# 2001 Paper 9 Question 1

Distributed Systems

(*a*) Explain the problem of clock drift in distributed systems.   [2 marks]

(*b*) What sources of conventional earth time might be used by computer systems? How would you estimate bounds on the accuracy of time received from such a source?   [4 marks]

(*c*) What constraint does distributed inter-process communication (IPC) impose on the clock values of the communicating parties?   [1 mark]

(*d*) Outline one clock synchronisation protocol that satisfies this constraint.   [4 marks]

(*e*) For each of the cases of IPC illustrated below, give the vector clock values that message receiving and delivery modules could maintain for each process.
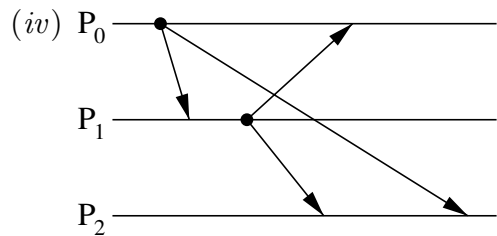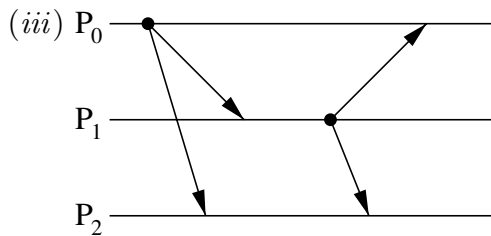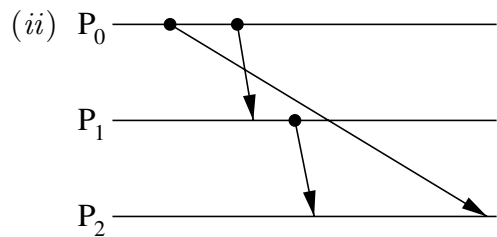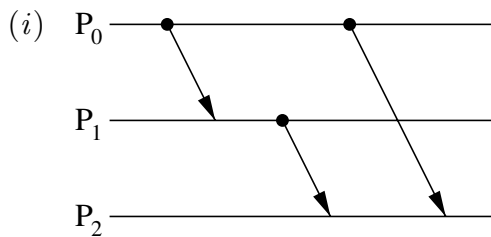
[6 marks]

(*f*) Define "causal order" of message delivery. In which, if any, of (*i*) to (*iv*) above is causal order violated at the message receiving module?   [3 marks]