2008 Paper 5 Question 4

Concurrent Systems and Applications

(a) A web server is an application that listens for incoming network connections on TCP port 80. Once a connection is established, the task of processing client requests and sending replies can be handled by an instance of a `Worker` class which you may assume already exists. `Worker` implements the `java.lang.Runnable` interface and has an accessible constructor that takes as argument a `java.net.Socket` object representing the network connection to a client.

Provide the Java code for a webserver which, upon start-up, attempts to listen on TCP port 80 and starts a new `Thread` running a new `Worker` for every connection. Your program should print helpful error messages indicating the likely cause of problems when it is unable to proceed as expected.   [10 marks]

(b) A busy web server might expect to handle concurrent requests to read and update some shared data and could use Timestamp Ordering (TSO) to enforce isolation between concurrent transactions.

  (i) Explain how TSO enforces isolation.   [5 marks]

  (ii) Is TSO appropriate for a web server application? Explain your reasoning.
                                                              [5 marks]