basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

INFORMATION TECHNOLOGY P2

NOVEMBER 2022

MARKS: 150

TIME: 3 hours

This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

1.   This question paper consists of SIX sections:

SECTION A: Short Questions   (15)
SECTION B: Systems Technologies   (25)
SECTION C: Communication 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   A process where a single program is broken up into multiple parts that can be processed simultaneously and independently:

A   Multitasking
B   Multiprocessing
C   Multithreading
D   Multiflow   (1)

1.1.2   The following is a type of volatile memory:

A   Solid-state disk
B   Disk cache
C   Flash disk
D   Blue-ray disk   (1)

1.1.3   A … is a file which includes visual media and is made available for download.

A   Media repository
B   RSS feed
C   Vodcast
D   Broadcast   (1)

1.1.4   A programming language used exclusively for manipulating data in a database:

A   SQL
B   AJAX
C   DELPHI
D   PHP   (1)

1.1.5   Given the following statement:

```
iAnswer := 12 + 4/2 * 2/(9 MOD 2);
```

The value of `iAnswer` will be …

A   12
B   13
C   Error
D   16   (1)

1.2 Choose a term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–R) next to the question numbers (1.2.1 to 1.2.10) in the ANSWER BOOK, e.g. 1.2.11 S.

COLUMN A		COLUMN B	
1.2.1	Any activity regarding creating, editing or deleting of data managed by a database management system (DBMS)	A	copyright
		B	user rights
1.2.2	A data structure that stores a set of values of the same data type	C	scalability
		D	artificial intelligence
1.2.3	A method used to bypass the normal authentication procedure on a network in order to obtain unauthorised access	E	driver
		F	AUP
1.2.4	A programming language that can be used to add interactivity to a website	G	phishing
		H	transaction
1.2.5	Protection for any published work that helps to prevent that work from being used without permission from the author	I	JavaScript
		J	backdoor
1.2.6	The process of having sets of the same data file on separate devices automatically being updated to the latest copy	K	array
		L	modulator
		M	string
1.2.7	A program that enables the operating system to control a device	N	convergence
1.2.8	Advanced settings for shared files, used by the server administrator to manage the type of access to the files	O	synchronisation
		P	C++
1.2.9	A field of computer science that usually involves data analytics, machine learning and rule-based decision-making to create the ability of automated decision-making	Q	class
		R	Python
1.2.10	The ability of a system to increase or decrease its resources depending on the number of users		

(10 x 1) (10)

TOTAL SECTION A: **15**

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

2.1   The local recycling club runs a gaming centre to raise funds. You have been tasked with the buying of computers for online gaming purposes.

      2.1.1   Computers are built with slots that hold the RAM.

            (a)   Give the acronym for the slots that hold the RAM.   (1)

            (b)   What is the base unit of measurement used to measure the size of the RAM?   (1)

      2.1.2   Give TWO hardware specifications that should be considered when choosing a GPU.   (2)

      2.1.3   A motherboard houses and connects the components of a computer.

            (a)   What is the component on the motherboard called that houses the CPU?   (1)

            (b)   Explain why a point-to-point connection is used to connect the CPU to the RAM, rather than a bus as used for other components.   (2)

2.2   A specific operating system has been recommended for use at the centre.

      2.2.1   Define the term *operating system*.   (1)

      2.2.2   State any TWO functions of an operating system.   (2)

2.3   The CPU is dependent on the RAM to process applications.

      2.3.1   What is the memory called that is created when the operating system reserves a portion of the storage to be used as memory (RAM)?   (1)

      2.3.2   Explain how the process of artificially increasing the RAM is used to ensure the smooth functioning of the computer system.   (2)

2.4   A software bug was found while testing software.

      2.4.1   What is a *software bug*?   (1)

      2.4.2   Give a practical example of how the software bug could be revealed to the user when running the software.   (1)

2.5   The club management noticed an increase in unauthorised access to their computers and programs. What can be done to prevent unauthorised access to software at the centre?   (1)

2.6   Mobile technologies have revolutionised the computing world. Some of the software used at the centre has been designed for use on mobile devices.

        2.6.1   Give TWO limitations related to the use of mobile devices when compared to devices such as PCs and laptops.   (2)

        2.6.2   Smartphones have the functions and abilities of many different devices built into a single device. What is the term used for this design approach?   (1)

2.7   The programmers at the club need to develop a system to manage the recycling centre. They have decided to use a programming language which uses an interpreter instead of a compiler.

