

COMPUTER SCIENCE TRIPOS Part IA – 2017 – Paper 2

3 Operating Systems (RMM)

- (a) What is the *CPU IO burst cycle*? How does it motivate *multi-programming*? What does it mean for a process to be *CPU bound* or *IO bound*? [6 marks]
- (b) Consider a single processor system supporting two running processes, *A* and *B*, with the following sequential execution patterns:

A: [CPU 8 ms; IO 1 ms; CPU 8 ms; IO 1 ms; CPU 8 ms]

B: [CPU 2 ms; IO 1 ms; CPU 2 ms; IO 1 ms; CPU 2 ms]

Assume that IO operations do not interfere with each other and are blocking, and that scheduling and context switch times are negligible.

- (i) What is the total elapsed time for the two processes to run to completion? [2 marks]
- (ii) Assume the system runs a non-preemptive scheduler where processes are scheduled in the order in which they become runnable, and that *B* takes priority over *A* in the event of a tie. Give the combined execution pattern of the two processes in the format as in part (b), and determine the total elapsed time for the two processes to run to completion. [5 marks]
- (iii) Repeat part (b)(ii) with a pre-emptive scheduler operating with a time slice of 4 ms. [5 marks]
- (iv) What are the costs and the benefits of a pre-emptive over a non-preemptive scheduler for this workload, which would you choose, and why? [2 marks]