committing piracy ✓ (2)

- 6.6.4 *TWO* ways in which virtualisation is applied to make scalability of services possible:
- Combining the resources of many machines into one powerful service ✓
Sharing the resources of one powerful machine between many users ✓ (2)

6.7.1 Any ONE reason to frequently change a password: ✓

- For security reasons
- Prevent access to your account due to password leaks

Also ACCEPT other valid reasons.

(1)

6.7.2 Any TWO reasons why *mfundi* is not a strong password: ✓✓

- Password too short/must be more than 8 digits
- Only lowercase characters/must contain an uppercase and lowercase letter, number and special character
- Can easily be guessed/do not use personal information

(2)

6.7.3 (a) How can Quantum computing can be used in the statistical process of preventing the spread of a virus:

It is used to easily query, monitor, analyse and act on data ✓, regardless of the source.

(1)

(b) Any TWO problems of cloud computing which are solved using Edge computing: ✓✓

- Bypasses the latency caused by cloud computing.
- Acts as mini data centres which cloud computing lacks.
- Used to process time-sensitive data in remote locations with limited or no connectivity to a centralised location.

(2)

TOTAL SECTION F: 40
GRAND TOTAL: 150