        2.7.1   What is the common goal of a compiler and an interpreter?   (1)

        2.7.2   Motivate why a compiler would be a better choice than an interpreter for programming in general.   (2)

2.8   The implementation of good computer management techniques is essential for the maintenance of a computer.

        2.8.1   Why is it necessary to clean up and arrange the items on a desktop computer?   (1)

        2.8.2   Explain why an operating system requires a file extension.   (2)

                                                              TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

The Smart Energy Company uses network consultants to advise them regarding their network.

3.1   The network of the company needs to be upgraded.

       3.1.1   Name the most suitable medium with which to connect the following:

            (a)   Thirty computers at the company's computer centre to form a local area network   (1)

   (b)   Mobile devices to the company's network   (1)

       3.1.2   State TWO advantages of installing a wireless network.   (2)

       3.1.3   State a function that a local network can still perform even when there is a faulty connection between the internet and the network.   (1)

3.2   A consultant suggested that a peer-to-peer network will work better than a client-server network.

       Consider the following diagram:

CLIENT-SERVER   **PEER-TO-PEER**
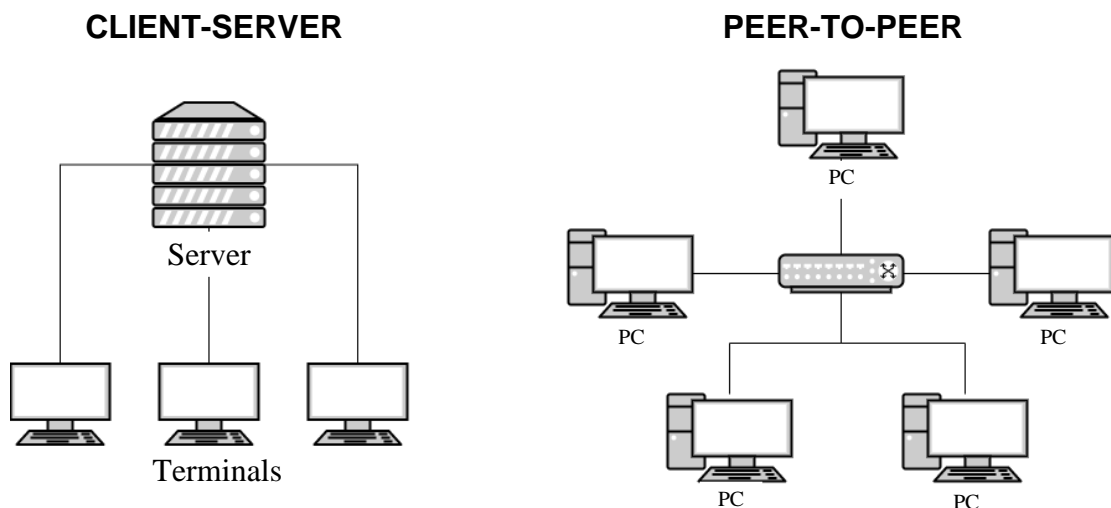
       3.2.1   Give TWO reasons why a peer-to-peer network is less suitable for a company with many users.   (2)

       3.2.2   Name a peer-to-peer file transfer protocol used for sharing large files over the internet   (1)

       3.2.3   State ONE possible role of a server in a server-based network.   (1)

       3.2.4   The peer-to-peer network uses a switch (marked X). State ONE disadvantage when using a switch in a network.   (1)

3.3   According to the consultant, a protocol is a set of rules for encoding and decoding data for transmission across a network.

     3.3.1   (a)   State the purpose of the hypertext transfer protocol.   (1)

                (b)   Why has HTTP been extended to the HTTPS protocol?   (1)

     3.3.2   Explain why data needs to be encoded before being transmitted over the internet.   (2)

3.4   The company requires assistance to market themselves on the internet.

     3.4.1   Explain the difference between a *website* and a *web page.*   (1)

     3.4.2   The company decided to use search engine optimisation (SEO) to promote their website.

                (a)   What is the purpose of SEO?   (1)

                (b)   State ONE way in which SEO can be applied in the design of their webpages.   (1)

3.5   The consultant advised that a good way to save time when designing and updating the website is to use CSS language.

     Explain how CSS works.   (2)

3.6   A person can gain access to the network at his/her workplace using a VPN service while connecting from a public hotspot.

