# THE BRITISH COMPUTER SOCIETY

## THE BCS PROFESSIONAL EXAMINATION
Professional Graduate Diploma

## PROGRAMMING PARADIGMS

8th May 2002, 10.00 a.m.-1.00 p.m.
Answer THREE questions out of FIVE.  All questions carry equal marks.
Time: THREE hours.

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

1.  The expression *"Horses for Courses"* is a term used in the racing world to mean choosing the right racehorse for a particular racecourse.  In the programming world, there exists a variety of programming languages that a programmer can use to implement a computer system.   The same expression is used to mean choosing the right language for the right application.

    Choose TWO different types of programming language (such as data-oriented, imperative, object-oriented), and compare and contrast them, discussing what characteristics they have and what type of applications they are most appropriate for. **(25 marks)**

2.  *a)*  Interactive Development Environments (IDEs) are now commonplace for most programming languages. Describe briefly the sorts of features available in such an environment to support the programming development process. **(10 marks)**

    *b)*  Evaluate the success of these tools in improving the productivity of programmers and the quality of the code they produce. **(15 marks)**

3.  *a)*  Discuss the role of constructors, pattern matching and recursion, when using compound types within an applicative (functional) programming language.  Provide illustrative examples of their role within a functional programming language with which you are familiar. **(15 marks)**

    *b)*  Lazy evaluation offers significant advantages over that of eager evaluation when performed within the context of functional programming.  Distinguish between these types of evaluation, and describe what these advantages are. **(10 marks)**

4.  *a)*  Real logic programming languages require "extra-logical" features.  Discuss this statement and comment upon any compromises that these features might create. **(12 marks)**

    *b)*  It has been proposed that logic programming languages should be integrated with other programming paradigms such as functional programming.  Present arguments for and against this integration. **(13 marks)**

5.  *a)*  Describe what is meant by the term *concurrency* when used within the context of multi-programming operating systems, multi-tasking operating systems and embedded systems.  Illustrate your answer with examples for each system. **(10 marks)**

    *b)*  Explain the mutual exclusion problem for concurrent programs.  Using simple examples from programming language examples that support concurrency, discuss the advantages, or otherwise, of the possible solutions to this problem. **(15 marks)**