education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

INFORMATION TECHNOLOGY P2

FEBRUARY/MARCH 2010

MARKS: 180

TIME: 3 hours

This question paper consists of 17 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of FIVE sections subdivided as follows:

SECTION A: Multiple-choice questions	(10)
SECTION B: Hardware and software	(55)
SECTION C: Applications and implications	(20)
SECTION D: Programming and development of software	(47)
SECTION E: Integrated scenario	(48)

2. Answer ALL the questions.

3. Read ALL the questions carefully.

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

5. 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 When users enter inappropriate/incorrect data, a program will deliver inappropriate/incorrect results. This is known as the …

A GIGO principle.
B GOGO principle.
C DVD issue.
D ISO issue. (1)

1.2 When an object class protects its data from access by other code, it is known as …

A parameter passing.
B abstraction.
C encapsulation.
D modular programming. (1)

1.3 The type of memory used as cache memory is …

A DRAM.
B SRAM.
C Virtual RAM.
D DDR RAM. (1)

1.4 Protecting your data by spreading it across multiple discs and including parity is a technique known as …

A RAID 0.
B mirroring.
C backing up.
D RAID 5. (1)

1.5 When the power goes out suddenly your data can become corrupted. The best hardware to use to prevent this is a …

A modem.
B UPS.
C EEPROM.
D router. (1)

1.6 The process used to divide a single physical hard drive into several virtual logical drives is called …

A physical formatting.
B clustering.
C partitioning.
D logical formatting. (1)

1.7 A *64 bit* processor refers to the …

A processing speed of the processor.
B size of the registers inside the processor.
C size of the level 1 cache memory on the processor.
D number of basic instructions the processor can recognise. (1)

1.8 Malware is …

A any type of software that steals data/damages your computer.
B a new type of virus distributed by using the Internet.
C any type of hardware that snoops on your computer data.
D a new type of spyware that spreads itself using e-mail. (1)

1.9 The part of the CPU that does integer calculations and comparisons is the …

A USB.
B CU.
C ALU.
D register. (1)

1.10 Netiquette refers to …

A guidelines to trap errors on computers.
B special software designed to trap malware.
C special software designed to identify errors in programming code.
D guidelines to appropriately use the Internet and its utilities. (1)

TOTAL SECTION A: 10

SCENARIO

One of the problems facing the modern, automated, computerised, industrialised world is healthy living. Obesity is reaching epidemic status on a global level. People are simultaneously decreasing their physical activity and increasing their calorie consumption and therefore follow unhealthy lifestyles. This increases the burden on society and the state to manage rising health costs. ICT is a tool that can be used to help resolve this issue.

SECTION B: HARDWARE AND SOFTWARE

QUESTION 2

Anand is a young entrepreneur who wants to use ICT (specifically mobile computing and Web 2.0) to increase awareness of health issues and help people manage their lifestyles so that they live more healthily. He owns a small company called HealthE and they have designed software and hardware devices that they are now ready to market. The first thing that they need to do is establish a Web presence. They have hired you as a consultant to advise them and answer their questions.

2.1 Anand wants to upgrade the server of their local network and he needs clarity on a number of issues:

2.1.1 He has to choose between a client-server and a peer-to-peer model for the network. Give THREE advantages of choosing a client-server network instead of a peer-to-peer network. (3)

2.1.2 A vendor is offering Anand two different Quad Core CPUs for the server. CPU A has 6 MB of cache and CPU B has 12 MB of cache.

