THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Advanced Diploma

DISTRIBUTED AND PARALLEL SYSTEMS

19th April 2000 - 2:30p.m. - 5:30p.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)*   Suggest the key characteristics and design goals of a distributed computer system and list the basic design issues that may achieve these goals.   **(8 marks)**

     b)   Suggest the desirable attributes of parallel algorithms and list the basic techniques by which their performance may be characterised.   **(8 marks)**

     c)   **EITHER** discuss how design goals are realised in a typical distributed operating system, such as Amoeba, Chorus, Firefly, Lotus or Mach.

            OR discuss how design tradeoffs may be assessed for a typical parallel algorithm, such as Convolution, Matrix multiplication, Shortest path, or 2D Grid.   **(9 marks)**

2.   Three decades ago Flynn classified computer systems into the four categories *SISD, SIMD, MISD,* and *MIMD.*

     a)   By considering the historical development of distributed and parallel systems, enlarge upon the relevance of these categories today.   **(12 marks)**

     b)   Discuss how a modern classification of distributed and parallel systems might be contrived.   **(13 marks)**

3.   Threaded programs may be executed on both single processor and multi-processor computers.

     a)   Explain what is meant by a thread and explain how threads are executed on a single processor. **(8 marks)**

     b)   Discuss how the performance of a multi-threaded program would be expected to alter when ported to a multi-processor.   **(8 marks)**

     c)   Using a programming language of your choice, design a threaded program that could be used to measure the performance of a program on a range of multi-processor computers, with between 2 and 20 processors.

            Explain the design of your program and how the performance will be measured.   **(9 marks)**

4.   Middleware is the term used to define the software technology designed to link otherwise incompatible computers, networks and applications together.

     a)   Describe a set of criteria for selecting middleware, which can be used generically for choosing the most appropriate software for a particular area of application.   **(9 marks)**

     b)   Describe an application that would need to be distributed across at least three computers. Indicate which middleware products would be suitable for linking the distributed parts. Use the criteria developed above to justify your choice.   **(16 marks)**

[Turn over

5.   You have agreed to talk for 30 minutes at the next meeting of your BCS branch. The title of your talk is "Software Engineering for Parallel and Distributed Systems".

Sketch out approximately eight overhead slides, with associated notes, that you would use for your talk.

(25 marks)