THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
Professional Graduate Diploma

DISTRIBUTED & PARALLEL SYSTEMS

19th April 2006, 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. *a)* An enterprise application uses a mix of fixed and mobile clients to deliver services to its customers. List and discuss the four key challenges faced by the distributed system, and suggest how these challenges can be met**.** **(12 marks)**

   b) Explain highlighting the notion of physical time, why it is necessary to synchronise computer clocks in distributed systems. Briefly discuss the technique of synchronising the clock of a client process with an external time server. Comment on the issues involved and the ways of addressing them. **(13 marks)**

2. *a)* Discuss the two approaches used for file sharing in Peer-Peer (P2P) systems highlighting advantages and disadvantages of each approach**.** **(12 marks)**

   b) Explain the purpose of replicating data objects in distributed systems. Discuss clearly highlighting issues, an architectural approach for carrying out transactions on replicated objects in distributed systems.
 (13 marks)

3. *a)* There always seems to be a demand for greater computational power from computer systems than is currently possible.   From where does this demand arise? **(7 marks)**

   b) In terms of speed-up factor and scalablility:
      i) what is the potential for increased computational speed within a multiprocessor system? **(8 marks)**

      ii) what is meant by *super linear speed up*? **(4 marks)**

   c) A multiprocessor consists of 100 processors, each capable of a peak execution rate of 2 Gflops.   What is the performance of the system as measured in Gflops, when 10% of the code is sequential and 90% is executed in parallel? **(6 marks)**

4. *a)* Shifting, scaling, rotation and clipping are graphical operations that can be performed upon a stored image. Explain why these operations may be considered *naturally* parallel? **(4 marks)**

   b) Summarise three different programming strategies that may apply to problems that can be divided into independent parts. **(9 marks)**

   c) For each strategy summarised above, describe an application that illustrates the use of that strategy.
 (12 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 *Trends in Distributed and Parallel Systems: Looking from the Past and Present toward the Future.*

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

(25 marks)