Homework 2

October 21, 2010

This problem refers to section 3.3 where we applied the fluid flow approximation to a multiplexer carrying voice traffic. Consider the case of $N = 2$ voice sources, with $\frac{1}{\alpha} = 1sec$ and $\frac{1}{\lambda} = 1.5sec$.

1. Find C, J_0 and J_u for two cases $\rho = 0.5, 0.75$ and $\rho = 0.85$. Indicate all three values on state diagram as in figure 3-5 of the textbook.

2. Find and compare the eigenvalues of equation 3-18 for the two cases in the previous case 1. Show that in both cases one eigenvalue is always 0 as expected!

3. Find the eigenvectors for all cases.

4. Derive the cdf $F(x) = Prob(X \leq x))$ for the queuesize. Compute the $G(x) = Prob(X > x))$. Also approximate the $G(x)$ using the dominant eigenvalue and verify that this eigenvalue is given by equation 3-42 in the text. Plot $G(x)$ and its approximations as a function of x for the different loads ρ.

You may wish to use Matlab for your calculations. Feel free to collaborate. Your report should include your code with enough documentation.