Operating System Foundations

(a) By means of an example, show why concurrency control, comprising both mutual exclusion and condition synchronisation, is needed in operating systems. [4 marks]

(b) Explain why, in general, forbidding interrupts is not appropriate as a basis for implementing concurrency control. [2 marks]

(c) How can a “read-and-clear” machine instruction be used as a basis for mutual exclusion and condition synchronisation? [4 marks]

(d) Define semaphores and discuss how they can be implemented. [6 marks]

(e) How can semaphores be used to achieve mutual exclusion and condition synchronisation? [4 marks]