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COMPUTER STUDIES DEPARTMENT INFORMATION TECHNOLOGY PAPER 1

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Examiner: D. Gruijters, D Kench

Moderator: Mrs. J Flanagan

Time: 3 hours

Marks: 180

PLEASE READ THE INSTRUCTIONS CAREFULLY

1. This question paper consists of 9 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. Number your answers exactly as the questions are numbered.
5. Leave suitable space between questions and write legibly.
6. You may detach the Appendix to refer to when you answer the questions.

QUESTION 1 TERMINOLOGY**20**

Write a suitable definition for each of the following terms:

- 1.1 Buffer
- 1.2 HSDPA
- 1.3 Cloud Computing
- 1.4 Forum
- 1.5 Information Hiding
- 1.6 Batch Processing
- 1.7 Method Overloading
- 1.8 IPV6
- 1.9 Ergonomics
- 1.10 Compiler

QUESTION 2 HARDWARE & SOFTWARE**51**

Your friend, Sam, (who does not do IT at school) has saved up about R8000 and wants to buy a new desktop computer system. He has been doing some research, but is very confused by all the options that are available. He wants to use the computer for basic office applications, various forms of communicating, as well as photo editing and some gaming.

Sam asks you to answer the questions that follow.

- 2.1 The CPUs in recent computer adverts are usually 2nd generation Core i3, i5 or i7.
 - 2.1.1 What company makes these CPUs? (1)
 - 2.1.2 An article says the architecture of these CPUs has “the processor, memory controller, and graphics on the same die”¹.
 - a) Explain what “on the same die” means. (1)
 - b) What effect do you think this might have in terms of the performance of such a processor? (2)

¹ <http://www.engadget.com/2011/01/03/intels-2nd-generation-core-processor-family-announced-includes/>

- 2.1.3 The same article also states that the manufacturer of these CPUs has “improved its Turbo Boost and Hyper-threading technologies”.
- a) Turbo Boost is a form of overclocking. What is overclocking? (2)
 - b) How does hyper-threading improve processor performance? (2)
- 2.1.4 Hyper-threading is a technology which was utilised in processors before multi core processors were developed.
- a) Given that we now have both dual and quad core processors available, is it still useful to use hyper-threading in these processors? Explain the difference between these technologies in your answer. (2)
 - b) Name one other improvement to the actual CPU chip which has enhanced performance. (1)
- 2.1.5 Based on Sam’s requirements, you have two possible processors to recommend to him: an i3 dual core with a clock speed of 3.4Ghz or an i5 quad core with a clock speed of 2.8Ghz. Justify which processor you would recommend to him. (3)
- 2.1.6 Explain how pipelining will improve the performance of the CPU. (4)
- 2.1.7 Although pipelining improves performance it also can create problems. Explain both problems that can occur and give the solutions used to deal with these problems. (4)
- 2.2 Some specifications refer to 64-bit computing,
- 2.2.1 To run a 64-bit operating system, your computer must have a 64-bit CPU. TRUE or FALSE? (1)
 - 2.2.2 Describe clearly what is meant by a 64-bit CPU. (2)
 - 2.2.3 Explain, with details, whether or not there are any advantages currently in buying a computer with a 64-bit operating system. (3)
- 2.3 A recent computer advert included the following. Explain clearly what each of the following refer to/are used for in a computer system:

ALL DESKTOPS INCLUDE:

Intel® H61MX chipset LGA 1155 Motherboard
HDMI : D-Sub : DVI : Gigabit LAN : 6-Ch Audio
1x PCI Express 2.0 16x : 1x PCI Express IX
2x PCI Slots : 4x SATA 2.0 : 6x USB 2.0 : Mouse and Keyboard

- 2.3.1 HDMI, D-Sub and DVI ports
- 2.3.2 1x PCI Express 2.0 16X
- 2.3.3 4x SATA 2.0 (3)

- 2.4 Are PCI Express and PCI slots the same?
- 1.4.1 YES / NO (1)
- 1.4.2 Justify your answer. (2)
- 2.5 Memory and storage are always big issues when buying a new computer system.
- 2.5.1 Compare the functions of primary memory (primary memory) and storage (secondary memory). (4)
- 2.5.2 Give the minimum specification, type and unit of measurement you would recommend Sam to get in his new desktop computer, for
- a) memory (RAM) (2)
- b) built-in storage (Hard disk) (2)
- 2.6 The operating system is the most important software in any computer system.
- 2.6.1 What operating system (brand and version) would you recommend for Sam's new computer? (2)
- 2.6.2 Discuss your reasons for recommending this operating system. (3)
- 2.7 Explain the difference between the terms multitasking and multithreading. (4)

QUESTION 3

NETWORKING

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The University of Cape Town (UCT) is the leading university on the African continent and the only South African university to appear in the list of the top 250 universities world-wide. Part of their success is due to their extensive use of technology.

