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 := 'abcdefghijklmnopqrstuvwxyz';
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
1.2.3	An injury often sustained by computer users due to frequent repetitive actions	E	RSI
		F	iOS
1.2.4	Step-by-step approach followed to solve a problem	G	adware
		H	spam
1.2.5	Unsolicited e-mail, usually in the form of advertisements	I	UTF-255
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	J	spoofing
		K	cyber bullying
		L	GIGO
1.2.7	A specific sequence of steps followed by the CPU when carrying out instructions	M	ASCII
		N	source code
1.2.8	Instructions in binary format that the CPU can execute directly	O	green computing
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	P	Android
		Q	social implications
		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.

    (a) Name the slot used to connect RAM to the motherboard of a computer. (1)

    (b) Apart from housing RAM, state TWO other functions of a motherboard. (2)

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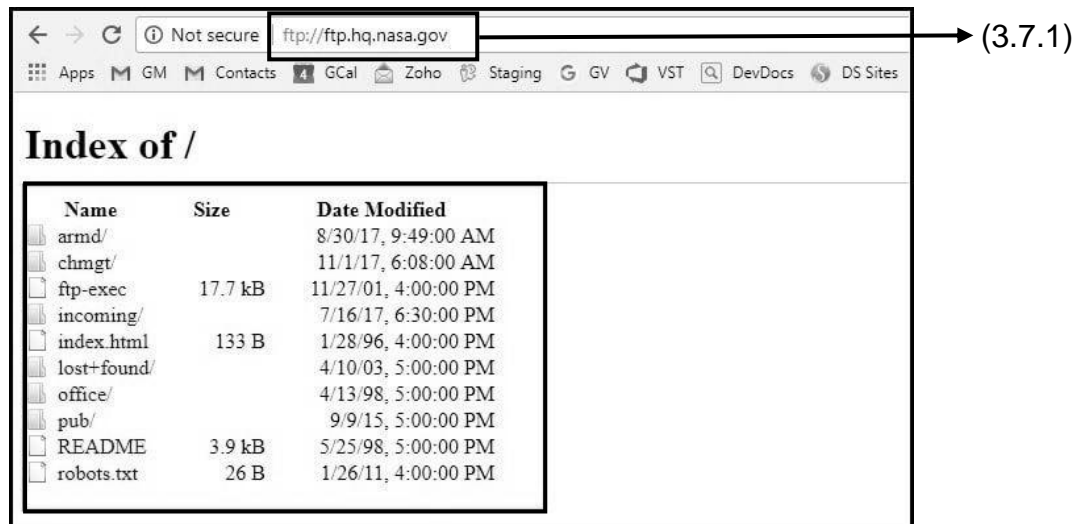
        3.7.1   Identify the protocol used by this site by studying the information provided in the address bar. (1)

        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.

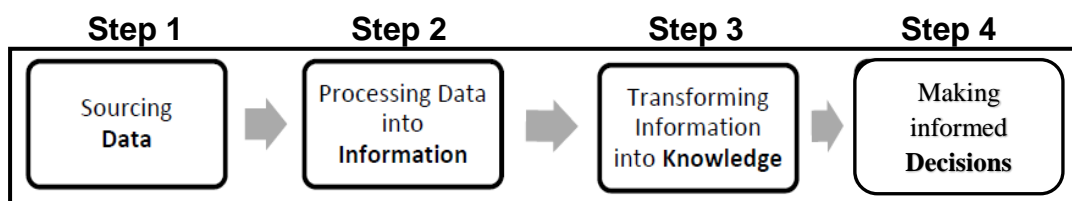   4.6.1   What is *data redundancy*?   (1)

    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:

Step 1	Step 2	Step 3	Step 4
Sourcing **Data**	Processing Data into **Information**	Transforming Information into **Knowledge**	Making 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)

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.
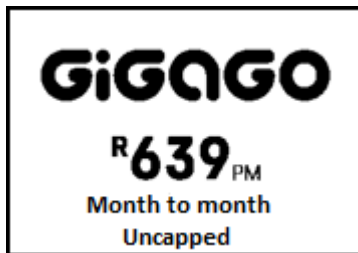
6.1   The company wants to computerise the business.

      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)
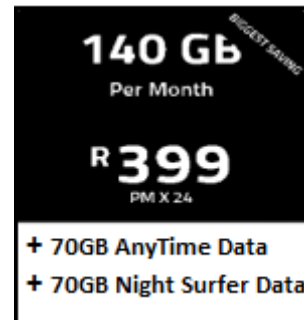
6.3   The company needs to renew their internet package.

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, Mfundi 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.
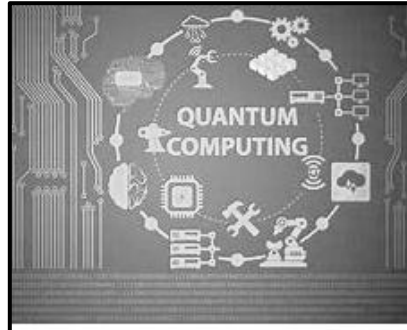
(a)   State how Quantum computing can be used in the statistical process of preventing the spread of a virus.   (1)

(b)   State TWO problems of cloud computing which are solved by the use of Edge computing.   (2)

TOTAL SECTION F: 40
GRAND TOTAL: 150