(a) Why is cache memory faster than normal memory? (1)

(b) Clock multiplication is one of the factors that made cache memory on the CPU a necessity. Explain why. (4)

(c) The concept of caching is applied elsewhere on the computer. Give an example of how caching is used to improve Internet browsing. (4)

2.1.3 The new server's CPU is described as 'Quad Core'.

(a) What does '*Quad Core*' mean? (1)

(b) What type of processing technique is used by a 'Quad Core' CPU? (1)

(c) When users are running multiple programs simultaneously, they will experience a single core CPU as being slower than a Quad Core CPU even though the CPUs are running at the same speed. Explain why. (2)

2.1.4 Anand has been offered a choice between Linux or Windows Server 2008 as operating system for his servers.

(a) Define the term *operating system*. (3)

(b) Linux is a free and open-source operating system. Apart from being available free of charge, name TWO other unique characteristics of a free and open-source operating system. (2)

(c) Anand wants to know why he should even consider Windows Server 2008 if Linux is available free of charge. Name TWO reasons why people would prefer Windows Server 2008 as an operating system. (2)

2.1.5 The server salesperson has also told Anand that it is better to get a system with a faster Front Side Bus (FSB), as this will reduce bottlenecks of data transfer and improve overall system speed.

Briefly explain the function of the FSB. (2)

2.1.6 One of the newer FSB designs is PCI Express. This design is serial but transfers data faster than the older parallel data bus designs.

(a) Explain the difference between serial and parallel data transfer. (2)

(b) Name TWO problems with increasing the speed of parallel data bus designs. (2)

2.1.7 Anand says he has always been curious about how a CPU works. You tell him that the basic process has four stages, namely fetch, decode, data transfer and execute. He wants more detail. Explain what happens during the:

(a) Fetch stage (2)

(b) Decode stage (2)

2.1.8 Anand is also curious about various technologies related to the improvement of computer performance over the years. Explain the following:

(a) What is the purpose of a heat sink? (1)

(b) Why does RISC improve CPU performance? (2)

(c) How does DDR RAM work? (You may use a diagram to enhance your explanation.) (3)

(d) Give THREE reasons why the reduced size of processors can improve the overall performance of a computer system. (3)

2.2

One of the products that HealthE has developed and plans to market is the EPed. The EPed is a pedometer, a device that measures not only how far you walk each day, but also how much exercise you get and how much energy you use. This EPed has a built-in heart-rate monitor that measures how fast your heart is beating to make sure you don't over-exercise when running/walking. Bluetooth would have to be built in for the device to form part of a PAN.	

2.2.1 What is a PAN? (2)

2.2.2 Name TWO other devices that typically include Bluetooth technology. (2)

2.2.3 Would Bluetooth technology be of any use to obtain medical assistance if the heart monitor detected a heart attack? Explain your answer. (2)

2.2.4 The EPed has a calorie counter which allows the user to capture data about the food they eat in a day (type of food and weight of the food) and then connects to a remote Internet server to calculate how many calories this adds up to.

(a) What type of communications technology would be needed to make this possible? (1)

(b) If required technology is used, what TWO additions (ONE hardware, ONE software) could be made to turn this device into a mobile Internet device? (2)

2.2.5 Anand is considering adding multiple features to the device including mobile Internet, a music player, an audiobook player and a GPS to track where you have run/walked.

(a) What trend in ICT does this type of multipurpose device illustrate? (1)

(b) The device that Anand is contemplating will need an operating system to work effectively. Give the names of TWO operating systems which could be used in this type of device. (2)

(c) What is the biggest user interface problem that users experience when using devices like these? (1)

TOTAL SECTION B: 55

SECTION C: APPLICATIONS AND IMPLICATIONS

QUESTION 3: e-COMMUNICATION

Anand says he has some good hardware designers but they have poor social skills and do not use e-communication the way that they should.

Answer the following questions so that he can give them tips on the do's and don'ts in e-communication.

3.1 You receive an e-mail, supposedly from your credit card company, with a link to a website for you to update your personal details (including your card number and pin). The e-mail indicates that the bank's computer system was hacked and they are rebuilding their database with greater security. Furthermore the e-mail states that your account will be suspended if you fail to update your personal details.

How should you respond to this e-mail? Explain your answer. (3)

3.2 You repeatedly receive e-mails from people trying to sell you what looks like pirated software, watches and medicine or offering you opportunities to make large amounts of money working from home.

