THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Professional Graduate Diploma

DISTRIBUTED & PARALLEL SYSTEMS

19th April 2004, 2.30 p.m.-5.30 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. In a parallel or distributed system the issue of load balancing is usually crucial to the performance of the system.

a) Explain what is meant by load balancing and differentiate between static and dynamic load balancing. **(10 marks)**

b) Using an example from a parallel or distributed system you have studied, evaluate how replication of processes within a system can enhance performance. **(15 marks)**

2. 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)**

b) Using a programming language of your choice, design a threaded program that could be used to measure the performance of the 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)**

3. Middleware is a 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. **(10 marks)**

c) 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. **(15 marks)**

4. *a)* Explain what is meant by a concurrent architecture. **(6 marks)**

b) Name three different concurrent architectures, indicate how they may be modelled and describe situations in which the architectures are used. **(9 marks)**

c) Discuss the merits of the different types of abstract connector that co-ordinate communication between components of a concurrent architecture. **(10 marks)**

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

Sketch out approximately eight overhead slides, with associated notes, that you would use for your talk. **(25 marks)**