THE BCS PROFESSIONAL EXAMINATION
Diploma

April 2001

EXAMINERS' REPORT

System Software

QUESTION ONE

a) Describe the facilities provided for users by two different named operating systems (15 marks)

b) Compare the facilities offered by each operating system and comment on their relative 'user friendliness' (10 marks)

Answer Pointers

a) Operating systems are various, (e.g. Windows [any incarnation], Unix/Linux, DOS [any variety], etc). Facilities are made up from file systems, memory management, device interfacing, systems programs, (various), scheduling and anything else that shows up.

b) Comparison of facilities (6 marks)
Commentary (4 marks)

QUESTION TWO

a) Briefly describe a typical memory hierarchy, consisting of at least three levels, for a stand alone computer system (7 marks)

b) For each level of memory, describe its functional characteristics and the ways in which it interacts with its neighbour(s) in the hierarchy (18 marks)

Answer Pointers

a) Context: Registers, RAM, Discs, backup (CDROM, tape zip)

b) Functional characteristics of each plus the movement of data between levels
Diagrams would help greatly (3 x 6 marks)

QUESTION THREE

a) With reference to a named operating system, describe the organisation of its filing system, explaining how files are accessed, including mechanisms to allow for the sharing of files between simultaneously executing processes (15 marks)

b) Describe mechanisms to ensure the privacy and security of files, distinguishing between the two requirements (10 marks)

Answer Pointers

a) According to the operating system chosen – Unix/Linux has its I-nodes and so on,

DOS/Windows has directories/folders (4 marks)
Access to files, according to choice (6 marks)
File sharing approach (5 marks)

b) Privacy/security (easy in Unix..)
Need to distinguish between these (2x5 marks)

QUESTION FOUR

a) Describe and outline the major components from which an operating system is constructed (7 marks)

b) What information is passed between these components and for what purposes? You should describe any necessary data structures used, with their typical contents (18 marks)

Answer Pointers

a) Components include file systems, memory management, device interfacing, scheduling and anything else that shows up. The wording is intended to eliminate potential overlap with question one.

b) Scheduling sends allocation requests to memory management; memory management interfaces with device interfacing, file systems interface with device interfacing and memory management (e.g. VMM) and so on.

Paths between components (5 marks)
Information passed along the paths and its purpose (9 marks)
Data structures (queues, stacks, messages etc) (4 marks)

QUESTION FIVE

a) Modern interactive program development systems provide much more than straightforward compiling or interpreting facilities. Describe briefly the sort of facilities you would expect to find in such a system (10 marks)

b) Discuss the implications that such features have on the way the program is represented (15 marks)

Answer Pointers

a) Syntactic errors result in a display of the erroneous section, with helpful messages. Execution time errors result in a display of the source code that was being executed when the error was detected, together with values of useful variables. Statement by statement execution, with the ability to display values of variables after each statement. Structure editing etc.

b) Expect a discussion about the need to maintain a representation of the original text together with enough syntactic structure information to make interpretation possible.

QUESTION SIX

The syntax of an identifier in a certain programming language is described in Backus Normal Form by the following:

<identifier> ::= <upper_case_letter>|
<upper_case_letter> <tail>
<upper_case_letter>::= A|B|C| . . . |Z
<tail> ::= <letter_string>|<letter_string><digit_string>
<letter>::=<upper_case_letter>|a|b|c| . . . |z
<letter_string>::=<letter>|<letter><letter_string>
<digit>::=0|1|2| . . . |9
<digit_string>::=<digit>|<digit><digit_string>

a) Describe precisely in normal English what are the permissible forms of an identifier (5 marks)

b) Develop a finite state machine that will recognise identifiers of this type (15 marks)

c) Demonstrate the operation of your machine by describing how it will deal with the following character strings: (5 marks)

AbC12
A1b

Answer Pointers

a) An identifier is:

1. A single upper case letter, or
2. An upper case letter followed by a string of upper and lower case letters, or
3. An upper case letter followed by a string of upper and lower case letters , followed by a string of digits

b) Various ways of doing it, depending on how closely you stick to the BNF

c) Depends on your machine