3.2.1 What do you think are the intentions of these people? (1)

3.2.2 How can you avoid receiving this type of e-mail? (1)

3.3 It is unsafe to do business such as Internet banking on public computers (like those in an Internet café) because of dangers like keyloggers.

What is a *keylogger*? (2)

3.4 People who are too busy to spend time logging on to forums and websites can subscribe to sites offering RSS feeds.

3.4.1 Describe the function of an RSS feed. (2)

3.4.2 One advantage of using an RSS feed is saving time. Name ONE other advantage. (1)
[10]

QUESTION 4: SOCIAL AND ETHICAL ISSUES

4.1 HealthE has decided that they will make the GPS data (the track log of where you have been and where you are right now) from their EPed device shareable on the Internet. Give TWO reasons why some users of the EPed could object to this. (2)

4.2 HealthE wants to expand its product line to improve general medical care in the country's hospitals and clinics. Explain THREE ways in which ICT can improve healthcare. (3)

4.3 HealthE wants to start an online health forum (like a Wiki) where their users can give each other advice about medical problems.

Should you rely on this forum as your main source of medical advice? Explain your answer. (2)

4.4 Whilst doing research for their *Guide to Healthy Living* publication, the HealthE researchers found several sources of information on the Internet with good quality material and graphical images.

4.4.1 Explain why they cannot just use this material as their own. (1)

4.4.2 What TWO steps can be taken to ensure legitimate use of this material? (2)
[10]

TOTAL SECTION C: 20

SECTION D: PROGRAMMING AND SOFTWARE DEVELOPMENT

QUESTION 5: ALGORITHMS AND PLANNING

Developing and maintaining software is one of the challenging aspects of HealthE. The members on the software team are young and do not have much experience. Anand and his senior partner have to assist in some aspects to help them develop their programming skills and knowledge.

5.1 Input of information by the user is an important part of the development and design of a program. Evaluate the design for the input screen below by answering the questions that follow.

```
Name?
|
Date of birth?
|
What type of exercise do you prefer? We update the types
of exercise according to the needs of the subscribers,
but you can choose any of the regular types of exercise.
We will inform you on a regular basis when the exercises
are updated. We can assist you if you contact us directly
on (012) 453 2314
|
Married?
```

5.1.1 State THREE ways in which you can improve the design of this input screen. (3)

5.1.2 It is important to make sure that the entered data is correct. Suggest THREE possible improvements to the design of the input for the date of birth in the example above to eliminate input errors by the user. (3)

5.1.3 Programming can be used to test the validity of input. Discuss this statement in terms of the following:

(a) Is valid data always accurate data? Use ONE of the input items on the input screen above to explain your answer. (2)

(b) Can all the input items on the given screen be validated by programming code? Substantiate your answer. (2)

5.2 Anand insists on programmers using a good programming style during the development of software.

State THREE guidelines for maintaining a good programming style which will also produce clear, readable source code. (3)

5.3 Debugging takes up a great deal of programming time. Syntax errors, runtime errors and logical errors have to be corrected.

5.3.1 Explain each of the errors below AND give ONE reason why/ example of where the error will occur.

(a) Syntax error (2)
(b) Runtime error (2)
(c) Logical error (2)

5.3.2 Give ONE example of how to identify each of the error types in QUESTION 5.3.1. (3)

5.4 Any programming language has to use loops to perform certain tasks repetitively. The following structures (Option A, Option B and Option C) have been developed to identify members of HealthE whose membership has expired, based on their date of registration. Members register at HealthE for a period of one year.

Evaluate each of the loop structures below to solve the problem in terms of correctness and efficiency by answering the following questions.