The university has contracted you to help solve some of their IT related problems. They require assistance with their network setup, internet policies and algorithms for some of their internal processes.

Consider the network diagram in Appendix A. This diagram depicts part of the UCT network. It shows that the various buildings and departments have their own internal networks which are connected to each other via the larger network. Using the diagram answer the questions which follow:

- 3.1 The network in the commerce faculty consists of a computer lab for students with a printer.
- 3.1.1 What cable is most likely being used to connect the computer in the LAN labelled **A**? (1)
- 3.1.2 Give **TWO** advantages of this cable type. (2)
- 3.1.3 What is the central device in LAN labelled **A**? (1)
- 3.1.4 What type of topology does the network in the Commerce Faculty use? (1)
- 3.1.5 Give **TWO** advantages of using this type of topology with the central device. (2)

- 3.2 All the separate networks on campus are connected via the fibre optic cable labelled **B**. This is a high speed cable with a very high bandwidth.
- 3.2.1 What is meant by attenuation? (1)
 - 3.2.2 Are fibre optic cables affected by attenuation (please tick the correct answer)? (1)
 - 3.2.3 What is eavesdropping? (1)
 - 3.2.4 Explain why fibre optic cables are immune to eaves dropping? (2)
 - 3.2.5 Give TWO reasons why two different types of cable (at A and B) are used instead of just a single cable type. (2)
- 3.3 Consider the network setup in the Media Centre
- 3.3.1 The device labelled C is a WiFi router. Name TWO devices (other than a laptop) which can connect to the network using this device. (2)
 - 3.3.2 Why is it necessary for the WiFi router to be connected to the central device indicated by the circle? (2)
 - 3.3.3 Would you consider the UCT network a WLAN? Motivate. (1+1)
- 3.4 UCT's central servers are situated at the location labelled **D**. In addition the university students have an internal network in their residence labelled **E**. One of the students says that the residence network labelled **E** is a peer-to-peer network.
- 3.4.1 Name THREE services that the servers at labelled D are likely to provide to the UCT network. (3)
 - 3.4.2 Would you consider the network at location E a peer-to-peer network? Motivate your answer. (1+2)
- The diagram shows the UCT firewall labelled F. This provides the entire campus with Internet access. Answer the questions which follow in order to help the management of UCT understand their internet situation and help inform acceptable use policy.
- 3.5 An IP address is indicated near the firewall at location **F**. The chancellor of the university is concerned that if hackers know the IP address of the university they will hack into the network. You explain to him that the firewall can block traffic on certain ports and thus prevent people from hacking in.
- 3.5.1 What is an IP address? (1)
 - 3.5.2 Do all the computers on UCT's network have the same IP address (137.158.158.44)? Explain. (1+2)
- 3.6 When people want to visit UCT's website they type in <http://www.uct.ac.za> which is linked to UCT's servers which are connected to the Internet using a broadband connection.
- 3.6.1 Explain how this URL is linked to the IP address shown at location F by making reference to the service which links URL's to IP addresses. (2)
 - 3.6.2 When the chancellor visits the UCT website his web-browser gives him a message warning him about cookies. What are cookies and what information do they store? (2)
 - 3.6.3 Are cookies dangerous? Give a reason for your answer. (1+1)
 - 3.6.4 What is broadband? (2)

- 3.6.5 Do you think that hosting their web-site on their campus servers affects the speed of the Internet for users on UCT's local area network? Explain (1+2)
- 3.6.6 Even though UCT have their own servers to host their website they still require an ISP. Explain why an ISP is still necessary. (2)

QUESTION 4 SOCIAL IMPLICATIONS

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Social media is becoming part of every sphere of society and UCT is interested in how this phenomenon applies to tertiary education:

- 4.1 What is the difference between social media and social networking? (2)
- 4.2 One of the criticisms of social media is information overload. What is information overload? (2)
- 4.3 The university wants to educate its students as to how they can cope with information overload. Give TWO ways in which young students can stop information overload. (2)
- 4.4 A professor wants to create a Facebook page for all his students where he can provide help and support to his students. Do you think this should be a concern to the university management? Discuss two ways in which this might present problems for UCT. (4)
- 4.5 Describe THREE ways that UCT can use technology to improve the standard of education at their university. (3)
- 4.6 A major concern for UCT is the quality of information used for research and the increasing occurrence of plagiarism.
- a) Give ONE way in which a website's quality and reliability can be assessed by users using the web site. (2)
 - b) What is plagiarism? (1)
 - c) Give TWO examples of plagiarism? (2)
- 4.7 How does Secure Sockets Layer (SSL) encryption work to make personal details safe from others? (3)
- 4.8 Read the account in the box below about Sony PSN.

