BCS The Chartered Institute for IT

THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 4 Certificate in IT

COMPUTER & NETWORK TECHNOLOGY

Wednesday 21st April 2010 - Afternoon
Time: TWO hours

Section A and Section B each carry 50% of the marks. You are advised to spend about 1 hour on Section A (30 minutes per question) and 1 hour on Section B (12 minutes per question).

Answer the Section A questions you attempt in Answer Book A
Answer the Section B questions you attempt in Answer Book B

The marks given in brackets are **indicative** of the weight given to each part of the question.

Calculators are **NOT** allowed in this examination.

SECTION A

Answer TWO questions out of FOUR in Answer Book A. Each question carries 30 marks.

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A1. a) The *stored program* von Neumann digital computer executes instructions in a *two-phase fetch/execute* mode. Explain what we mean by the expressions ***stored program*** and ***fetch/execute*** used in this statement.

(6 marks)

b) With the aid of a diagram describe the structure of a digital computer (in terms of registers, buses, and functional units) and explain how instructions are executed.

(12 marks)

c) Describe the machine (assembly language) instructions that are executed by a typical computer. The computer may be a commercially available machine or a conceptual machine that you have studied on your course. Illustrate your answer with several different types (or class) of assembly language instruction to demonstrate the range of operations these instructions may carry out.

(12 marks)

A2. Operating systems have come a long way from the primitive punched-card-based systems of the 1960s to today's operating systems like Windows 7™ or Mac OS X™.

a) Give a brief account of the history of the operating system and indicate some of the key developments in its history.

(6 marks)

b) Explain the role and functionality of the operating system in a modern high-performance personal computer or work station.

(18 marks)

c) Briefly state how you think that operating systems might develop in the next decade?

(6 marks)

A3. a) With the aid of one or more diagrams, explain how a hard disk drive operates.

(12 marks)

b) What are the fundamental characteristics (operating parameters) of a modern high capacity hard disk drive in a PC or work station?

(6 marks)

c) All modern hard disk drives have an internal cache memory. Describe the purpose of this cache memory and briefly explain how it operates.

(6 marks)

d) Optical storage mechanisms such as CD, DVD, and Blu-ray are also used to store data. In what way do the operational characteristics of optical storage media differ from magnetic media?

(6 marks)

A4. An alarm system has four digitals inputs, p, q, r, s and one output, f. The output is asserted (set to a logical 1) if the inputs indicate a dangerous situation.

The alarm inputs are:

Temperature sensor 1	p
Temperature sensor 2	q
Motion detector	r
Sound detector	s

An alarm is sounded if any of the following conditions are true:

- Both temperature sensors are activated
- The motion detector and sound detector are both activated
- One temperature sensor and either the motion detector the sound sensor is activated
- If ever the sound detector and temperature sensor 2 are activated then the alarm is not asserted irrespective of any other input conditions (i.e., this state overrides all others).

a) Construct a truth table with four inputs, p, q, r, s, representing the four sensor states and alarm output f.

(8 marks)

b) Using Boolean algebra write down an expression (unsimplified) for the alarm output f.

(7 marks)

c) By means of Boolean algebra or a Karnaugh map write down a simplified Boolean expression for the alarm output f.

(7 marks)

d) Using AND, OR, and NOT gates design a circuit to generate the alarm signal, f, from the sensor inputs.

(8 marks)

SECTION B

Answer 5 questions (out of 8). Each question carries 12 marks.

B5. Communication protocols provide various functions during data transmission.

a) Describe what you understand by communication protocols. **(6 marks)**

b) Explain where and how DHCP is used. **(6 marks)**

B6. Computer technology has seen lot of development in the recent years. In particular, several semiconductor manufacturers have introduced dual core (or multicore) processors.

a) Explain what a dual-core processor is. **(6 marks)**

b) Describe how dual-core processors have improved processing capabilities. **(6 marks)**

B7. a) Briefly describe the concept of network performance monitoring. **(8 marks)**

b) Explain why it is important to monitor the performance of a computer network. **(4 marks)**

B8. a) Differentiate between LAN and WAN. **(6 marks)**

b) What is a VLAN? **(6 marks)**

B9. a) Define decimal, binary and hexadecimal number bases. Explain why it is necessary to understand number base conversion. **(6 marks)**

b) Convert hexadecimal 4F7B into binary and decimal **(6 marks)**

B10. In the context of computer security, briefly describe the following:

a) Digital certificate **(4 marks)**

b) SSL **(4 marks)**

c) Firewall **(4 marks)**

B11. a) Describe and distinguish between the operating principles of a laser printer and an ink-jet printer.

(6 marks)

b) What factors determine whether a user would buy a laser printer or an ink-jet printer?

(6 marks)

B12. In the context of data security, differentiate between data mirroring and server mirroring.

(12 marks)