     3.6.1   State TWO security risks that may be encountered when using a public hotspot.   (2)

     3.6.2   Explain the process a VPN service follows to give access to a workplace network.   (3)

3.7   The internet has evolved to where Web 3.0 (semantic web) is used increasingly.

     3.7.1   Explain why companies have not abandoned static web pages completely for their websites.   (1)

     3.7.2   Dynamic web pages are created by software running on a web server each time the page is accessed.

               State TWO advantages for the users of dynamic web pages when compared to static web pages.   (2)

     3.7.3   The semantic web uses metadata to conduct searches.

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

                (b)   Explain how a semantic search would take place.   (2)

TOTAL SECTION C: **30**

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

The company named Reduce e-waste collects data from users to make informed business decisions.

4.1 A loyalty program at stores is a way in which invisible data capturing can take place.

4.1.1 Give another example of invisible data captured about a customer during purchases, other than their personal details such as name, surname and address. (1)

4.1.2 Give ONE reason why a company would want to capture invisible data on the purchases made by cardholders. (1)

4.1.3 Except for card readers and credit cards, name TWO other mechanisms of invisible data capturing. (2)

4.2 The company uses a database to store details of their customers.

4.2.1 State TWO ways of ensuring the validity of captured data. (2)

4.2.2 How can two customers with the same name and surname be distinguished in the database? (1)

4.3 The company attempted to improve the design of their database.

4.3.1 It was found that some of the data was repeated in the database.

(a) What is the term given to the unnecessary repetition of data across multiple records? (1)

(b) An update anomaly can occur when data is repeated unnecessarily. Explain how an update anomaly takes place. (2)

4.3.2 A relationship between tables can be created rather than repeating data in different tables. Identify the type of relationship presented in EACH of the following diagrams:

(a)

(1)

(b)

(1)
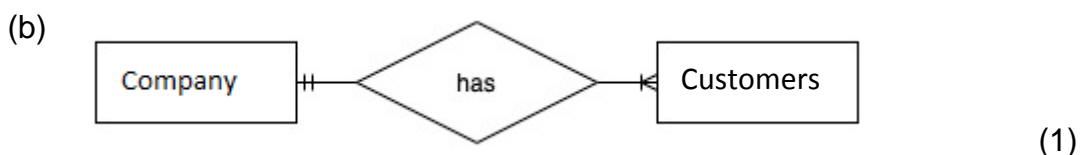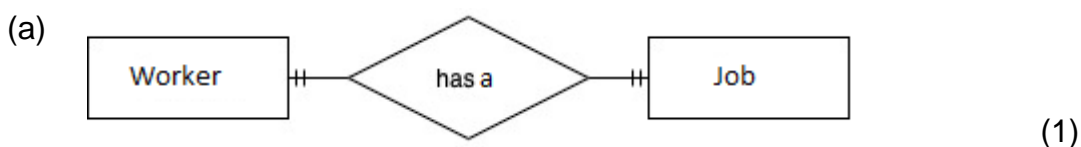
4.4   The database **CollectionDB** used by the recycling company consists of two related tables, **tblClients** and **tblCollections**. The details of collections for recycling are saved in table **tblCollections**.

tblCollections		
Field Name	Data Type	Description (Optional)
ClientID	Short Text	The ID of the client dropping off items for recycling
CollectionDate	Date/Time	The date of the collection
CollectionTime	Date/Time	The time of the collection
CollectionWeight	Number	The weight of the collection

4.4.1   Name the type of key formed when multiple fields are used together as the primary key.   (1)

4.4.2   Suggest another key field that can be created in **tblCollections** instead of using the three fields as the primary key.   (1)

4.4.3   The field **ClientID** also serves as the foreign key in table **tblCollections**.

What will the data type of the primary key field in table **tblClients** be?   (1)

4.4.4   Referential integrity is enforced between the two tables **tblCollections** and **tblClients**. Explain the term *referential integrity*.   (1)

4.4.5   The accounts department uses parallel data sets to store the data they work with.

Indicate whether the following statements related to parallel data sets are TRUE or FALSE. Write only 'true' or 'false' next to the question numbers (4.4.5(a) to 4.4.5(d)) in the ANSWER BOOK.

