



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2016

**INFORMATION TECHNOLOGY: PAPER I**

Time: 3 hours

180 marks

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**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. A non-programmable calculator may be used.
  6. Number your answers exactly as the sub-questions are numbered.
  7. Start the 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 ... is a protocol used by browser software to process requests for webpages to web servers.
- A POP
  - B HTTP
  - C FTP
  - D SMTP
- 1.2 The ... is the part of the CPU that directs and coordinates most of the motherboard's activities.
- A machine cycle
  - B arithmetic logic unit
  - C register
  - D control unit
- 1.3 A(n) ... is part of the motherboard and connects the processor to main memory.
- A expansion bus
  - B front-side bus
  - C system clock
  - D memory module
- 1.4 RAID means ...
- A to distribute data over more than one hard drive.
  - B to duplicate data for backup purposes.
  - C to take the hard drive apart.
  - D that the tracks on the hard drive are concentric.
- 1.5 Which of the following will make a field inaccessible to other classes?
- A String
  - B Private
  - C Public
  - D Protected
- 1.6 A PAN is defined as:
- A A group of devices connected across a city.
  - B The interconnection of devices within the range of typically 10 metres.
  - C A geographically dispersed telecommunications network.
  - D A large physical network to be split into smaller logical networks.

- 1.7 A ... is a website that allows users to post short text updates, usually between 100 and 200 characters.
- A wiki
  - B portal
  - C microblog
  - D podcast
- 1.8 What is the code of acceptable behaviour called that users should follow while on the Internet?
- A Netiquette
  - B Post Office Protocol
  - C FAQ
  - D The Golden Rule
- 1.9 The ... chip stores configuration data of the computer.
- A BIOS
  - B POST
  - C CMOS
  - D RAM
- 1.10 Which one of the following is NOT a characteristic of quality data?
- A Accuracy
  - B Currency
  - C Completeness
  - D Accessibility

**[10]**

**QUESTION 2      MATCHING COLUMNS**

Write down along the left side of your page only the **number** of the question from Column A, and next to it the correct matching **capital letter** from Column B, for example 2.11 T.

<b>Column A</b>		<b>Column B</b>	
2.1	Storage device that contains moving parts.	A.	VOD
2.2	Dedicated graphics processor on a graphics card, used to render images stored in the RAM of the graphics card.	B.	CPU
2.3	Type of user interface associated with the use of input icons.	C.	ISO
2.4	Systems which allow users to select and watch/listen to video or audio content when they choose to, rather than having to watch at a specific broadcast time.	D.	HDD
2.5	The essential start up instructions of a computer, stored in ROM on the motherboard.	E.	LTE
2.6	Protocol for sending files over an Internet connection.	F.	MICR
2.7	Health condition associated with the improper or frequent use of input devices.	G.	GIGO
2.8	A technique for creating fast and dynamic webpages which updates parts of a webpage, without reloading the whole page.	H.	GPU
2.9	A document that outlines the rights and responsibilities of users within a network environment, including the consequences of violating these stipulations.	I.	WWW
2.10	The latest standard for wireless communication of high-speed for mobile devices.	J.	AUP
		K.	RSI
		L.	XML
		M.	EDGE
		N.	FTP
		O.	AJAX
		P.	SSD
		Q.	IDE
		R.	CMOS
		S.	ZIP
		T.	GUI
		U.	EULA
		V.	BIOS

[10]

<b>20 marks</b>
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**SECTION B SYSTEM TECHNOLOGIES**

CONSIDER THE **SCENARIO** BELOW WHEN ANSWERING THE REST OF THIS PAPER, ESPECIALLY **SECTION B** AND **SECTION C**.

**GIVEN SCENARIO**

Working parents find it difficult to transport their children and keep them entertained during the school holidays. A new au-pairing, tutoring and holiday-fun business is being considered to assist these busy South African parents. The company called **EduRoots** will make use of small vehicles for transportation and sightseeing trips during school holidays. The company will provide inexpensive trips at a cost of R25 for a trip up to 3 km. Android devices in each vehicle with 3G connections will allow children to track their journey, take photographs and upload them to the Cloud, and to access RFIDs located at some landmarks. These RFIDs broadcast interesting details about their landmarks. The vehicles will have uncapped Wi-Fi Internet access. At their offices, **EduRoots** will have all the electronic equipment to run a business including a LAN consisting of multiple computers and one printer, with Internet connectivity.

