NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2011

INFORMATION TECHNOLOGY: PAPER I

Time: 3 hours 180 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 10 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.

SCENARIO

The year 2012 where the end of the world is predicted, is fast approaching. Learners from various disciplines have dismissed the idea of catastrophe, similar to what was expected during the year 2000 changeover. Your IT teacher is quite nervous about this and has asked you to preserve as much information about IT as possible in case all existing technologies are re-formatted.

QUESTION 1

Briefly describe each of the following **terms** currently in use so that future generations will be able to understand the present level of technology use. Expansion of the acronyms is not required.

1.1 WAP

1.2 Smartphone

1.3 IP Address

1.4 Protocol

1.5 Interrupt requests

1.6 Symbian

1.7 RFID

1.8 Twitter

1.9 Real-time operating systems

1.10 Repeater

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QUESTION 2

Supply the **correct term** for each description below to provide future generations with a quick cross-reference description of current IT terminology:

2.1 A simple error-detection scheme in which each transmitted message is accompanied by a numerical value based on the number of set bits in the message.

2.2 A method, other than email, of transmitting graphics, video clips, sound files and short text messages over wireless networks using the WAP protocol.

2.3 A location, typically found in airports and coffee shops, where wireless network connectivity is provided for the public.

2.4 The design of equipment and furniture taking the human body into account.

2.5 A freely-distributable open-source operating system that runs on a number of hardware platforms.

2.6 A graphical representation of a player or an icon used in an on-line computer game.

2.7 A protocol used by GSM cellular telephones to communicate with the service provider's computers.

2.8 The global address of documents and other resources on the World Wide Web.

2.9 A set of mobile telephony protocols that includes the two popular standards, High Speed Downlink Packet Access and High Speed Uplink Packet Access.

2.10 A technique used to 'steal' traffic that would normally be directed to another website in search engine results.

2.11 Software that allows computer programs to run on a platform other than the one for which they were originally written.

2.12 A network device that links together different networks using the same protocol.

2.13 An example of a learning management system designed to facilitate online learning.

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QUESTION 3

Use the information provided **on the THREE laptops below** to assist future generations to answer the questions which follow:

LAPTOP A
- Intel® Core™ i7-640M processor 2.8 Ghz with Turbo Boost to 3.46 Ghz
- 8 192 MB RAM
- 256 GB Quad SSD
- Blu-ray Super Multi Drive
- Integrated nVIDIA GeForce GT 330M GPU
- Ethernet LAN and 802.11 bgn
- Microsoft Office Starter
- 13.3" LED display
- Microsoft Windows 7 Professional
- 1 Year warranty

LAPTOP B
- Intel® Core™ i3-380UM processor 1.33 GHZ
- 2 048 MB RAM
- 320 GB HDD
- Integrated Ethernet LAN and 802.11 bgn
- Microsoft Office Starter
- 11.6" LED display
- Microsoft Windows 7 Home Premium
- 1 Year warranty

LAPTOP C
- Intel® Core™ i5-460M processor 2.53 GHz
- 3 072 MB RAM
- 500 GB HDD
- Blu-ray Super Multi Drive
- Integrated webcam, Bluetooth & Ethernet 802.11 bgn
- Microsoft Windows 7 Home Premium
- 15.6" Full HD display
- 1 Year warranty

3.1 Identify the entry-level laptop, the mid-range laptop and the high-end laptop. (3)

3.2 The Core i7-640m processor is a dual-core, hyperthreaded processor with 4 MB of cache memory.

3.2.1 What is cache memory? (1)

3.2.2 Explain the difference between the terms hyperthreading and dual-core in the description of the processor. (2)

3.3 The i7 processor includes turbo boost functionality.

3.3.1 What does the turbo boost do? (1)

3.3.2 Why would you need a turbo boost? (1)

3.4 Considering the above specifications of the laptops, which laptop would you recommend for a Grade 12 IT learner who likes to play 3D computer games? Motivate your answer. (3)

3.5 Your IT Teacher, who enters his marks on a computer on a daily basis, bought laptop B recently and is keen to safeguard his data on the hard drive, but the hard drive is 320 GB in size. He needs to make backups of his hard drive.

