THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
Professional Graduate Diploma

PROGRAMMING PARADIGMS

20th April 2006, 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. A national supermarket, *Mini-Mart*, wishes to allow its product database to be made available over the web. Customers initially will be allowed to browse what products it stocks and eventually be allowed to shop online. The company currently uses C++ for all its IT systems but is now considering moving to another language for the web system.

    As the senior programmer, you have been tasked with writing a short report evaluating possible choices of language. Choose two different programming paradigms, such as object-oriented programming, scripting languages, logic programming, functional programming, or imperative programming, and evaluate their strengths and weaknesses for such a web-based system. **(25 marks)**

2. *Cap-Saturn* is an international facilities management company. The Technical Director has decided to buy the company's programmers an interactive development environment (IDE). The programmers typically work in individual teams of around ten, but occasionally there is a need for teams from different countries to work together.

    a) Describe what features an IDE should have to support such teams of programmers. **(10 marks)**

    b) The Technical Director needs to justify the expense to the Company's Financial Director. What benefits will the IDE bring to offset these costs? **(15 marks)**

3. *a)* A run-time error is called an *exception*. In the context of an embedded system, why is exception handling necessary and what problems are associated with providing this facility? **(12 marks)**

    b) What is meant by the term referential transparency? Illustrate your answer with examples from both an imperative and a functional programming language with which you are familiar. **(13 marks)**

4. *a)* "To be truly practical, logic programs includes features that have nothing to do with logic programming." Explain why this statement is true. **(12 marks)**

    b) A software inference engine conducts logical inferences from one formula to another until the problem is solved. What role does unification have to play in this process? Illustrate your answer with examples from a logic programming language. **(13 marks)**

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5. *a)*   Explain the term concurrency using examples from multi-programming operating systems, multi-tasking operating systems and embedded systems. **(10 marks)**

b)   In the context of concurrent programs, explain the mutual exclusion problem. Discuss the advantages and disadvantages of the possible solutions to this problem using examples from a programming language that supports concurrency. **(15 marks)**