basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

INFORMATION TECHNOLOGY P2

FEBRUARY/MARCH 2015

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:　　Multiple-choice Questions　　　　　　　　(10)
　　　　SECTION B:　　System Technologies　　　　　　　　　　　(25)
　　　　SECTION C:　　Communication and Network Technologies　(27)
　　　　SECTION D:　　Data and Information Management　　　　　(26)
　　　　SECTION E:　　Solution Development　　　　　　　　　　(27)
　　　　SECTION F:　　Integrated Scenario　　　　　　　　　　　(35)

2.　　　Answer ALL the questions.

3.　　　Read ALL the questions carefully.

4.　　　The mark allocation generally gives an indication of the number of facts required in your answer.

5.　　　Number the answers correctly according to the numbering system used in this question paper.

6.　　　Write neatly and legibly.

SECTION A: MULTIPLE-CHOICE QUESTIONS

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 A ... is a collection of fields on a single entity.

    A   database
    B   table
    C   record
    D   byte   (1)

1.2 Which design tool would best suit a software developer who wants to determine the output of an algorithm?

    A   Use case diagram
    B   IPO diagram
    C   Trace table
    D   TOE chart   (1)

1.3 ... is a collection of programs that is designed to infiltrate a computer and gain the highest level of privileges to take control of the infected computer.

    A   A trojan horse
    B   A rootkit
    C   Spyware
    D   A worm   (1)

1.4 ... was specifically developed to provide fast data transfer for a video camera and external data storage.

    A   FireWire
    B   AGP
    C   PCI
    D   SATA   (1)

1.5 Which ONE of the following options regarding wireless networks is listed from the smallest to the largest area of coverage?

    A   WiMAX, Wi-Fi, Bluetooth
    B   Wi-Fi, WiMAX, Bluetooth
    C   WiMAX, Bluetooth, Wi-Fi
    D   Bluetooth, Wi-Fi, WiMAX   (1)

1.6   Which type of data validation CANNOT be done by means of programming code?

     A   Presence check
     B   Correctness check
     C   Range check
     D   Format check   (1)

1.7   A/An ... compiles and executes one line of programming code at a time.

     A   compiler
     B   interpreter
     C   translator
     D   assembler   (1)

1.8   Which ONE of the following is an example of cloud storage?

     A   Web 3.0
     B   Mobi
     C   Skype
     D   Google Drive   (1)

1.9   Data mining refers to the process of ...

     A   maintaining the accuracy and consistency of data.
     B   ensuring that data meets a specific set of requirements.
     C   analysing large collections of data.
     D   protecting data from loss or theft.   (1)

1.10   What will the output be when the following algorithm is executed?

```
num ← 5
product ← 0
loop (repeat) num times
        product ←product * num
display product
```

     A   0
     B   25
     C   5
     D   625   (1)

TOTAL SECTION A: 10

SECTION B: SYSTEM TECHNOLOGIES

QUESTION 2

A local community centre is being equipped with a modern ICT resource centre. The resource centre will include access to digital resources, the Internet and mobile technologies.

2.1 Mobile devices will be made available at the centre to access the Internet. These mobile devices have a preloaded operating system.

    2.1.1 Define an *operating system*. (2)

    2.1.2 Which mobile operating system is associated with the terms Ice Cream Sandwich and Jelly Bean? (1)

    2.1.3 State ONE problem that can occur when upgrading the operating system on a mobile device. (1)

    2.1.4 Improvements in technology have made it possible for mobile operating systems to support multitasking.

           Explain the concept of *multitasking*. (2)

2.2 The mobile devices that the community members will use in the resource centre make use of solid-state drives (SSDs).

    Give TWO reasons why solid-state drives are used for storage on the mobile devices instead of hard disk drives. (2)

2.3 Old desktop computers were donated to the centre. These computers become very slow when a number of applications are open at the same time. Closer inspection shows that there is a high level of continuous hard drive activity.

    2.3.1 Which term is used for the problem described above? (1)

    2.3.2 Describe how a computer manages to still open a number of applications despite having limited RAM. (2)

    2.3.3 What possible problem(s) will be experienced if the centre tried to upgrade the RAM on these computers? (1)

2.4   A quotation for new computers for the ICT resource centre with the specifications below has been received.

> Intel Core i5 2.6 GHz CPU
> 2 GB RAM
> 3 TB HDD

2.4.1   The Intel Core i5 CPU contains multiple cores.

Briefly explain why this feature improves the performance of the CPU.   (2)

2.4.2   The quotation was rejected because it was too expensive.

Identify the single component in the quotation that could clearly be identified as having an unnecessary high specification level.   (1)

2.4.3   The processing speed of the CPU is directly influenced by the clock speed at which it runs. The clock speed of the CPU is normally much higher than the speed of the system clock.

