IEOR 263A PS 10

Do Chapter 7 problems: 32, 42, 43, 44. Also:

1. (optional) If the time between renewals is either 5 with probability 1/3 or 15 with probability 2/3, what is the equilibrium distribution? What is its mean? Describe the equilibrium distribution as a mixture of Unif(0,5) and Unif(0,15). Why do the mixing probabilities make sense?

2. (optional) An airport shuttle bus picks up all passengers waiting at a bus stop and drops them off at the airport terminal; it then returns to the stop and repeats the process. The times between returns to the stop are independent random variables with distribution F, mean μ, and variance σ^2. Passengers arrive at the bus stop in accordance with a Poisson process with rate λ. Suppose the bus has just left the stop, and let X denote the number of passengers it picks up when it returns.

   (a) Find $E[X]$.

   (b) Find $Var(X)$.

   (c) At what rate does the shuttle bus arrive at the terminal without any passengers?

   (d) Suppose that each passenger that has to wait at the bus stop more than c time units writes an angry letter to the shuttle bus manager. What proportion of passengers write angry letters?

   (e) How does your answer in part (d) relate to $F_e(x)$?