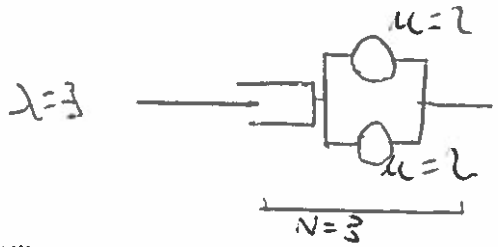
NAME:_____

Extra Credit Quiz ESE-CSE 346 T. Robertazzi Fall 2019

Answer all questions. Total is 6 points: part 1:4 pts, part 2: 1 pt, part 3: 1 pt. Show all work.

1. **[a]** For this queueing system showing all work in detail clearly find p_0 numerically. Here the system holds 3 customers at most.



[b] Find U, utilization.

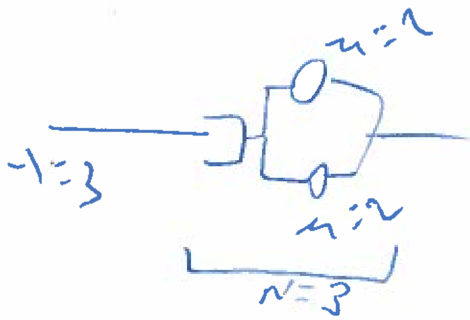
[c] Find P_B, blocking probability.

Extra Credit Quiz

Fall 2019

ESE/CSE 346

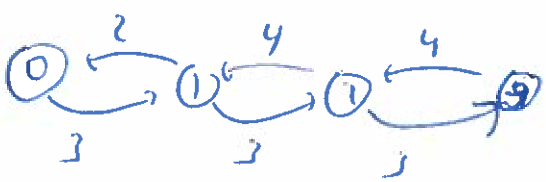
6 points



M/M/2

Find P_0, U

Let $\lambda = 3$ $\mu = 2$



P_0:

$3P_0 = 2P_1$	$P_1 = \frac{3}{2} P_0$	$P_1 = \frac{3}{2} P_0$
$3P_1 = 4P_2$	$P_2 = \frac{3}{4} P_1$	$P_2 = \frac{9}{8} P_0$
$3P_2 = 4P_3$	$P_3 = \frac{3}{4} P_2$	$P_3 = \frac{27}{32} P_0$

$$P_0 + \frac{3}{2} P_0 + \frac{9}{8} P_0 + \frac{27}{32} P_0 = 1$$

$$P_0 = \frac{1}{1 + \frac{3}{2} + \frac{9}{8} + \frac{27}{32}}$$

$$= \frac{1}{1 + 1.5 + 1.125 + .84375}$$

$$= \frac{1}{4.469}$$

$= .2237 = P_0$ (4)

$U = 1 - P_0 = .776$ (1)

$P_B = P_3 = \frac{27}{32} P_0$ (1)

(6)

$= .1887$