THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 4 Certificate in IT

COMPUTER & NETWORK TECHNOLOGY

15th October 2007, 2.30 p.m.-4.30 p.m.
Time: TWO hours

Both Section A and Section B 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) Compare and contrast the use of magnetic and optical disk storage systems in a high-performance personal computer, work station, or business machine.

Your answer should cover the characteristics and performance of modern state-of-the art optical and magnetic storage devices. **(15 marks)**

b) A hard disk rotates at 15,000 revolutions per minute. A track contains 63 sectors.

i. For this disk calculate the average rotational latency.
ii. Calculate the time taken to read a sector once it has been located.
iii. Calculate the rate at which data is read from a sector while the sector is passing under the read head (i.e., the speed at which data comes from the disk while a sector is being read in bits/second). Assume that a sector contains 4096 bits.

(15 marks)

2. A circuit has four inputs, P, Q, R, S, representing the natural binary numbers $0000_2 = 0_{10}$, to $1111_2 = 15_{10}$. P is the most-significant bit. The circuit has one output, X, that is true if the number represented by the input is divisible by three or seven. (Regard zero as being indivisible by three or seven).

a) Construct a truth table for this circuit. **(8 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 only to implement this circuit. **(8 marks)**

d) Construct a Boolean equation that represents this circuit using NAND gates only. **(6 marks)**

3. a) The architecture of a microprocessor is defined in terms of its resources (e.g., registers), instruction set (i.e., the operations it can carry out), and its addressing modes (i.e., the way in which it can access data).

Although there are many different computer architectures available (e.g., the Intel Pentium, the Power PC, the ARM, MIPS, SPARC), the instruction sets of most computers are fairly similar in terms of the basic operations provided.

Describe the various classes of instruction provided by typical computers (for example, the arithmetic class that includes operations like add and subtract) **(15 marks)**

b) The following terms all describe the same addressing mode in assembly language:

- Indexed addressing
- Pointer-based addressing
- Indirect addressing
- Address register indirect addressing

Describe the meaning of this addressing mode and explain how it is used by **means of an example of your own choice**. **(15 marks)**

4. Today's personal computers are often interconnected with each other by means of a local area network and are also connected by the Internet.

a) Explain how a PC can be connected to the Internet or to other PCs. Discuss the characteristics of the mechanisms used to link computers to each other and to the Internet. **(14 marks)**

b) Data transmission is inherently error-prone (particularly over the public switched telephone system). Briefly describe how a computer's hardware and software is able to reliably transmit information across a network. **(8 marks)**

c) The introduction of the Internet, high-speed networks and large-capacity storage systems have proved to be problematic for those who create music and video (e.g., content providers such as Hollywood). Modern technology is making it increasingly easy to bypass the copyright law (that is, it is easy to make illegal copies of copyrighted material).

Briefly describe the problems posed by modern technology to content providers (music and video) and outline some of the ways in which the content providers can 'fight back' and deal with the problem. **(8 marks)**

SECTION B

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

5. Copy and complete the table below. Clearly show all your workings.

Binary	Decimal	Hexadecimal
	155	
111110011	499	
	40	
		2E
101001010		
		1FB

(2 marks each)

6. The Central Processing Unit (CPU) of the computer contains several registers. Describe the purpose of each of the registers below.

a) Sequence Control Register (also called Program Counter) **(3 marks)**
b) Instruction Register **(3 marks)**
c) Memory Address Register **(3 marks)**
d) Memory Buffer Register **(3 marks)**

7. In the context of networking, differentiate between each of the following pairs of terms:

a) router and switch. **(6 marks)**
b) DTE and DCE **(6 marks)**

8. Over the past few years, there has been lot of development in the areas of network protocols. Describe and explain the following terms:

a) IP address **(6 marks)**
b) VoIP (Voice over IP) **(6 marks)**

9. a) Differentiate between computer virus, spyware and Trojan horse **(6 marks)**
b) Describe the possible strategies you would take in protecting a computer system against the threat of viruses. **(6 marks)**

10. a) What do you understand by the ISO's OSI Reference Model **(2 marks)**
b) Briefly describe the 7 layers of the OSI Model **(10 marks)**

11. Mobile Communications Technology has become very popular over the past few years.

a) Describe the advantages and disadvantages of mobile communications technology. **(6 marks)**

b) Explain how you think mobile technology may develop in future. **(6 marks)**

12. As an IT Support Staff member, you must be fully aware of the functions of Operating Systems.

a) Describe three main functions of an Operating System with which you are familiar. Include in your answer the reasons why these functions are required. **(6 marks)**

b) Compare and contrast between Command Line Interface (CLI) and Graphical User Interface (GUI). As the IT Support Staff, explain when and why you would use CLI. **(6 marks)**