

THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
BCS Level 4 Certificate in IT

COMPUTER & NETWORK TECHNOLOGY

16th October 2006, 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.
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SECTION A

Answer 2 questions (out of 4). Each question carries 30 marks.

1. A computer is defined in terms of its Instruction Set Architecture (ISA) that describes its functional characteristics. A computer's ISA includes its register set, instruction set, and addressing modes.

Describe the instruction set architecture of a computer with which you are familiar. (You may describe a real microprocessor or a 'hypothetical teaching machine').

Your answer should also discuss instruction categories; for example, data movement, arithmetic, etc.

You are asked to describe the computer's register set, addressing modes and typical instructions. You are NOT asked to describe features such as speed, performance, I/O, buses, or memory management. **(30 marks)**

Turn over]

2. An alarm has four logical binary inputs A, B, C, and D. An input is 1 if the corresponding alarm is triggered. The alarm signals are:

A: temperature detector 1 (output 1 if hot)
B: flame detector (output 1 if flames detected)
C: temperature detector 2 (output 1 if hot)
D: smoke detector (output 1 if smoke detected)

The alarm provides a fire warning output under the following circumstances:

- If the outputs of both temperature detectors are true.
- If the output of the smoke detector is true and the output of one or both temperature detectors are true.
- If the output of the flame detector is true.

- a) Draw a truth table to illustrate this problem. **(9 marks)**
- b) From the truth table write down a Boolean expression for the alarm in terms of the four inputs A, B, C, and D. **(8 marks)**
- c) By means of Boolean algebra or a Karnaugh map, create a simplified expression for the fire alarm output. **(7 marks)**
- d) Using AND, OR and NOT gates design a suitable circuit for this alarm. **(6 marks)**

3. The microprocessor drove the personal computer revolution that began in the 1980s. In parallel with the revolution in personal computing, there have been revolutions in the fields of consumer electronics (digital cameras, camcorders, MP3 and personal audio) and communications (the cell phone, WiFi wireless networks, and the Internet/WWW).

A feature of today's world is the convergence between personal computing, communications, and personal entertainment systems. The distinction between computers, personal organizers, and cell phones is beginning to disappear as new devices are marketed that have features of personal computers, cell phones, and entertainment systems.

- a) Provide a short history of the development of computers and communications systems, paying attention to the features that have made these systems so popular, portable, and widely available. **(20 marks)**
- b) Discuss the ways in which you think that such devices will develop over the next two or three years as processing power increases, display devices become more sophisticated and consume less power, and communications systems continue to evolve. **(10 marks)**

4. Computers execute instructions in sequence unless the flow of control is modified by a branch (jump) instruction, or by a subroutine call or a subroutine return.

The flow of control is also modified by the interrupt (also called an *exception*). Interrupts may be divided into two broad classes; those that originate in hardware and those that originate in software.

- a) Explain why interrupts (both hardware and software) have been implemented by most computers. **(8 marks)**
- b) What is the role of *software interrupts* (also called *traps*)? **(7 marks)**
- c) How are hardware interrupts used to implement input/output mechanisms? Describe the sequence of events that take place when a peripheral requests attention. **(8 marks)**
- d) Some computers have a prioritized, vectored interrupt-driven input/output system. What do we mean by the terms *prioritized* and *vectored* in the context of interrupts? **(7 marks)**

SECTION B

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

5. The internet and electronic mail have become major aspects of our daily lives.
- a) Using examples, describe and explain the function and importance of a web browser. **(6 marks)**
 - b) SPAM can seriously affect internet users. Explain what SPAM is. Describe how users can protect themselves against SPAM. **(6 marks)**
6. In the context of networking, differentiate between the following pairs of terms:
- a) local area network and wide area network **(6 marks)**
 - b) FTP and SMTP **(6 marks)**
7. a) Briefly outline the stages of the compilation process. Include in your answer the purpose of each stage. **(9 marks)**
- b) What is the difference between a *compiler* and an *interpreter*? **(3 marks)**
8. Optical scanners are extensively used today for scanning a wide range of data. Describe the operation of an optical scanner. Explain the main characteristics of the scanner and how they contribute to its use. **(12 marks)**
9. With the help of a block diagram, show and briefly explain the internal components of the Central Processing Unit of a digital computer. **(12 marks)**

Turn over]

10. Briefly describe EACH of the following terms and state their roles in a computer system:

- a) Direct Memory Access (DMA)
- b) Virtual memory
- c) Cache memory

(3 x 4 marks)

11. Operating Systems support full Graphical User Interface (GUI) environments. Explain each of the following terms as applied to GUI:

- a) pointer
- b) windows
- c) menu
- d) desktop
- e) shortcut
- f) task bar

(6 x 2 marks)

12. a) What is a DSL Internet Connection?

(6 marks)

b) In the context of network security, describe the use of a *packet filter* and *proxy server* as used in a firewall.

(6 marks)