**QUESTION 3**

**EduRoots** is considering TWO different devices: Device A (tablet) and Device B (laptop). Their specifications follow below:

Device A (tablet)	Device B (laptop)
	
<p style="text-align: right;">[Extracted from:  <a href="http://www.pcworld.com/article/2030166/review-dell-xps-10-tablet-32gb-keyboard-bundle-.html">http://www.pcworld.com/article/2030166/review-dell-xps-10-tablet-32gb-keyboard-bundle-.html</a>]</p>	<p style="text-align: right;">[Extracted from:  <a href="http://pngimg.com/img/electronics/laptop">http://pngimg.com/img/electronics/laptop</a>]</p>
<ul style="list-style-type: none"> <li>• Microsoft Windows 8.1 32-bit</li> <li>• Intel Atom processor Quad-Core, 2.41 GHz, 2 MB Cache</li> <li>• 10.8" HD LCD (1366 × 768) 16:9</li> <li>• USB 3.0 port × 2, Mini HDMI port</li> <li>• 36W removable battery</li> <li>• 8 MP Camera</li> <li>• 2 GB DDR3 SDRAM at 1 MHz</li> <li>• 32 GB SDD</li> <li>• Dell Wireless 1538 Dual-Band 2 × 2 802.11n WiFi + Bluetooth 4.0</li> <li>• Weight: 0.8 kg</li> <li>• Micro SD Card Reader</li> <li>• Detachable keyboard</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Windows 7 Home 64-bit</li> <li>• Intel Core i5 Dual-Core, 1.6 GHz, 3 MB Cache</li> <li>• LCD Backlight Display 1366 × 768 (HD)</li> <li>• VGA; HDMI</li> <li>• 2 × USB 2.0; USB 3.0</li> <li>• 1.3 MP Camera</li> <li>• 8 GB of DDR3 SDRAM 1333 MHz</li> <li>• 500 GB HDD</li> <li>• 16 GB SDD</li> <li>• DVD±RW</li> <li>• Intel HD Graphics 3000</li> <li>• Wireless: 802.11 a/b/g/n</li> <li>• Gigabit Ethernet</li> <li>• Weight: 1.8 kg</li> <li>• 4 in 1 (SD Card, MultiMediaCard, SDHC Card, SDXC Card)</li> </ul>

- 3.1 Explain what **HDMI** is used for. (2)
- 3.2 What is a **Quad core** processor? (2)
- 3.3 Device A (tablet) uses a Windows 8.1 operating system. Name **TWO** other tablet-operating systems. (2)
- 3.4 Name **ONE** specification in the advert of Device A that will allow you to access the Internet. (1)
- 3.5 Is Bluetooth suitable to replace the 802.11n wireless technology in Device A? Provide a reason for your answer. (2)
- 3.6 **EduRoots** would like to choose one of the above devices, for the children to use while being driven around town. Make a suggestion as to which **ONE** of these two devices you would use, and give **THREE** reasons for your choice. (4)
- 3.7 **EduRoots** decided to use Device B in their office. Give **TWO** reasons why this is a good choice by referring to the device specifications **AND** the scenario. (4)
- 3.8 One of the owners of the company prefers Apple products and would like to run Mac programs on Windows devices.
- 3.8.1 How can this be achieved? (1)
- 3.8.2 Name **TWO** consequences of running a Mac program on a Windows operating system. (2)
- 3.9 One of the main functions of an operating system is the controlling of all hardware and software resources. This includes process management and memory management.
- 3.9.1 What is a **process**? (2)
- 3.9.2 Software and hardware need to communicate with the processor when they need attention. How is this done? (1)
- 3.10 **EduRoots** is thinking of replacing the operating system of Device B (laptop) with Open Source Software (OSS).
- 3.10.1 Which open source operating system would you recommend? (1)
- 3.10.2 Discuss the replacing of the installed operating system with an open source operating system by listing:
- (a) **TWO** advantages and (2)
- (b) **TWO** disadvantages of this replacement. (2)
- 3.11 By using the given scenario, explain a situation where a web browser will use multi-threading. (2)

<b>30 marks</b>
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**SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES****QUESTION 4**

