

# Advanced Systems Lab Exercises

## Queuing Exercises 02

Presented on: **23rd Nov 2009**

### Exercise 1

For a queuing system  $M/M/1/B$ , compute the number of jobs in the system as a function of the traffic intensity.

### Exercise 2

Assume a device with an arrival rate of 10 jobs per second and the ability to process up to 5 jobs in parallel with an average service time of 0.1 seconds for each server. Show that the system has better performance if implemented as  $M/M/5$  than as five distinct  $M/M/1$  systems and that we can uniformly distribute the jobs across the 5 systems.

### Exercise 3

Show algebraically that the traffic intensity in an  $M/M/m$  system is the same as the traffic intensity of each one of the queues if we model the same system as  $m$   $M/M/1$  queues.

### Exercise 4

During an observation period of 5 seconds, a device processed 2000 requests. The device can process 500 requests per second. What was the utilization of the device?

### Exercise 5

We can choose the speed at which we can clock a digital device so that it can process between 200 and 800 request per second depending on the clock rate. To avoid overheating, the device can only operate at a maximum utilization of 50%. What is the throughput range that can be achieved with such a device?