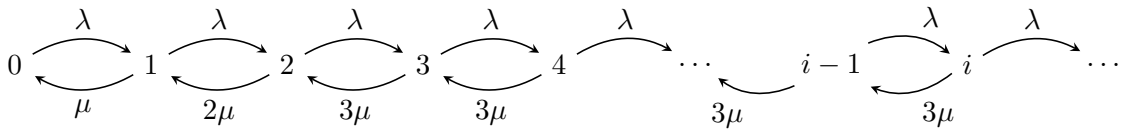
YOUR NAME:
YOUR TA usually:

Stochastic Modelling, Short test 4

5 December 2022, 12:25-12:45

Question 1. Consider the $M/M/3$ model. It is a CTMC with transition diagram



(a) Write down the balance equations for sets $\{0, \ldots, i-1\}$, $i \geq 1$.

(b) From the balance equations, express in terms of p_0^{occ} all other p_i^{occ}. You can use the notation $\rho := \lambda/(3\mu)$ (in particular, $\lambda/\mu = 3\rho$, $\lambda/(2\mu) = 3\rho/2$).

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Question 2. In the PK formula, you have to calculate the second moment $E(B^2)$ for the service time B.

(a) What is $E(B^2)$ if the service time B has the normal $N(3, 1^2)$ distribution? Recall that the 1st parameter of the normal distribution is its expectation and the 2nd parameter is its variance.

(b) What is $E(B^2)$ if the distribution of the service time is

$$B \sim \begin{cases} N(3, 1^2) & \text{with probability } 1/3, \\ N(7, 2^2) & \text{with probability } 2/3 \ ? \end{cases}$$

(Show how you plug in all the numbers, you do not have to finish the calculation.)