(a)   Describe how the clock speed influences the processing speed of the CPU.   (2)

(b)   Explain how it is possible that the CPU works at a much higher speed than the speed of the system clock.   (2)

2.4.4   The computer motherboard uses both buses and point-to-point connections to transfer data.

(a)   What is the purpose of the internal bus on a motherboard?   (1)

(b)   Explain the difference between a *point-to-point connection* and a *bus*.   (2)

2.5   The resource centre manager will be given a new laptop computer for office use. The laptop computer is equipped with a fingerprint sensor.

2.5.1   State the advantage of the fingerprint sensor on the laptop.   (2)

2.5.2   Give another example of a biometric device/system that can be used to uniquely identify individuals.   (1)

TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

The computers at the new resource centre need to share an Internet connection; therefore the computers will be networked.

3.1   Different topologies may be used to set up a cabled Ethernet LAN in the resource centre.

      3.1.1   Draw a labelled sketch to illustrate the layout of devices in a **star** topology.

              NOTE: Include labels for the devices in your sketch.   (3)

      3.1.2   Give TWO reasons why a star topology is used in the majority of modern LANs.   (2)

      3.1.3   Name ONE other type of topology that can be used in a LAN.   (1)

3.2   An access point will also be installed in the resource centre to create a wireless network (WLAN).

      3.2.1   What is the main advantage in using a WLAN over a cable-based LAN?   (1)

      3.2.2   One access point is not sufficient for the resource centre.

              Give TWO reasons why more than one access point may be needed.   (2)

      3.2.3   A password is required in order to access the WLAN.

              Why does having a password not guarantee the safety of the WLAN?   (1)

3.3   When community members access the Internet, they are exposed to online risks such as spoofing and malware.

      3.3.1   Briefly explain the concept of *spoofing*.   (2)

      3.3.2   Name TWO measures that can be taken to prevent the computers from getting infected with malware.   (2)

3.4   Community members sometimes use mobile devices to connect to the Internet.

      3.4.1   Give TWO reasons why some websites do not display correctly when viewed on the mobile devices.   (2)

      3.4.2   Why is it possible for mobile devices, like tablets, to wirelessly connect to a device like a keyboard, while at the same time using a wireless connection to the Internet on a WLAN?   (2)

3.5   The staff members at the resource centre have been encouraged to network with other community resource centres via video conferencing and instant messaging.

      3.5.1   Name the protocol used for video conferencing.   (1)

      3.5.2   Briefly describe TWO challenges of video conferencing in South Africa.   (2)

      3.5.3   Most instant messaging programs are cross-platform.

                  What does *cross platform* mean?   (1)

3.6   The resource centre manager needs to be able to connect remotely when not at the centre. The manager has the choice of a remote desktop connection or VPN.

      3.6.1   Describe how the manager will be able to connect remotely by using a VPN.   (3)

      3.6.2   Briefly explain how the user of a remote desktop connection sees the connection on his/her side (the user side) and what it offers.   (2)

TOTAL SECTION C: 27

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

The new resource centre needs a database to manage resources, such as books, DVDs, iPads.

4.1   A server database will be used rather than a desktop database. Differentiate between a *desktop database* and a *server database*.   (2)

4.2   The resource centre has mobile devices that can be borrowed by community members. Information about borrowing of resources is stored in a database called **Resources**.

The table called **DevicesTb** stores information about the mobile devices and the table called **BorrowedTb** stores information about when a device is borrowed.

The table structures are as follows:

DevicesTb			
Key	**Field name**	**Data type**	**Description**
🔑	DeviceID	Text	Unique device ID
	Make	Text	The device manufacturer
	Type	Text	P-Phone/T-Tablet/L-Laptop
	Value	Currency	Value of the device

BorrowedTb			
Key	**Field name**	**Data type**	**Description**
🔑	BorrowedID	Number	Unique code for each borrow event
	DateBorrowed	Date	Date device is borrowed
	DateReturned	Date	Date device is return – left blank by default
	MemberID	Text	ID of the person borrowing the device
	DeviceID	Text	ID of borrowed device

4.2.1   Write down the relationship between **DevicesTb** and **BorrowedTb**, clearly indicating the following:

(a)   Type of relationship formed – as from the **DevicesTb** side   (1)

(b)   The fields used in the relationship and from which tables   (2)

(c)   The key type of both keys in the relationship – also indicate the table names and field names of keys   (2)

4.2.2   Use the table structures in QUESTION 4.2.1 to write SQL statements for each of the following queries:

(a) Display the make, type and value of all tablets in descending order of value.   (4)

(b) Delete the records of devices that are telephones.   (3)

(c) Decrease the value of each device by 10%.   (3)

(d) Display the following information about all the devices that have not yet been returned:
    •   ID of the person who borrowed the device
    •   The type of device borrowed
    •   The date on which the device was borrowed   (5)

4.3   The table below, called **MembersTb**, was created and added to the **Resources** database. The table keeps track of books being borrowed but was not well designed.