(a)   Multiple copies of the data are kept.   (1)

(b)   Downtime is expected when a data set gets damaged.   (1)

(c)   Parallel data sets use less storage than distributed databases.   (1)

(d)   Parallel data sets are used when mining data.   (1)

TOTAL SECTION D: 20

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

5.1   Procedures and functions are coding constructs often used as part of modular programming.

   5.1.1   Give a reason for the use of modular programming.   (1)

   5.1.2   State ONE difference between a *procedure* and a *function*.   (1)

5.2   State whether each of the following statements are valid or invalid:

   5.2.1   `X := Y = 2;`

   where the data type of **X** is Boolean and **Y** is integer   (1)

   5.2.2   `If Name1 > Name2 then`
             `.....`

   where **Name1** and **Name2** are declared as string type variables.   (1)

5.3   Many programmers use defensive programming techniques in their code.

   5.3.1   Explain what *defensive programming* is.   (2)

   5.3.2   While the program was running, an error caused the program to stop executing. The following error message was displayed:

   `'Execution halted – an overflow error occurred'`

   (a)   Give a possible reason for an overflow error.   (1)

   (b)   State a way in which programming code can be used to prevent a runtime error.   (1)

5.4   The following class was designed using object-oriented programming (OOP) principles. Study the class diagram below and answer the questions that follow.

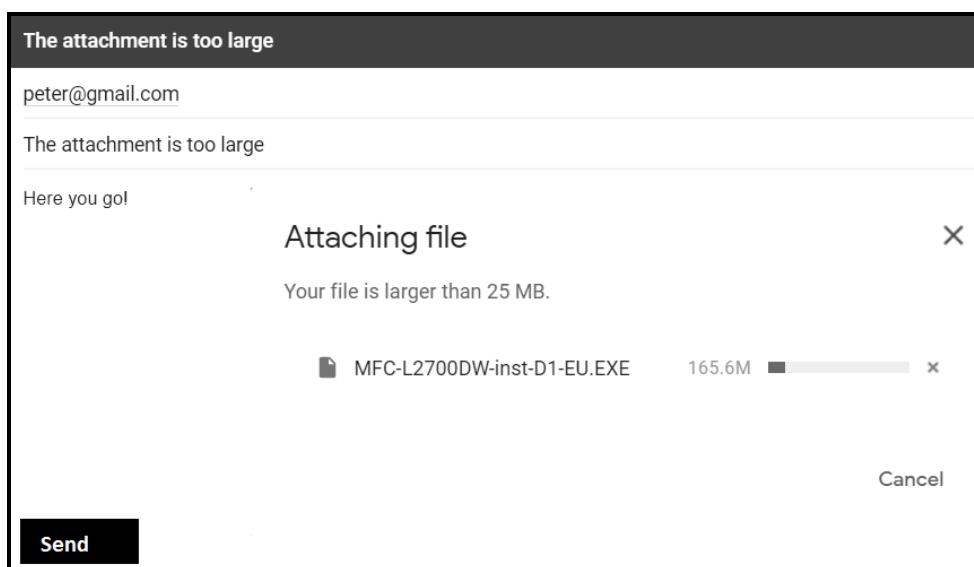| RecycleCompany	
Attributes	- CompanyNum - CompanyName - Address + ContactNumber + NumberOfEmployees
Methods	+ Constructor(CompanyNum, CompanyName, Address, ContactNumber) + getCompanyName():String + isValidContactNumber():Boolean + toString():String

        5.4.1   State the purpose of a constructor method.   (1)

        5.4.2   Identify an accessor method from the class diagram.   (1)

        5.4.3   Mutator methods will be required for the object.

                    (a)   For which attribute will the use of a mutator method be the LEAST applicable?   (1)

                    (b)   Motivate your answer to QUESTION 5.4.3(a).   (1)

        5.4.4   OOP classes use both private and public access specifiers.

                    (a)   State where in the class diagram access specified to methods/attributes violates the recommended/allowed access to methods/attributes.   (1)

                    (b)   Explain why the incorrect access to methods/attributes identified in QUESTION 5.4.4(a) might cause a problem when working with an object of this class.   (2)

5.5   A company randomly selects one of 10 bins for paper recycling, excluding bins that are already full. Presently bins 5 and 8 are already full.

            A random number must be generated repeatedly until a bin number other than 5 or 8 is identified to be used for the next load of recycling paper.

