



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2014

INFORMATION TECHNOLOGY: PAPER I

Time: 3 hours

180 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 12 pages. Please check that your question paper is complete.
 2. Read the questions carefully and make sure that you answer all parts of each question.
 3. Answer ALL questions – there are no options in this paper.
 4. Show all working where applicable.
 5. Non-programmable calculators may be used.
 6. Number your answers exactly as the sub-questions are numbered.
 7. Start each answer to each question on a **new page**.
 8. Please leave a **line open** between sub-questions.
 9. It is in your own interest to write legibly and to present your work neatly.
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SECTION A SHORT QUESTIONS**QUESTION 1 MULTIPLE CHOICE**

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the question number, for example 1.11 D.

1.1 Which one of the following refers to application software, which allows a user to read .PDF documents?

- A Silverlight Powerdoc
- B Quick Time player
- C JavaDocs
- D Adobe Reader

1.2 An approach to developing software in which the problem is modelled using units that combine the properties and behaviours of an entity is ...

- A RAD development
- B Incremental model
- C OOP design
- D GUI programming

1.3 An attack on a company's network or website where the network is disabled and held to ransom is a ...

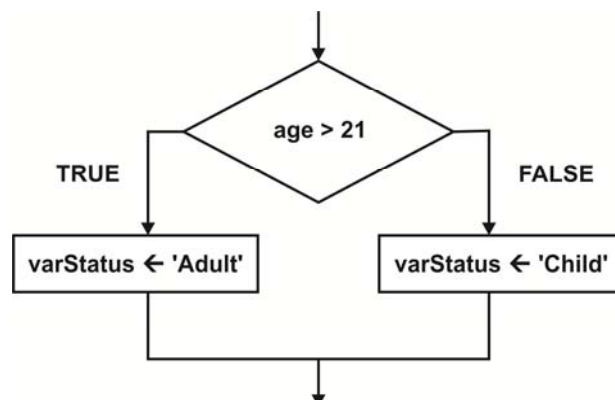
- A semantic attack
- B denial-of-service attack
- C man-in-the-middle attack
- D backdoor attack

1.4 Which one of the following refers to two separate integrated circuit chips, connected directly to the motherboard and which regulates the data traffic?

- A Front Side Bus
- B Dual-core chip
- C Control Unit
- D Chipset

1.5 Which one the following statements or control structures would be used to implement the flowchart given?

- A While loop
- B Repeat loop/While Do loop
- C If then else statement
- D Case/Switch statement



- 1.6 Which one of the following statements is FALSE?
- A The North Bridge connects the CPU to RAM.
 - B The South Bridge is often referred to as the Input-Output controller.
 - C The motherboard chipset determines the type of CPU that can be used.
 - D The Front Side Bus (FSB) allows you to connect additional devices to a computer.
- 1.7 The factorial of a number N is defined as $N \times (N - 1) \times (N - 2) \dots \times 1$. For example, the factorial of 4 is $4 \times 3 \times 2 \times 1 = 24$. What type of error is likely to occur if one wrote a program to calculate the factorial of 100 000 and stored the result as an integer in 8 signed bits?
- A Division by zero
 - B Invalid memory reference
 - C Type mismatch
 - D Overflow
- 1.8 Which term applies when a person behaves offensively towards another member of an e-mail news group, thereby inciting argumentative behaviour?
- A Phishing
 - B Spamming
 - C Lurking
 - D Flaming
- 1.9 Which one of the following is a wireless communication technology which is dependent on 'line of sight' for communication?
- A RFID
 - B Wi-Fi
 - C IrDA
 - D Bluetooth
- 1.10 Which one of the following statements concerning disk fragmentation is FALSE?
- A Fragmentation slows down access to a disk.
 - B Defragmenting a disk will increase the amount of RAM available.
 - C Defragmenting a disk involves grouping together the separate parts of files that are distributed across a disk.
 - D Fragmentation occurs when parts of files become 'scattered' across a disk.

