14.d) G/H/1 queue w/ a=1, b=5, μ=.4

$$\sigma = \sqrt{(b-a)^2/12} = \sqrt{(5-1)^2/12} = \sqrt{16/12} = 1.16$$

mean service time = 2.5 mins

mean interval: 3 mins

$\lambda = 1/3$

$1/.4 = 2.5$ mins

$\frac{5+1}{2} = 3$

$\rho = \frac{2.5}{3.0} = .83 = 83\%$ utilization

$$W_q = \frac{\lambda(\sigma^2 + 1/\mu^2)}{2(1-\lambda/\mu)} = \frac{1/3(1.16^2 + 1/.4^2)}{2(1-\frac{1/3}{.4})} = \frac{.85 + 6.25}{2(.167)} = \frac{7.1}{.33}$$

$= 3.87$ minutes

$L_q = W_q \cdot \lambda = 3.87 \text{ minutes} \cdot 1/3 =$ 1.30 entities in queue

$W = W_q + 1/\mu = 3.87 + 1/.4 =$ 6.37 minutes in system

$L = \lambda W = 1/3(6.37 \text{ minutes}) =$ 2.12 entities in system

The above was my initial try, which differs from what I expected based on spreadsheet provided. My retry is below:

$\mu = .4$

$a = 1$ $\rho = 2.5/3 = .83 = 83\%$

$b = 5$

$\lambda = 1/3$ $W = \frac{1}{\mu(1-Z)} = \frac{1}{.4(1-.7210115)} = \frac{1}{.1115954}$

$Z = .7210115$ (from spreadsheet)

$=$ 8.96 mins. in system

$W_q = W - 1/\mu = 8.96 - 1/.4 =$ 6.46 mins in queue

$L = \lambda W = 1/3(8.96) =$ 2.99 entities in system

$L_q = W_q \cdot \lambda = 6.46 \text{ mins} \cdot 1/3 =$ 2.15 entities in queue

Not sure how to attack finding Z.