3.5.1 List TWO ways your IT teacher can perform a backup of his work. (2)

3.5.2 Justify each of the answers you gave in Question 3.5.1. (2)

3.5.3 How often should this backup take place? Motivate your answer. (2)

3.6 RAM is the best known form of computer memory.

3.6.1 State, in **Gigabytes**, the amount of RAM in each laptop. (3)

3.6.2 Explain any benefits there might be of installing more RAM in laptop C. (2)

3.6.3 Why should the storage capacity of the hard disk drive in each laptop be considerably larger than the RAM? (2)

3.6.4 Name the process where the hard drive disk is used when RAM becomes full. (1)

3.6.5 Briefly explain the process named in Question 3.6.4. (3)

3.6.6 The i7 processor is a 64-bit processor. List TWO of the North Bridge components that are affected by this fact. Justify your answer. (4)

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QUESTION 4

Your IT teacher has asked that you set up a computer network at school, consisting of three different but connected LANs to enable users to communicate with each other and the Internet. The distance between the different LANs will be approximately 300 m.

4.1 What type of network topology would you use within each of the LANs? Motivate your answer. (3)

4.2 An access method is a set of rules governing how network nodes share the transmission medium.

4.2.1 What type of media access method would you use within each LAN? (1)

4.2.2 Briefly explain how the media access method you proposed in Question 4.2.1 works. (3)

4.3 What type of cable would you use between the LANs? Motivate your answer. (2)

4.4 The IT learners may bring their own laptops to school to access the school's Intranet.

4.4.1 List TWO different ways a learner could connect their laptop to the school's network. (2)

4.4.2 Which TWO network protocols would be used to 'surf' the Internet via the laptop? (2)

4.4.3 The school has an uncapped data line that allows all users to connect to the Internet. Briefly explain the meaning of 'uncapped'. (2)

4.4.4 How would each of the following help to protect the school's data?

(a) Firewall
(b) User names and Passwords
(c) RAID
(d) UPS (8)

4.5 The network administrator wants to set up a Virtual Private Network (VPN).

4.5.1 What is a Virtual Private Network? (2)

4.5.2 Give ONE reason why a learner at home would need access to the VPN. (1)

4.5.3 Your IT teacher describes a new concept that may help save much of the information that is presently available on the Internet in the event of the imagined 2012 re-formatting of all technologies. He tells you of a concept called **cloud computing**. Simply put, it is the idea of hosting and sharing all infrastructure, software and services over the Internet. In this way, any future users would simply need a PC with Internet access to make use of any information and software currently available on the Internet.

Discuss how the idea of cloud computing would compare to a VPN. (3)

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QUESTION 5

Your IT teacher has asked you to save as much information as possible for future generations. You use the 'Cut-and-Paste' functionality to save time. Your teacher got upset because as wonderful as the Internet is, it has created the 'Cut-and-Paste' generation. Read the article below and then answer the questions that follow:

Cut-and-Paste Culture

Technology is everywhere. 'Net Geners' cannot remember a time in their education where a computer was not used for some learning experience. Because of this 'tech-savviness', traditional educational practices and ethics are coming into question. Cheating, for example, always a major academic infraction[1], is on the rise on college campuses and technology is helping with cheating. Talk to students and any one of them will tell you that cheating is prevalent and part of the culture, especially in technical disciplines. That is, if you use the strict definition of cheating.

Plagiarism is the academic infraction of choice. How can it not be, though? Information is easily available from the Internet, especially from sites like Wikipedia. Old term papers are being sold online. Because the Internet provides easy information fast, the temptation to click 'copy/paste' and pull in quotes from a website without attribution is great. But students still get caught because faculty members can search for familiar phrases or quotes to root out plagiarism.

Author: **Ben McNeely** is the managing editor of *Technician*, the student newspaper at North Carolina State University.

[Taken from: <http://www.educause.edu/Resources>]

[1] *Infraction = violation; infringement*

5.1 Comment on what you think is meant by the 'Cut-and-Paste' culture mentioned in the above article. (2)

5.2 Give a simple explanation of the Wikipedia website. (2)

5.3 If the above article was reworded, and not referenced, would it be considered plagiarism? Motivate your answer. (2)

5.4 How could the authenticity and the validity of the above Internet article be determined? (2)

E-commerce refers to commercial transactions that take place over the Internet, e.g. on-line shopping or Internet banking. There are always associated security risks.

5.5 What does the 'E' in E-commerce refer to? (1)

5.6 SSL is used only when accessing secure sites, e.g. banking sites. How can you check if a site is secure? (2)

5.7 SSL makes use of Public Key Encryption with a Digital Certificate. Explain, step by step, how it is possible for a user to use their credit card safely on the Internet by referring to SSL. (6)

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QUESTION 6

6.1 You appeal to your IT teacher that the photo of yourself on your Facebook home page could be enhanced using Adobe Photoshop. This will make you more attractive to anyone accessing your data in the future. He is not sure whether this is ethical or not.