MembersTb			
Key	Field name	Data type	Description
🔑	MemberID	Text	Member's ID
	FirstName	Text	Member's first name
	Surname	Text	Member's surname
	Address	Text	Member's address
	Fine	Text	Fine to be paid for overdue borrowed books
	DateOfBirth	Text	Member's birth date
	BookTitle	Text	Title of first book that was borrowed
	BookAuthor	Text	Author of the first book borrowed
	BookTitle	Text	Title of second book that was borrowed
	BookAuthor	Text	Author of the second book borrowed

4.3.1   Some field data types in the table above are not appropriate.

Choose TWO fields and recommend more appropriate data types.   (2)

4.3.2   Give TWO reasons to motivate why the part of the database that contains the **MembersTb** table is not normalised.   (2)

TOTAL SECTION D: 26

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

An administration program has been developed for the resource centre.

5.1   The GUI below is used to input member details.

5.1.1   Give a possible motivation for the choice of each of the following components:

(a) Combo box for the selection of the age   (1)

(b) Radio buttons for the selection of gender   (1)

NOTE: The same motivation will NOT be accepted for both answers.

5.1.2   Why will a value entered into the Surname field rarely lead to a runtime error?   (1)

5.1.3   The components used for date selection will not prevent an invalid date from being selected.

Motivate this statement and use an example to illustrate your answer.   (2)
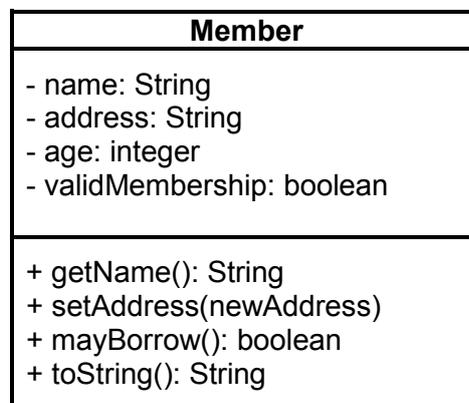
5.1.4   When the **Save Details** button is clicked without the name or surname fields completed, the dialogue box below is displayed.

Criticise the design of the dialog box.   (2)

5.2   The administration program uses an object class called **Member** to store the member's details.

The **Member** class is declared with the following attributes and methods:

Member
- name: String - address: String - age: integer - validMembership: boolean
+ getName(): String + setAddress(newAddress) + mayBorrow(): boolean + toString(): String

5.2.1   What is the purpose of a constructor in object-orientated programming?   (1)

5.2.2   Why are methods used to change the values of the attributes of a **Member** object?   (1)

5.2.3   The **mayBorrow()** method indicates whether a member may be allowed to borrow devices from the centre, or not.

(a)   Classify the **mayBorrow()** method as a mutator, accessor or auxiliary method.   (1)

(b)   A member may borrow devices if any ONE of the following conditions is met:
- The member is 21 years or older and have a known address
- The member is older than 16 years and membership has been validated

Write pseudocode for the **mayBorrow()** method to determine whether a member may borrow devices, or not.   (4)

5.3   The administration program offers the facility to do a survey in order to determine the number of days on which members return items late. For the survey, items are only considered if it is returned late from 1 up to a maximum of 100 days.

The pseudocode below was designed to calculate the average number of days on which items are returned late, by recording the days late for a random sample of six late returns. The code contains some errors that need to be corrected.

Line	Pseudocode
1	Count ← 1
2	Total ← 0
3	While Count < 6
4	Read Days
5	Repeat
6	If Days < 0 or Days > 100 Then
7	Display "Invalid days entered"
8	*... missing code ...*
9	Until *... missing code ...*
10	Total ← Total + Days
11	Count ← Count + 1
12	End While
13	AvgDays ← Total / Count

5.3.1   The purpose of the nested Repeat-Until loop is to ensure that only days within the specified range will be entered.

(a)   Complete the missing code in line 8.   (1)

(b)   Write down the missing condition in line 9, needed to complete the Repeat-Until loop.   (2)

5.3.2   With the nested Repeat-Until loop now functioning as required, debugging determines that the program is only allowing five values to be entered, instead of the required six values.