5.4.1 Identify the best solution. (3)

5.4.2 Comment on why you think the two remaining options are inefficient/incorrect. (4)

Option A

```
Loop
    Extract month and year from current date
    Extract month and year from register date
    Calculate number of months registered
    If months more than 12, display Expired
Until last member
```

Option B

```
Extract month and year from current date
Loop
    Extract month and year from register date
    Calculate number of months registered
Until last member
    If months more than 12, display Expired
```

Option C

```
Extract month and year from current date
Loop
    Extract month and year from register date
    Calculate number of months registered
    If months more than 12, display Expired
Until last member
```


5.5 A database with two tables named **tblInstructor** and **tblMembers** has been designed for HealthE. The screen shots below show the structure and the content of the two tables.

tblInstructor : Table

InstructorID	InstructorName	InstructorSurname
INS001	Peter	Simon
INS002	John	Moeketsi
INS003	Pamela	Peterson
INS004	Debby	Johnson

tblInstructor : Table

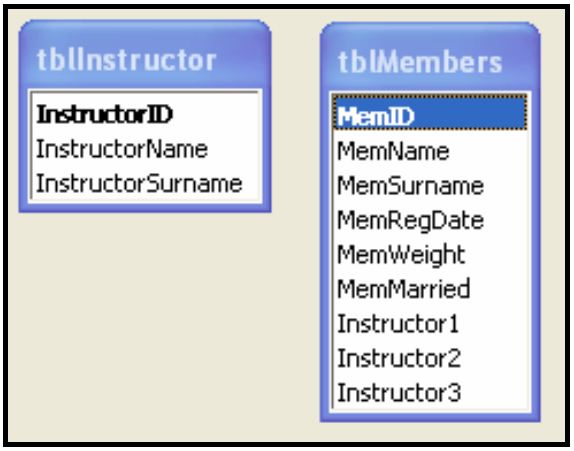
Field Name	Data Type
InstructorID	Text
InstructorName	Text
InstructorSurname	Text

tblMembers : Table

MemID	MemName	MemSurname	MemRegDate	MemWeight	MemMarried	Instructor1	Instructor2	Instructor3
ME001	John	Smith	2008/02/01	102.5	YES	INS001	INS002	INS003
ME002	Karin	Wessels	2007/02/11	67.8	NO	INS001	INS003	
ME003	Sandy	Pule	2008/02/14	87.2	YES	INS001	INS004	

tblMembers : Table

Field Name	Data Type	Description
MemID	Text	Unique Member ID
MemName	Text	
MemSurname	Text	
MemRegDate	Text	Date the member was registered
MemWeight	Text	Current weight of member
MemMarried	Text	Is the member married?
Instructor1	Text	ID of first instructor
Instructor2	Text	ID of second instructor (if any)
Instructor3	Text	ID of third instructor (if any)



5.5.1 The layout of the **tblMembers** table on the previous page indicates how the data types of the fields have been defined. The data types of all the fields were defined as text. Indicate a data type better suited to each of the following THREE fields from the **tblMembers** table with regard to size/format:

MemRegDate
MemWeight
MemMarried (5)

5.5.2 The database needs to be modified so that it is normalised. Copy the three blank tables below into your ANSWER BOOK and indicate the following:

(a) The correct fields to be placed in each table (3)
(b) The primary keys (PK) and foreign keys (FK) (2)
(c) The type of relationships between the tables (2)

tblInstructor

tblLink

tblMembers

5.6 Study the class diagram below representing a member at HealthE.

NOTE: A minus (-) indicates a private declaration and a plus (+) indicates a public declaration.

Member	
Fields	**Methods**
- fID:String	+ constructor create / Member (ID, name)
- fName:String	+ getID():String
- fRegDate:String	+ getName():String
- fNumMonths:byte	+ getAmountToPay(Fee):double
- fAmountPaid:double	+ hasExpired()
	+ setAmount(newAmount)

5.6.1 What is the difference between a *class* and an *object*? (2)

5.6.2 The **fAmountPaid** field in the class diagram above has been declared private, which means that it cannot be directly accessed by an object. Explain how the **fAmountPaid** field of an object will be updated. (2)

5.6.3 What is the purpose of a constructor (such as the one shown in the diagram) aside from instantiating the object? (1)

5.6.4 Identify a mutator method in the class diagram above. (1)

TOTAL SECTION D: 47

SECTION E: INTEGRATED SCENARIO

QUESTION 6

HealthE has received a government grant to establish 100 clinics in disadvantaged rural communities around the country.