- 4.1 **EduRoots** is networking their office building. The network manager has decided on primarily using copper cables to connect the computers in the office. Give **THREE** advantages of using copper cables in the office network as opposed to using a wireless connection. (3)
- 4.2 In order to connect the devices they have purchased, they have decided to include Wi-Fi with the 802.11n standard.
- 4.2.1 Explain what a **protocol** is. (2)
- 4.2.2 As part of their network infrastructure they must choose between buying a switch OR ADSL router. They can afford only one. Choose which device is needed and provide **TWO** reasons for your answer. Refer to the scenario in your answer. (5)
- 4.2.3 A fibre connection could be an alternative to copper cables. Give **THREE** characteristics of fibre cables. (3)
- 4.2.4 **EduRoots** is considering a wireless mesh network to provide wireless connectivity outside their building as part of a community project.
- (a) What is a wireless mesh network? (1)
- (b) Give **THREE** reasons why wireless mesh technology would be a good solution for providing wireless connectivity outside the building. (3)
- 4.3 **EduRoots** would love the children to take photographs while on their sightseeing journey and share them with their friends and family all over the world. Explain why **BitTorrent** is not suitable for this scenario. (2)
- 4.4 The network manager is trying to understand encryption using keys. She has discovered the following information:
- "When you access your bank's website on the Internet, your browser sends a message to the bank's server that then responds by sending back the bank's digital certificate which contains the public key. Your browser then encrypts all data sent to the bank's website with this public key. The bank then decrypts the data using another key."
- 4.4.1 Is this an example of asymmetrical or symmetrical encryption? Give a reason for your answer. (2)
- 4.4.2 What is the key called that the bank uses to decrypt the data sent to it? (1)
- 4.4.3 What is the purpose of the digital certificate in terms of using a banking website? (2)
- 4.4.4 The above description makes use of a commonly-used protocol for managing the security when transmitting on the Internet. What is this protocol called? (1)

- 4.5 Instead of buying their own servers, the company has decided to make use of Cloud Computing Services. They want to "rent" a server that will function as a mail server and a web server.
- 4.5.1 Why would this NOT be considered as software as a service (SaaS)? (2)
- 4.5.2 What is server virtualisation? (2)
- 4.5.3 Name TWO advantages of server virtualisation. (2)
- 4.6 One of the employees of **EduRoots**, Sally, keeps referring to the server virtualisation as a Virtual Private Network (VPN).
- 4.6.1 What is the purpose of a VPN? (2)
- 4.6.2 Sally confuses server virtualisation with a Virtual Private Network. Explain what the term "Virtual" means in both concepts. (2)
- 4.7 The network manager at **EduRoots** is travelling countrywide and wants to access her work computer via remote access.
- 4.7.1 Explain how remote access works. (2)
- 4.7.2 The network manager thinks remote access is the same as a VPN. Explain how they differ by choosing:
- (a) where the processing will occur in a VPN (local computer/remote computer). (1)
- (b) where the processing will occur in remote access (local computer/remote computer). (1)
- 4.7.3 Which of VPN or remote access would be the most suitable to access a file stored on a file server at **EduRoots**? Give ONE reason for your answer. (2)
- 4.8 **EduRoots** wants to create a website to effectively market their company.
- 4.8.1 What is SEO (Search Engine Optimisation)? (2)
- 4.8.2 Discuss TWO techniques that needs to be followed when designing the website to achieve SEO. (2)
- 4.8.3 Give TWO reasons why the company should choose to create a Dynamic Website by referring to the scenario. (4)
- 4.9 Distinguish between an Intranet and an Extranet. (2)

<b>51 marks</b>
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**SECTION D SOCIAL IMPLICATIONS**

**QUESTION 5**

- 5.1 **EduRoots** regard themselves as an innovative group of people who are in touch with the latest technology trends. List TWO ways that they can stay up to date with these trends. (2)
- 5.2 There are a number of threats to the security of mobile devices. Read the extract from the article provided, and then answer the questions that follow:

**Digital pickpockets are now targeting your smartphone**



A digital pickpocket can gain unauthorised access to your phone to steal sensitive information or data.

"The scourge of viruses, trojans and other malware has long been a familiar foe for desktop PC users. As iPhone users in China recently discovered, these digital nasties are no longer confined to traditional computers and are already a very real threat to the security of mobile devices such as smartphones, tablets and wearables.

Few smartphone owners seem to realise this risk, despite the fact that our smartphones have become a veritable treasure trove of digital booty – photos, passwords, emails and texts, location data and more. To enterprising malware engineers, scammers and bad actors, sneaking into a smartphone may be the ultimate jackpot. Consumers are not without options, however, and taking a few quick and easy precautions vastly decreases the risk of becoming a victim."

[Source: <<http://www.entrepreneur.com/article/253646>> Accessed 4 January 2016]

- 5.2.1 What are trojans? (2)
- 5.2.2 How can you protect your smartphone or tablet against a digital pickpocket? (2)
- 5.2.3 Social engineering is defined as the act of manipulating people into divulging confidential information.
  - (a) Name THREE different social engineering techniques. (3)
  - (b) Give examples of each social engineering technique named in Question 5.2.3 (a) that can occur in the **given scenario**. (3)
- 5.3 Distributed computing power offers new opportunities for solving issues of national and even international importance. Explain why distributed computing could be considered dangerous for computer users. (2)
- 5.4 The students have enabled Location Based Services (LBS) on the tablets. They have uploaded their sight-seeing selfies to Facebook. Explain TWO dangers of enabling LBS in this scenario. (4)

**18 marks**

**SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT**

**QUESTION 6**

**BACKGROUND**

**EduRoots** is using a database table called **tblTravel**, which contains a list of all their vehicles and the drivers who drive those vehicles. Each vehicle is either black or white and has either 4 or 6 seats available respectively. The vehicles drive on EIGHT different routes and each route has a RouteID and a distance. The "VehicleID" and "Driver" and "RouteID" is the composite primary key.

