COMPUTER SCIENCE TRIPOS Part II – 2014 – Paper 8

10   Principles of Communications (JAC)

(a) In distributed routing in networked systems such as the Internet, there may be intermittent faults which could cause the choice of routes to osciliate between one path and another, leading to undesirable consequences.

(i) What problems would rapid route change cause?   [5 marks]

(ii) How might a feedback control system be used to damp such oscillations?
                                                                          [5 marks]

(b) A network provider deploys Explicit Notification (ECN) capability in their routers. End systems running TCP can take advantage of this to trigger Congestion Control behaviour in TCP when receiving packets with ECN marks. A suggestion that the TCP congestion control scheme to date, using Additive Increase and Multiplicative Decrease (AIMD) could be replaced by a proportional-integral-derivative controller (PID controller) is made.

Describe how such a controller could operate to adjust TCP's congestion control window in response to ECN marked packets in qualitative terms. Explain any assumptions that might have to be made about the bottleneck router marking packets and what the advantages of a PID controller over AIMD might then accrue.   [10 marks]