

2006 Paper 8 Question 11

Computer Systems Modelling

- (a) Define the $M/M/1$ queueing model and derive the steady-state distribution for the number of customers present when the traffic intensity is less than one. [5 marks]
- (b) For the $M/M/1$ model in steady-state, derive the mean number of customers present and the mean time spent by a customer in the system. What is the utilisation of the server? [5 marks]
- (c) Now consider the $M/M/1/K$ queueing model with K finite and again derive the steady-state distribution for the number of customers present. For what values of the traffic intensity does your steady-state distribution exist? What is the utilisation of the server and explain how this compares to the $M/M/1$ queueing model. [5 marks]
- (d) Give an example of the use of the $M/M/m/m$ loss model. Derive Erlang's formula for the steady-state probability that an arriving customer finds all m servers occupied. [5 marks]