- One vehicle has many drivers.
- One driver can drive any vehicle.
- A driver can drive more than one route.
- Vehicles are either black or white and have either 4 or 6 seats.

**tblTravel:**

<u>VehicleID</u>	<u>Colour</u>	<u>NumSeat</u>	<u>Driver</u>	<u>Tel</u>	<u>RouteID</u>	<u>Distance (km)</u>
1	Black	4	Marcel Roux	0725631212	1	1.5
2	White	6	John Wilcox	0824747441	2	2
3	Black	6	Mike Ndlovu	0836548921	3	2
3	White	4	Sarah Mashala	0124568456	4	2.5
4	Black	4	Sarah Mashala	0124568456	5	2
5	Black	6	John Black	0778549672	6	3
5	Black	6	John Black	0778549672	7	2
6	Black	4	Andi Roy	0564654554	8	3
6	White	4	Andrew White	0769876541	1	1.5

- 6.1 When a database is poorly designed, errors or anomalies can occur which might cause all sorts of difficulties. (3)
- 6.1.1 Name THREE such **anomalies**. (3)
- 6.1.2 Give an example of each type of anomaly by referring to the given tblTravel table. (3)
- 6.2 Motivate why it is necessary to have a **composite key** of three fields VehicleID, Driver, RouteID for a primary key. (2)
- 6.3 Explain why redundant data is produced by first normal form. (2)
- 6.4 Identify a many-to-many relationship in the table. (2)
- 6.5 Normalise the table to Third Normal Form (**3NF**). When writing the relation make use of Relational Notation: TableName (Field01, Field02, Field03 ...) Remember to underline the primary keys. (10)
- 6.6 The age of each vehicle needs to be available as each vehicle must be serviced every two years. (1)
- 6.6.1 Explain why storing the age of the vehicle is not a suitable solution. (1)
- 6.6.2 Provide an alternative solution to determine the age of the vehicle. (1)
- 6.6.3 In which of the tables you created in Question 6.5 would you place this field? (2)

6.6.4 Explain the purpose of using **GROUP BY**, **MAX** and **HAVING** in the following SQL statement:

```
SELECT VehicleID, MAX(Distance) AS MaxDistance
FROM tblTravel
GROUP BY VehicleID
HAVING MAX(Distance) >=2
```

(3)  
[29]

**QUESTION 7**

7.1 **EduRoots** is keeping record of the petrol price each month, since transporting is one of the main aims of the business.

Write an **algorithm** which allows the user to input the petrol prices for each month for a year. Output the name of the month with the **lowest petrol price**. (10)

7.2 The class diagrams for the **Driver Class** and the **DriverArray Class** are given below. The text file containing the relevant data of the driver for **EduRoots** is called **Drivers.txt**. There can be a maximum of 20 drivers. A sample of the text file is printed below:

**Drivers.txt in the format: Firstname#Surname#Cellnumber**

*Marcel#Roux#0725631212*  
*John#Wilcox#0824747441*  
*Mike#Ndlovu#0836548921*  
*Sarah#Mashala#0124568456*

<b>Driver class</b>
<b>Properties:</b> – String name – String surname – String tel
<b>Methods:</b> + Constructor (String n, String s, String t) + getName () : String + getSurname () : String + getTel () : String + toString () : String

<b>DriverArray class</b>
<b>Properties:</b> – Driver driveArr[20] – Integer size
<b>Methods:</b> + Constructor (String filename) + sort() + toString () : String

7.2.1 Motivate why the **Driver class** needs a parameterised constructor method. (2)

7.2.2 Sam (one of the programmers) said he does not want to use the **Driver** class, but would rather make use of three parallel arrays to store the data of the drivers.

(a) Give THREE reasons why the data structure of parallel arrays is an inferior solution. (3)

(b) Give the declaration of the THREE parallel arrays that will store the name, surname and telephone numbers. (3)

7.3 You also want a **Vehicle class** which will store the vehicleID, vehicle colour and the number of seats the vehicle has. Create a class diagram for the Vehicle class. Include the correct data types for the fields, as well as the correct method declarations. You need **not write any code** for the methods, just the **method declarations**. (9)

7.4 A new driver has started at **EduRoots**. His details must be inserted into the Driver's Array. Code a new method called **addDriver** to achieve this. The driver's details will be sent as parameters to the method. (5)  
[32]

<b>61 marks</b>
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**Total: 180 marks**