[10]

QUESTION 2

Give the correct term for the following descriptions:

- 2.1 The name given to the use of good manners and showing respect for other users when using the Internet.
- 2.2 Programs which add extra features to software, such as a web browser. These programs are needed to allow the user to view 'special' effects.
- 2.3 A network where access is provided to the organisation's private network to users from outside the organisation.
- 2.4 Specialised software and hardware designed to be used at a till point. It manages stock and creates reports when stock is sold to customers.
- 2.5 The process where data files on different devices are updated with the latest copy so that both versions of the files are identical.
- 2.6 The amount of data an ISP allows a person to upload and download in a month.
- 2.7 The maximum amount of data that can be transferred across a communication channel in a given time period.
- 2.8 The gap between people that have access to computers and technology and those who do not.
- 2.9 Another name for Web 3.0.
- 2.10 A number of Internet computers that have been set up to forward transmissions to other computers on the Internet without the knowledge of their owners.

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SCENARIO

Shouldn't recycling of electronics be made easier?

More than a billion computer items have been discarded to date, which are known as e-waste. Society thinks of these as disposable items, but it can pollute the ground and the air. One solution is to recycle old electronic equipment, but the recycling effort has made little progress in South Africa. There is no company in SA which fully recycles electronic equipment. As an IT student caring for the environment, you approached Mr Salvage, the owner of a recycling company to help you with your job shadowing requirements during the holiday. You have been appointed as an assistant to Mr Salvage for your work experience. Answer ALL questions that follow to the best of your ability.

**SECTION B SYSTEM TECHNOLOGIES
(HARDWARE AND SOFTWARE)****QUESTION 3**

Employees of the recycling company are not very knowledgeable about computer hardware and software products. Assist them by answering the questions listed below.

- 3.1 People tell me that computers are built with a modular design today.
- 3.1.1 What does modular design mean? (2)
- 3.1.2 Give TWO advantages of modular design computers. (2)
- 3.2 There are many factors influencing the performance of a computer. Name and describe THREE factors that will improve the performance of the CPU. Explain **how** each factor will improve speed. Do not merely state faster. (6)
- 3.3 3.3.1 Name TWO factors that affect the speed at which data is retrieved from secondary storage. (2)
- 3.3.2 Explain why solid state hard drives have faster access times than mechanical hard drives. (2)