(a)   Using the following headings, draw and complete your own trace table with two columns in your ANSWER BOOK:

Count and **Count < 6** (WHILE condition)

Use the trace table to show why the error occurs.   (3)

(b)   A suggestion has been made to change the condition of the WHILE loop in order to correct the error.

Show how the conditions for the WHILE loop should be changed in order to ensure that six values may be entered.   (1)

(c)   Why will changing the condition for the WHILE loop not be the correct solution to the problem?   (1)

(d)   Give the line number and the correct instruction for the line that should have been changed to correct the problem, rather than changing the condition for the WHILE loop.   (1)

5.4

> - The administration program tracks the number of books borrowed by the members each day.
> - An array called **NumBooks** stores the number of books borrowed per day from Monday to Friday.
>
> Example of possible data: **NumBooks ←(16, 19, 21, 13, 17)**
>
> - An array called **Weekdays** stores the names of the days of the week.
>
> Example: Weekdays←**(Monday, Tuesday, Wednesday, Thursday, Friday)**

Write an algorithm using pseudocode to determine the day of the week on which the most books were borrowed.   (4)

TOTAL SECTION E: 27

SECTION F: INTEGRATED SCENARIO

QUESTION 6

Read the scenario below and answer the questions that follow.

SCENARIO
The ICT resource centre has presented new opportunities and challenges. A resource centre administrator has been appointed to manage the resource centre.

6.1   A draft Acceptable Use Policy (AUP) document which has been compiled for the resource centre includes a section on green computing.

       6.1.1   The AUP states that, where possible, electronic documents should be used instead of printed documents.

              State TWO advantages of using electronic documents.   (2)

       6.1.2   The AUP states that the symbol below must appear on all computers that are bought for the resource centre.

              What does this symbol indicate?   (1)

       6.1.3   The AUP does not address the disposal of old computers.

              Suggest TWO measures that could be included in the policy to address the disposal of old computers.   (2)

6.2   4G technology is a possible alternative Internet connection option for the resource centre which is currently using WiMAX.

       6.2.1   In which way is 4G technology different from WiMAX?   (2)

       6.2.2   Give an important reason why 4G may not be the more appropriate choice for Internet connection for the resource centre.   (1)

       6.2.3   What is the similarity between the technology used for 4G and WiMAX connections?   (1)

6.3   Two of the challenges of the resource centre is to prevent the loss of data and to prevent unauthorised access to data.

      6.3.1   Give ONE example of human actions which may cause data to be lost. (1)

      6.3.2   Briefly name and explain any TWO techniques that can be used to protect the resource centre's data. (4)

6.4   The administrator wants to raise awareness of community members regarding their digital footprint and privacy when browsing the Internet.

      6.4.1   When one is browsing the Internet, the web browser stores cookies.

              What is a *cookie*? (2)

      6.4.2   Modern web browsers offer a privacy mode for users when browsing the Internet.

              Give TWO reasons why a user would want to use the privacy mode. (2)

6.5   The administrator has set up a wiki for the resource centre. The manager is concerned about the quality of information being added to the wiki.

      6.5.1   How does a *wiki* differ from *other reference resources*? (2)

      6.5.2   Describe TWO ways in which the administrator can ensure that the information placed on the wiki is of an appropriate standard. (2)

6.6   The resource centre also provides extra lessons for learners. Videos are produced for these lessons and made sharable on the Internet using BitTorrent.

      6.6.1   Explain how the *BitTorrent protocol* works. (2)

      6.6.2   Name an alternative way in which the videos could be shared. (1)

6.7   The resource centre has the option of buying resources online from developers and media stores.

      6.7.1   The developers use an encryption key to secure their information that is transmitted over the Internet.

              Explain how *key encryption* works. (2)

6.7.2   Some online media stores provide a facility of media repositories.

      (a)   What is a *media repository*? (1)

      (b)   Identify TWO ways in which the resource centre could benefit from using a media repository service. (2)

6.8   The resource centre is a development that has contributed to the use of technology regarding many aspects of community life. In this era of globalisation, the resource centre is trying to address the digital divide still found in many communities.

6.8.1   What does the term *globalisation* mean? (2)

6.8.2   The use of technology by large organisations, such as the government, banks and hospitals, requires that everybody must be able to use a variety of new digital devices. Encouraging globalisation at the centre has therefore impacted positively on the daily lives of community members.

      Give THREE examples to support this statement. (3)

TOTAL SECTION F: 35
GRAND TOTAL: 150