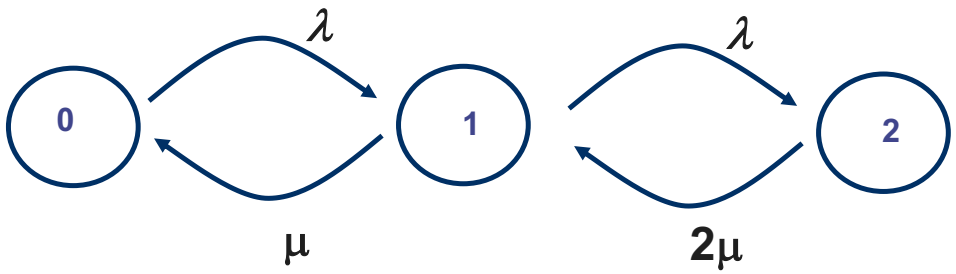
COMP9334 Revision Questions Week02B — Solution

Question 1

(a) The state transition diagram is:



The state transition rate from S_2 and S_1 should be 2μ. Note that in order for the state to move from S_2 to S_1, any one of the calls in the call centre has to finish. Consider a small time interval δ,

$$
\begin{aligned}
& \text{Prob[Transiting from } S_2 \text{ to } S_1] \\
= \; & \text{Prob[Call at Operator 1 has finished OR Call at Operator 2 has finished]} \\
= \; & \text{Prob[Call at Operator 1 has finished]} + \text{Prob[Call at Operator 2 has finished]} - \\
& \text{Prob[Call at Operator 1 has finished AND Call at Operator 2 has finished]} \\
= \; & \mu\delta + \mu\delta - (\mu\delta)^2 \\
\approx \; & 2\mu\delta
\end{aligned}
$$

(b) The state balance equations for States 1, 2 and 3 are respectively:

$$
\begin{aligned}
\lambda P_0 &= \mu P_1 && (1) \\
\mu P_1 + \lambda P_1 &= \lambda P_0 + 2\mu P_2 && (2) \\
\lambda P_1 &= 2\mu P_2 && (3)
\end{aligned}
$$