THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
Professional Graduate Diploma

NETWORK INFORMATION SYSTEMS

21st 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 process group is a collection of processes that co-operate towards a common goal or that consume one or more common streams of information. Group structures are defined according to the pattern of communication in which the members of a group are involved.

   The figure below shows one such group structure, referred to as client-server group.

   a) Explain how requests from clients are handled and the subsequent actions of the servers. (**9 marks**)
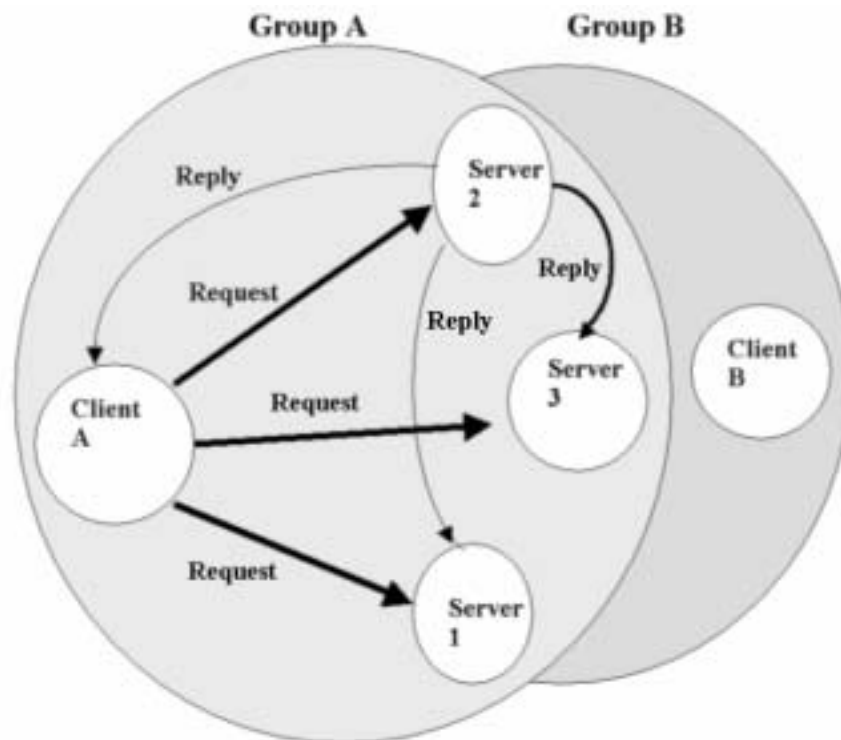
   b) Using diagrams where appropriate, explain the principles of operation of the following group structures:

   i) Peer group
   ii) Server group
   iii) Subscription group
   iv) Hierarchical group

   (**16 marks**)

2. *a)* Explain the difference between a GET and a POST HTTP request to a Web server and within your explanation clearly identify when POST should be used in preference to GET. **(10 marks)**

b) Explain why HTTP is stateless and describe the mechanisms which can be used to implement the following sessions on a Web site:
i) log in
ii) update profile
iii) log out **(9 marks)**

c) Identify the mechanisms which can be used to restrict access to a Web site to authorised users only. **(6 marks)**

3. You are required to produce a draft report identifying the design issues that arise specifically from the distributed nature of systems. However as a full report would cover five sections: Naming, Communication, Software Structure, Workload Allocation and Consistency Maintenance, your report should only consider Workload Allocation.

Your report, using suitable diagrams where necessary, should be divided into the following four parts:
a) the Workstation-server model **(6 marks)**

b) the processor-pool model **(6 marks)**

c) use of idle workstations **(6 marks)**

d) shared-memory multiprocessors **(7 marks)**

4. *a)* Describe the principles of public key cryptography. Explain what makes public key encryption secure when using the RSA algorithm. **(7 marks)**

b) Describe mechanisms by which public keys can be exchanged which avoid a "Man in the middle Attack". **(8 marks)**

c) Explain how a digital certificate is used as:
i) a server certificate
ii) a client certificate **(10 marks)**

5. *a)* With reference to Wide Area Networks explain the terms:
i) circuit switching
ii) packet switching
ii) message switching.

Also explain why message switching suffers from several weaknesses related to message length. **(11 marks)**

b) With the aid of an example and a diagram verify the following statement; 'A message gets to its destination faster when sent within packets'. **(8 marks)**

c) Interface Message Processors (IMPs) are used in international Wide Area Networks. Produce a schematic design for such a network, making reference to the length of packets and messages as parameters of data communications between hosts and IMPs. **(6 marks)**