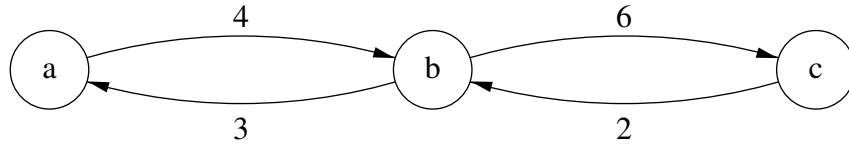


1993 Paper 8 Question 3

Computer System Modelling

The state diagram for a Markov chain showing transition rates is shown below. Solve for state occupancy probabilities.



[5 marks]

The steady state distribution for the number of jobs in an $M/M/1$ queue, k , is

$$p_k = (1 - \rho)\rho^k \quad k = 0, 1, 2, \dots$$

where $\rho = \lambda/\mu < 1$. Here λ and μ are the mean arrival rate and mean service rate respectively.

Find the first and second moments of this distribution and hence verify that the variance of the number of the jobs in the system is given by

$$\frac{\rho}{(1 - \rho)^2}$$

[10 marks]

What does this result show about the predictability of system performance at high loads?

[5 marks]