Is it unethical to alter your own digital photographs? Motivate your answer. (3)

6.2 You also want to make changes to publicly recognisable images (e.g. make the Mona Lisa smile friendlier or change the colour of the McDonald's logo) and your teacher again questions whether this would be art or fraud.

Critically discuss whether you think altering such images is **art** or **fraud**. (4)

6.3 It has been demonstrated that the whole mechanism for protecting sensitive information is seriously outdated. List TWO measures you would take to protect a company's sensitive data from loss, damage and misuse to ensure its integrity for future use. (2)

6.4 A recent article in the newspaper reports that the total number of emails classified as **spam** has reduced in the last year.

6.4.1 What is spam? (2)

6.4.2 Give THREE ways to protect the data you intend saving for future use from being compromised by spam. (3)

6.4.3 Is it possible to completely block spam? Justify your answer. (3)

6.5 A recent movie described the development of Facebook and mentioned providing an email facility for all of its users. Do you think this feature will be successful? Justify your answer. (3)

6.6 Explain to future generations how you would dispose of an old laptop without negatively affecting the environment. (3)

6.7 Present day IT users often spend too much time solving computer problems. Give TWO examples of computer courses that can upgrade the skills of present day computer users allowing them to be more productive. Explain how these courses will improve productivity. (4)

6.8 Today Web 2.0 technologies allow users to generate their own content. In other words, users can comment as they wish using social media. This has brought about the phenomenon of cyber-bullying. Critically discuss whether banning anonymous comments would reduce cyber-bullying by referring to the technical and social implications. (4)

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QUESTION 7

7.1 It is the year 2012. Your IT teacher's predictions about all data being re-formatted have come to pass! A learner has found the school lab you set up and has accessed a file called **OOP**. Help them understand that this is not 'Oops, I deleted all my data' by explaining the following:

7.1.1 In the context of programming what is information hiding? (2)

7.1.2 Methods describe what an object is capable of doing. Name and briefly describe TWO types of methods. (4)

7.1.3 Briefly describe TWO advantages of programming using object orientation. (2)

7.1.4 Describe TWO advantages of inheritance in object-oriented programming. (2)

7.2 IT professionals use the object-oriented approach for program development. A class diagram is a tool the programmer uses during object-oriented design. The class diagram below should display all IT learners' names and test marks.

Study the class diagram below and then answer the questions that follow:

Learners
- String name - Test1, Test2, Test3
+ **constructor**Learners () + **constructor**Learners(pSurname : String; pTest1, pTest2, pTest3 : Integer) + getAverage() return real + showMarks()

7.2.1 What does the **+** and **–** mean before each field and method in the diagram? (2)

7.2.2 In the above class diagram one of the constructors is overloaded.

(a) What does it mean to overload a method? (2)
(b) Why should you overload the constructors in the Learners' class? (2)

7.2.3 A method must be created to calculate each learner's test average. Write code to calculate **getAverage**(). (3)

7.2.4 What alternative data structure would you use to store Test1, Test2 and Test3? Give TWO reasons to justify your answer. (3)

7.3 The finders of your pre-2012 saved data, find another file called **SQL**. Help them understand that SQL is a structured language to query databases, by supplying answers to the following questions:

7.3.1 What is the purpose of a foreign key? (2)

7.3.2 In a motor vehicle repair shop where vehicles are worked on by many of the employed mechanics, a database is needed to represent the details about each vehicle's repair. The system must store the vehicle registration number, make and model. The name of the employee and ID of the mechanic, who worked on each vehicle, must also be stored.

Use a diagram OR a set of relations to describe how the many-to-many relationship between the vehicle and the mechanics will be represented. (5)

7.4 **Normalisation** is not the post-2012 discovery of saved data, but it is the process of taking data from a problem and reducing it to a set of relations while ensuring data integrity and eliminating data redundancy.

7.4.1 Distinguish between data integrity and data redundancy. (4)

7.4.2 To move from 2NF (second normal form), to 3NF (third normal form), you remove transitive dependencies. When does a transitive dependency exist? (2)

7.5 The program development cycle consists of the following steps:

I *Document Solution*
II *Design Solution*
III *Validate Design*
IV *Analyse Requirements*
V *Test Solution*
VI *Implement Design*

Arrange these steps in a logically correct sequence. *You may also make use of a diagram to illustrate the cycle.* (3)

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Total: 180 marks