THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 4 Certificate in IT

COMPUTER & NETWORK TECHNOLOGY

21st April 2008, 10.00 a.m.-12.00 p.m.
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).

*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. Each question carries 30 marks.

1. a) There are three ways of moving information into or out of a computer: polled input/output, interrupt-driven input/output and DMA.

   Describe, with the aid of diagrams, how a computer may implement **interrupt-driven** input/output. Your answer should describe the advantages and disadvantages of this method with respect to the two other input/output methods. Your answer should also include descriptions of **vectored interrupts** and **prioritized interrupts**.

   (20 marks)

   b) A computer transmits data to a peripheral at 400 Mbits/s. Information is transmitted in the form of 1024-byte blocks of user data followed by a 128-byte block of control data.

   It is necessary to transfer the entire contents of a full 8-Gbyte flash card (e.g., CompactFlash) to a computer using this data transfer mechanism. If we assume that the access time of the flash card is negligible, how long does it take to transfer the contents of a full 8-byte card to the computer?

   Is the assumption of negligible access time for the flash card reasonable?

   (10 marks)

2. a) A computer's architecture is composed of its register set, instruction set, and addressing modes (that is, the architecture represents the assembly language programmer's view of the computer).

Define the terms **register set**, **instruction set** and **addressing modes** and give examples of each of these terms (you may use a real processor or you may use a 'hypothetical' computer with which to illustrate your answer). You should also make clear the difference between register storage and memory storage and explain why it is necessary for a computer to have both internal registers and main memory (RAM).

(20 marks)

b) Year after year computers (CPUs or microprocessors) have steadily become faster in accordance with the empirical law known as **Moore's law**. This law has held for approximately four decades.

State, with reasons, whether you expect this law to hold true for the next two decades or whether computers are reaching limitations to their performance.

(10 marks)

3. A circuit has four inputs, P, Q, R, S, representing the natural binary numbers $0000_2 = 0_{10}$, to $1011_2 = 11_{10}$. P is the most-significant bit.

The input code represents a month of the year with 0000 = January, 0001 = February, …, and 1011 = December. The circuit has one output, X, that is true if the number represented by the input is a month with 31 days. Note that months with 31 days are January, March, May, July, August, October, and December.

a) Construct a truth table for this circuit.

(7 marks)

b) Hence (or otherwise) obtain a Boolean expression for X in terms of inputs P, Q, R, and S.

(8 marks)

c) Give the circuit diagram of an arrangement of AND, OR and NOT gates to implement this circuit.

(7 marks)

d) Modify the Boolean expression of part (b) so that the output is true if the month has 31 days or is February (which can be 28 or 29 days).

(8 marks)

4. a) A modern operating system running on a PC or workstation provides two types of function. One function is the control of the physical hardware (processor, memory, discs, I/O, communications). The other function is the user interface; for example, Windows™.

Describe, in some detail (with diagrams where necessary) these two elements of the operating system. In particular, you should explain the range of both hardware control and user interface functions that are typically available today.

(20 marks)

b) Progress in computer hardware over the last few years has been immense (processor speed, memory capacity and speed, the increasing use of non-volatile flash memory, USB and FireWire serial interfaces, WiFi, and so on).

Using your knowledge of the progress that has been made in the past few years, describe (with reasons) what type of advances and progress you might reasonable see in operating systems design over the next decade.

(10 marks)

SECTION B

Answer FIVE questions out of EIGHT. Each question carries 12 marks.

5. Network technology has developed rapidly over the past few years. Organisations are using state of the art equipment to conduct their business activities. Using suitable examples, describe the following network technologies:

a) Virtual Private Network (VPN)

(6 marks)

b) Intranet

(6 marks)

6. The computer's memory is crucial to its operation. There are different types of memory which enable various tasks to be executed.

a) Describe and explain the need for Virtual Memory in a computer.

(6 marks)

b) *Paging* or *Swapping* is a technique used for Virtual Memory. Explain what Paging is. When does an Invalid Page Fault occur?

(6 marks)

7. BCS Students can access the BCS website and make use of various resources.

a) 'To access the BCS website, students need to know BCS's URL'. Explain this statement using BCS website as an example.

(6 marks)

b) BCS Examiners' reports are available on the website as PDF files. Describe the characteristics of a PDF file.

(6 marks)

8. Various techniques are available for network security. Briefly describe each of the following terms:

a) Data Encryption
b) Digital Certificate
c) SSL
d) S-HTTP

(3 marks each)

9. The OSI model and TCP/IP protocol suite are crucial in enabling interoperability of hardware and software components from different manufacturers.

a) Describe what TCP/IP protocol suite is.

(3 marks)

b) Compare and contrast the TCP/IP layers to those of the OSI model

(9 marks)

10. With reference to wireless computing, explain each of the terms below:

a) Wi-Fi
b) Bluetooth technology
c) GPS

(4 marks each)

11. With wider access to the internet, computer users face increasing security threats. Describe each of the security threats and suggest possible ways of dealing with these.

a) Trojan Horse
b) Hacking
c) SPAM
d) Phishing

(3 marks each)

12. Input-Output devices have become very sophisticated over the past few years. Compare and contrast the following devices.

a) Plasma display and LCD monitors.

(6 marks)

b) Laser-jet and Ink-jet printers.

(6 marks)

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