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QUESTION 4

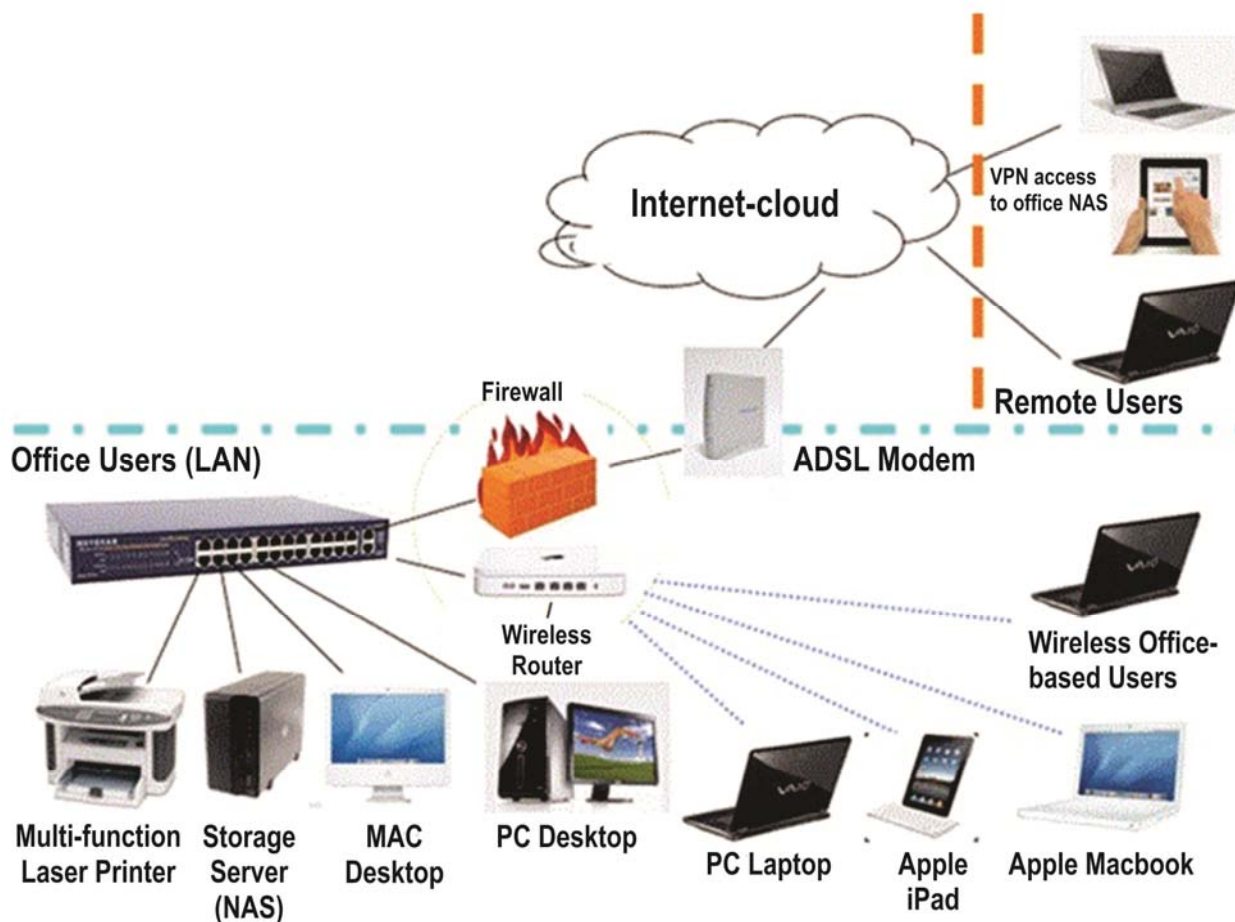
- 4.1 Mobile technologies are almost indispensable because they have the ability to connect to the web, interact with remote businesses and access information, anywhere and anytime.
- 4.1.1 Using the scenario, give an example of data and information. (2)
- 4.1.2 Briefly describe TWO advantages and TWO disadvantages of mobility. (4)
- 4.2 Many schools have introduced the use of tablets for learners. Justify why you, as a Grade 12 IT learner, would rather use a laptop or netbook instead of a tablet. Provide TWO reasons in your answer. (4)
- 4.3 Today everybody talks about the 'cloud', from which the term cloud computing is derived.
- 4.3.1 Explain the terms Software as a service (Saas), Infrastructure as a service (Iaas) and Platform as a service (Paas). (6)
- 4.3.2 For each of the following, classify as either Saas, Iaas or Paas.
- (a) Creating a web page online. (1)
- (b) Using Google Doc to create a spreadsheet. (1)
- (c) Creating a virtual data centre for many companies to host their websites. (1)
- 4.3.3 A BitTorrent has been suggested as an alternative method to file sharing.
- (a) Explain how BitTorrent works. (2)
- (b) Do you think a BitTorrent is a good way of sharing data in this scenario? (2)
- 4.3.4 How does virtualisation differ from cloud computing? (2)
- 4.4 To improve the battery life of your smartphone, you need to reduce the power consumption. Describe TWO examples how to reduce power consumption. (4)
- 4.5 When applications are developed, you will see separate versions, e.g. one for Android, and another one for IOS.
- Why does the same application need to have separate versions for different operating systems? Motivate. (3)

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SECTION C COMMUNICATION & INTERNET TECHNOLOGIES

QUESTION 5

The recycling company has a head office with printers, PCs and tablets. This simple network diagram below illustrates a wired LAN connected to wireless devices and devices that access the network remotely.



