THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION Certificate

TECHNOLOGY

19th April 2001 – 2.30 p.m. – 4.30 p.m. Time: 2 hours

SECTION A

Answer TWO questions out of FOUR. All questions carry equal marks.

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

- 1. The low-level programmer's view (or assembly language programmer's view) of a computer is known as the computer's architecture. Computer architecture is concerned with a computer's instruction set, its addressing modes, register set, and all the other aspects of its programming model.
 - *a)* Briefly describe the meaning of the terms *register set, instruction set,* and *addressing modes* as they are used in today's world. In each case, you should use appropriate examples. (10 marks)
 - *b)* Describe the architecture of any computer (microprocessor) with which you are familiar. Discuss the strengths and weaknesses of its architecture. (20 marks)
- 2. People have now been using personal computers for over 20 years. A personal computer can be defined as a machine that can be used at home and which includes a range of peripherals from the display and printer to the modem and the scanner.

However, the personal computer in 2001 is a very different machine from the so-called personal computer of 1981.

- *a)* Explain how the personal computer has developed over the last 20 years. We are not interested in particular brand names or in specific interfaces and peripherals. We are interested in the way in which processors and peripherals have developed, the change in their characteristics, and their performance. (14 marks)
- b) How has the role of the personal computer developed over the last 20 years? (8 marks)
- c) How do you think that the personal computer will develop over then next 5 years in terms of its role and functionality? This question does not ask you to state the obvious (i.e., computers will get faster and memories larger); it asks you to consider the way it will develop to both exploit new technology and fulfil new applications. (8 marks)
- **3.** You are sitting at a computer in Singapore using the Internet to find the best place to get a cup of coffee in Seattle, Washington State, in the USA. Explain how your request leaves your computer and travels to the web server in the USA and how the reply is returned. Your answer should briefly cover the I/O techniques used by the computer, the way in which your computer is connected to the Internet, and the way in which the messages travels across the Internet.

You are not expected to describe every possible I/O system and communications technology. Chose a reasonable scenario to describe. (30 marks)

4. Ideally, all computer memory would be *non-volatile*, have an *access time* less than 1 ns, a *density* of 1000 Gbytes/mm², consume no power, and cost almost nothing to manufacture.

In practice, life is not so simple. Optimising one memory parameter is often achieved at the expense of another parameter; for example, fast memory is invariably expensive.

Real computers have dealt with the problem of conflicting memory parameters by employing a *memory hierarchy* with registers and cache memory at the top of the hierarchy and CD-ROMs and magnetic tape at the bottom.

- *a)* Explain the meaning of the four terms in italics in the above three paragraphs. (10 marks)
- b) Explain how the operating system uses memory management to make a collection of different types of memory (cache, DRAM, and hard disk) appear as a homogeneous memory that is as large as the disk space and almost as fast as the cache memory.
 (20 marks)

NOW PLEASE ANSWER QUESTIONS FROM SECTION B OVERLEAF →

SECTION B

Answer FIVE questions out of EIGHT. All questions carry equal marks.

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

5. Write a short note on each of the following:

derive the truth table for the function f.

b) Express the function f as a simplified Standard Sum of Products.

	a)	Computer hacking	(6 marks)	
	b)	Computer viruses	(6 marks)	
	Incl	Include in your answer details of how each of these can be guarded against.		
6.	a)	Describe the main components of a compiler.	(6 marks)	
	b)	Explain, with the use of an example, how the stack is used to support the subroutine call/return m and the passing of parameters.	echanism (6 marks)	
7.	Give	en the decimal number –634.4375 convert it to		
	a)	a 2s compliment binary number	(6 marks)	
	b)	a Binary Coded Decimal (BCD)	(6 marks)	
	Sho	w all workings and state any assumptions made.		
8.	A company that sells motor car insurance is thinking about installing a network of 50 PCs to support its office staff. It has been told it should think about <i>performance, capacity planning, reliability,</i> and <i>resilience</i> of the network but does not know what these terms mean. Write a brief document for the company explaining these terms and why they are important. (12 marks)			
9.	Wit	h the use of examples, briefly describe the uses operating systems make of interrupts.	(12 marks)	
10.	a)	Given the boolean function		
		f = AC(BD + BD) + B(ACD + ACD) + BCD + AD(BC + BC)		

(6 marks)

(6 marks)

11. Write brief notes on the following pairs of topics:

<i>a</i>)	synchronous and asynchronous serial data transmission	(6 marks)
b)	A-D and D-A converters.	(6 marks)

12. *Client side* and *server side* are two terms often used with respect to Web technology. What do you understand by these terms? What is the difference between *static* and *dynamic* web pages? Give examples. (12 marks)