In April last year, “hackers stole account information from users on Sony Corp.’s 77 million member-strong PlayStation Network. Sony turned off the PSN in response, but said that the information stolen or compromised likely included the following: name, address, country, email address, birthdate, password/login, purchase history and billing address, and credit card information (the card number and expiration date).”²

² <http://blog.zonealarm.com/2011/05/online-gaming-security.html>

Do you think Sony should be held responsible for not providing sufficient security for the data? Justify your answer. (3)

- 4.9 Instant Messaging (IM) logs, like e-mail, are relatively easy for a hacker to intercept.
- Describe TWO possible dangers for teenagers using IM. (2)
 - Give TWO safety measures that teenagers should follow to prevent harm when using IM. (2)

QUESTION 5 PROGRAMMING AND PROBLEM SOLVING

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The following diagram shows the design of a class (and its attributes and methods).

Pizza
ATTRIBUTES: name diameter toppings
METHODS: Create(...); toString : String; setDiameter getCheeseType calcCost

- Name two advantages of Object Oriented Programming. (2)
- What would be a suitable data structure to store at most three toppings for each pizza? Explain your answer. (3)
- The method calcCost determines the cost of the pizza based on the diameter and types of toppings. Should this method be typed or void. explain your answer. (2)
- A new type of Pizza called a Pizza pie has been added. It is a pizza with filling added inside the pizza base. The filling could be chicken or beef. The cost of the pizza pie is the cost of the normal pizza plus R20.
 - Why would inheritance be suitable to create the pizza pie object? (2)
 - Draw a class diagram of the PizzaPie object. Show any inheritance. (3)
 - We need to add a method to calculate the cost of the Pizza pie. Write down the method you would use in Java to calculate the cost as efficiently as possible. Indicate the class that this method belongs to. (5)
- What is polymorphism? Explain your answer using the Pizza class above. (3)

QUESTION 6 DATABASE NORMALISATION**17**

Consider the following database relations for a database called **TakeAwayDelivery**:

TakeAway(storeID, name, telephone, address)

MenuItems(itemID, name, price, storeID)

The **TakeAway** relation exists to store details of all fast food take-away stores in a small town called Sunshine City. It stores all the details of each take-away store: the store's ID, name, telephone number and address.

The **MenuItems** relation stores each item that is sold at each store and the item's price. Different stores may sell different items at a different price.

- 6.1 **itemID** in the **MenuItems** relation is listed as the primary key. Why would the field name, in the **MenuItems** relation, not be a suitable primary key? (2)
- 6.2 Which field is the foreign key of this database? (1)
- 6.3 Explain why a foreign key is needed for this database. (2)
- 6.4 A relation can be identified with a concatenated primary key or a single key that has been added. For example a table that stores information about students and their sports could have a key StudentID combined with SportID. The table could also have add an extra single field called SportStudID to uniquely identify a row still keeping the fields SportID and StudentID. What is the consequence of adding a single field primary key as opposed to concatenating existing fields produce a unique key. (3)
- 6.5 A sample of records of a third relation, called **Orders**, of the **TakeAwayDelivery** database, is listed below:

Orders(itemID, clientID, clientAddress, clientCell, Date, Quantity)

<u>itemID</u>	<u>clientID</u>	clientAddress	clientCell	Date	Quantity
1	1	5 Curl Street, Sunshine City	087986446	15-Jul-10	1
2	1	5 Curl Street, Sunshine City	087986447	15-Jul-10	3
1	5	2 Crescent Avenue, Sunshine City	072569087	1-Aug-10	1
25	4	2 Windy Rd, Sunshine City	076542411	1-Aug-10	1
3	4	2 Windy Rd, Sunshine City	076542411	1-Aug-10	1
17	4	2 Windy Rd, Sunshine City	076542411	1-Aug-10	1
18	10	5 Twisted Lane, Sunshine City	078654219	3-Aug-10	5

Normalise the database using the data from all three tables. Write your solution as a set of relations. Remember to underline all your primary keys. (10)

Appendix A – University of Cape Town Network Diagram