[Taken from: [<http://whysofree.blogspot.com/2010/04/mac-pc-apple-ipad-network-diagram.html>]]

Figure 5.1

- 5.1 The diagram shows an ADSL modem.
 - 5.1.1 Explain why this device is not a modem. (2)
 - 5.1.2 Give the correct name for this device. (1)
- 5.2 Give THREE different examples why connecting the computers in a network would be to the benefit of this company. Use the scenario in each of your examples. (3)
- 5.3 Wired and wireless LANs are installed as seen in the above diagram.
 - 5.3.1 Name ONE negative aspect of using a WLAN. (1)
 - 5.3.2 State ONE advantage of using UTP cables other than cost. (1)
 - 5.3.3 What device is needed to connect UTP cabled devices to the server in a star topology? (1)

- 5.4 The diagram does not show any devices to store web pages accessed from the Internet. Somebody mentioned a proxy server to Mr Salvage.
- 5.4.1 Define a proxy server. (2)
- 5.4.2 Which would you consider to be a better choice for this scenario, a web server or a proxy server. Justify your choice. (2)
- 5.5 Why is it advisable for the company to have a firewall installed as seen in Figure 5.1? Briefly describe TWO reasons. (2)
- 5.6 Mr Salvage has come across two different protocols: TCP and UDP. Explain how each of these protocols would be used in the scenario. (2)
- 5.7 The network has a NAS for storing critical data:
- 5.7.1 Do you think it would be better to use a cloud service such as Google Drive to store the critical data? Give TWO reasons for your answer. (3)
- 5.7.2 Would the remote users still need a VPN if the critical data was moved to Google Drive? Explain your answer. (3)
- 5.8 The company's database was planned and created by the database administrator. He made use of all the information given to him.
- 5.8.1 The database administrator keeps confusing the terms RAID and backup. Explain the difference between these TWO terms and how they work together to ensure that data is secure. (4)
- 5.8.2 A pamphlet received from the recycling company contained the following information:
-
- Someone queried this statement, believing it to be incorrect. State THREE ways of verifying the trustworthiness of data/information. (3)
- 5.9 Websites can be categorised as static or dynamic.
- 5.9.1 What do we mean when we say a website is static? (1)
- 5.9.2 What is the essential difference between static and dynamic websites? (2)
- 5.9.3 Briefly explain how dynamic web pages are created and function. (2)
- 5.9.4 Many websites such as Facebook, allows you to tag friends and family in photos. Is this a feature of Web 1.0 or Web 2.0? (1)
- 5.10 The recycling company has fast computers, but their internal network speed is slow. Using Figure 5.1, recommend TWO possible upgrades to the network that will improve the speed of the network. Explain how each upgrade will improve the network speed. (4)

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SECTION D SOCIAL IMPLICATIONS**QUESTION 6**

- 6.1 The company needs to draw up a policy for employees in terms of recycling and reducing e-waste. List TWO issues that should be addressed in the policy and explain why they are important. (4)
- 6.2 Should the government mandate a recycling program for electronics? Motivate your answer with TWO clearly explained reasons. (4)
- 6.3 The company has taken on a project to employ rehabilitated people with criminal records to sort through the items to be recycled. The details of each employee is stored in a database.
- 6.3.1 Do you think it is ethical to store the criminal history of each employee? Justify your answer. (3)
- 6.3.2 The employees are paid using online banking. The Secure Socket Layer (SSL) is a commonly used protocol for managing the security when transmitting data over the Internet. Give a step by step description of how SSL works. (6)
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SECTION E DATA AND INFORMATION MANAGEMENT & SOLUTION DEVELOPMENT

QUESTION 7

Neil, one of the company employees, is responsible for managing the library of movies about environmental issues. In order to keep an accurate account of these movies he has decided to ask you to create a database to store the details for the movies.