        5.5.1   When would a sentinel controlled/conditional loop be preferred to other loops?   (1)

        5.5.2   The following code was used to generate a random number in the range 1 to 10, excluding numbers 5 and 8.

```
Repeat
    iNumber := RandomRange(1,11);
Until (iNumber <> 5) AND (iNumber <> 8);
```

               Rewrite the code using a WHILE loop.   (4)

                                                  TOTAL SECTION E: **20**

SECTION F: INTEGRATED SCENARIO

QUESTION 6

A company named e-Waste Technologies Africa specialises in the recycling of electronic waste.

6.1 Recycling in the 21st century plays a critical role to save our planet. Many companies and households need to manage their electronic waste.

6.1.1 Define the term *electronic waste*. (1)

6.1.2 Give ONE reason why electronic waste is often hazardous to the environment. (1)

6.1.3 State TWO ways to reduce electronic waste. (2)

6.1.4 Explain what should be done with regard to a user's privacy with any electronic storage device before it is recycled/discarded. (1)

6.2 Large recycling companies require internet connection for all the staff working at the different branches and depots.

6.2.1 The employees at a branch must be able to communicate effectively with employees at other branches.

(a) The employees use e-mail for daily communication.

Differentiate between the *POP protocol* and the *IMAP protocol* used for e-mail. (2)

(b) Spam is a problem for the employees at the company.

State ONE way in which spam affects the company negatively. (1)

(c) Fake news usually spreads rapidly over the internet and has the potential to cause chaos.

Suggest TWO possible ways how to identify fake news. (2)

6.2.2   An employee attempted to send an e-mail with an attachment, but the following error message appeared:

The attachment is too large
peter@gmail.com
The attachment is too large
Here you go!
Attaching file ✕
Your file is larger than 25 MB.
📄 MFC-L2700DW-inst-D1-EU.EXE   165.6M ▪ ✕
Cancel
Send

(a)   State another way in which to send the attachment successfully over the internet.   (1)

(b)   State ONE risk of sending the attachment when using your suggested method in QUESTION 6.2.2(a).   (1)

(c)   Explain what a *media repository* is.   (1)

(d)   Define the term *ubiquity* in terms of the way in which we work with files on the internet.   (1)

6.3   It is important for staff working in the finance department to remain up to date with current threats and scams.

6.3.1   A RAT (remote access Trojan) was detected on one of the computers connected to the company's network.

(a)   Briefly explain what a *RAT* is.   (1)

(b)   State TWO ways in which a user's computer could be infected with Trojan malware.   (2)

6.3.2   Give TWO reasons why websites are often hacked.   (2)

6.4 The company uses a distributed database as their clients are spread over a large geographical area.

6.4.1 Explain what a *distributed database* is. (2)

6.4.2 What is the main difference between the *Duplication model* and *Partitioning model* in terms of the data that they store? (2)

6.4.3 Discuss why there is a need for regular data synchronisation when a distributed database model is used. (2)

6.5 The recycling company is also actively involved in finding solutions to the challenges posed by pollution.

6.5.1 The company uses a system that gathers information from a variety of sources, analyses it and presents it in a structured format to support decision-making.

What is such a system called? (1)

6.5.2 Explain how an expert system/knowledge-based system can be used in conjunction with the system in QUESTION 6.5.1 to ensure quick automated decision-making. (2)

6.6 The employees at the company were provided with notebook computers with an open-source operating system to work from home.

6.6.1 What does *open-source* refer to? (1)

6.6.2 The notebook computers quickly ran out of storage space due to the amount of data employees store on the hard drives. It was suggested that the disk clean-up utility be used to free up storage space.

Name ONE type of file that the disk clean-up program will identify and remove during scanning. (1)

6.6.3 The digital divide results in some employees not being able to work from home.

(a) Define the term *digital divide*. (1)

(b) State TWO factors that contribute to the digital divide. (2)

6.7   Hyper-automation and robotics process automation (RPA) are some of the new emerging technologies that has the potential to maximise the efficiency of company operations around the world.

      6.7.1   Explain the difference between *hyper-automation* and *RPA*. (2)

      6.7.2   An analysis of the demographics of most developed countries show an aging population.

               Discuss how RPA will help solve this problem in order to keep factories running. (2)

6.8   Extended reality is a broad term that includes virtual reality, augmented reality and mixed reality.

      6.8.1   Differentiate between *virtual reality* and *augmented reality*. (2)

      6.8.2   How is mixed reality a further improvement on the realities named in QUESTION 6.8.1? (1)

TOTAL SECTION F: 40
GRAND TOTAL: 150