6.1 Each clinic will have a chief administrator, two clerks and a dispensary, as well as three doctors. To improve their efficiency all their records will be computerised. The computers will need to be networked.

6.1.1 They have to choose between a star and a ring network topology.

(a) Draw diagrams to illustrate each of these topologies. (4)

(b) Which topology is the current standard and therefore the better choice? (1)

(c) What piece of equipment is needed to make a star topology work? (1)

6.1.2 For any network to exist the computers need to connect to each other using some medium.

(a) Name TWO wired media that can be used. (2)

(b) Name TWO wireless media that can be used. (2)

(c) Which type of wired medium would be best for connecting the computers in the clinic? Give TWO reasons to motivate your answer. (3)

(d) Collisions can occur on a network. Briefly describe how Ethernet technology deals with these collisions. (4)

6.1.3 All the clinics will be able to connect to each other around the country. To do this they will have to connect to the Internet.

(a) Why is it likely that they will need to use 3G technology instead of ADSL? (Remember they are rural clinics.) (2)

(b) They have been told they will need an ISP. What service does an ISP provide? (1)

(c) Each computer on the network will share an Internet connection. What piece of hardware will be needed to connect the network to the Internet? (1)

(d) Another essential piece of equipment is a firewall. Name TWO ways in which a firewall protects your computer/network. (2)

(e) The best way for the clinics to connect their networks together over the Internet is to use a VPN. What does VPN stand for? (1)

6.1.4 When a patient moves to another clinic their medical files can be transferred by e-mail. This is confidential data and should be protected. You suggest they use PGP, a tool that makes use of Public Key Encryption.

(a) Define the concept *encryption*. (3)

(b) Briefly describe how encryption and decryption take place in the public key model. (4)

6.2 HealthE plans to create a website that their users will be able to customise. This website will also allow their customers to download files containing useful information and use the secure facility to pay their medical bills, for example.

6.2.1 This means that the website will have to save data about a user's preferences. Name TWO ways in which this data can be stored. (2)

6.2.2 What protocol would be used to download files? (1)

6.2.3 Describe TWO ways in which a user can tell if his/her browser is secure for sensitive transactions. (2)

6.2.4 HealthE will also use this website to give users an easy way to get the latest device drivers for their EPed (referred to in QUESTION 2.2) and other devices that HealthE makes. What does a device driver do? (3)

6.3 HealthE decides to use the concept of 'Cloud Computing'. As a consequence of this decision all their common administrative office tasks will be done using online tools such as Google Docs.

6.3.1 Describe TWO advantages of using online software such as this (the program is not installed on your computer but runs on a server which you connect to using the Internet – your documents are also stored on that server). (2)

6.3.2 Describe THREE disadvantages of this type of system. (3)

6.4 HealthE will develop software that they will give to schools, businesses and members of the community for free. This software will educate people about good habits of health, hygiene and medical care.

One of the problems that HealthE faces is that the community has a low level of literacy. Describe TWO ways in which they can still get the message across with their software by using less text (less reading). (2)

6.5 Anand wants the public to know all about him and HealthE, so he has created a HealthE page on Facebook. He has entered all his personal details there, including his name, address, phone number, e-mail, ID number and information about his likes, dislikes, hobbies and activities.

You tell him that he is being very foolish and runs the risk of falling victim to identity theft. Describe TWO ways in which an identity thief can use this information. (2)

TOTAL SECTION E: 48

GRAND TOTAL: 180