7.1 You have been given the table design for the table called `tblMovies` which appears as follows:

tblMovies		
Field Name	Data Type	
ID	AutoNumber	An automatically generated field
Title	Text	The title of the movie
Director	Text	The name of the director
ReleasedDate	Date/Time	The year the movie was released
Length	Number	Running time of the movie
Producer 1	Text	Name of producer
Producer 2	Text	Name of producer
Producer 3	Text	Name of producer
Actor 1	Text	Name of actor
Actor 2	Text	Name of actor
Actor 3	Text	Name of actor
Rating	Number	Between 1 and 10 inclusive

Figure 7.1

- 7.1.1 Explain why ID is set to AutoNumber. (1)
- 7.1.2 What is the purpose of a foreign key? (1)
- 7.1.3 If you used a combined key of Title and Director as a primary key, explain what implications this would have for the data in the table. (2)

7.2 You realise the table needs to be normalised.

7.2.1 Neil thinks that once a table is in second normal form (2NF) it is also normalised to third normal form (3NF).

(a) Define a transitive dependency. (1)

(b) Explain why it is important to look for transitive dependencies when normalising a database. (2)

7.2.2 Explain why ID, Producer and Actor would be a suitable primary key for this table. (2)

7.2.3 Show Neil how the table design will change by bringing it into 3NF. All the original fields given in the table (Figure 7.1) must appear in your new design. You are allowed to add extra field(s) to accommodate the normalisation process.

Show the following as part of your design:

- The fields that make up the new tables. This must include all the fields from the original table as well as any extra field(s) that you will need to achieve 3NF.
- Primary keys (PK)
- Foreign key(s) (FK)

Write your solution as a set of relations. (8)

7.3 You suggest to Neil that the design should include data validation:

7.3.1 Briefly explain to Neil the purpose of data validation. (2)

7.3.2 Name THREE validation checks that can be performed on the Rating field. (3)

7.4 Getting data into the database and making sure that it is accurate is only the first step in making a database work. The real power of a database lies in how you get information out of it. To do this you need to know how to query the database. The best way to do this is to use SQL.

7.4.1 Explain what the following SQL statement will achieve:

```
SELECT director, Count (*)  
FROM tblmovies  
WHERE rating > 5  
GROUP BY director
```

 (3)

7.4.2 Neil is confused by the WHERE and HAVING clause of a SQL statement. Explain the difference between these two statements, using two SQL statements: One with a WHERE clause; and one with a HAVING clause applied to the tblmovies table in Figure 7.1. (6)

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QUESTION 8

Users who log onto a website to order movies need to create a profile which includes a user name and a password. You explain to Neil that he will need some programming done to make sure that users' passwords are sufficiently strong. If a password is not strong enough, then the user must re-enter a new one.

The criteria for a sufficiently strong password are as follows:

- Minimum of 9 characters
- Must include a number
- May not include the user name

Write down an algorithm to test if a password satisfies the criteria. The algorithm will be called by

boolean valid ← checkPassword (username, password)

Marks will be awarded for efficiency of code. Ensure that the algorithm returns a result.

NOTE: Use pseudocode and NOT programming code.

[11]

QUESTION 9

Neil created a website for his own small business to sell movies online. He has decided the program that records the sales from the web-site should now be re-written to use OOP programming techniques. He has created a rough design of a class to store details about a movie.

Fields	Methods
<ul style="list-style-type: none"> • itemCode • costPrice • title • fileName 	<ul style="list-style-type: none"> • setPrice (price) • setTitle (title) • getFileName • toString • getSalesPrice

Figure 9.1

- 9.1 Name ONE method whose purpose is to display the value of a field in the object. (1)
- 9.2 If we removed all the fields from the class, which of the methods in Figure 9.1 would still be needed? Explain your answer. (2)
- 9.3 What (data) type would the getFileName method return? (1)
- 9.4 Create a class diagram from Figure 9.1 above, namely the **Movie** class. (6)
- 9.5 Neil wants to add a field called VAT to store a value of 14. Do you think VAT should be included as a property of this class? Give a reason for your answer. (2)
- 9.6 Neil wants to permanently store all the sales he made over the year. Suggest a suitable permanent data structure to store all the sales. Give TWO reasons for your answer. (3)

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Total: 180 marks