2003 Paper 6 Question 4

Concurrent Systems and Applications

A distributed system is being designed to hold details of appointments on behalf of its users. The system comprises a single server holding the appointments and a number of clients which interact with the server over a network supporting an unreliable datagram-based protocol such as UDP.

(*a*) The server is to provide operations using a remote procedure call (RPC) interface with exactly-once semantics. For instance,

```
boolean addEntry (Client c, Client d, Appointment a);
```

is used by client `c` to add an entry to the diary of client `d`. Describe how this RPC system can be implemented, including

(*i*) how parameters are marshalled and unmarshalled;

(*ii*) how exactly-once semantics are achieved;

(*iii*) how threads are used, both within a client and within the server.

You may assume that the clients already know an appropriate network address to contact the server and that separate mechanisms are used for authentication and for security in general. [10 marks]

(*b*) The system is to be extended to support transactional-style accesses by providing three further operations,

```
void startTransaction (Client c);
void abortTransaction (Client c);
boolean commitTransaction (Client c);
```

Define *strict isolation* and describe how, in this case, it could be enforced by *timestamp ordering*. [10 marks]