EXERCISES S-38.215: WEEK 5

Exercise 12:

Consider the fluid model for the TCP source described in the lecture of this week. Assume that the TCP source can only be in two states (S = {1,2}) and that $r < c < 2r$. Show that

$$\begin{aligned} F_1(y) &= F_1(K) \cdot e^{\theta(y-K)}, \\ F_2(y) &= F_1(K) \cdot \frac{c-r}{2r-c}\left[e^{\theta(y-K)} - e^{-\theta K}\right], \end{aligned}$$

where $\theta = \lambda/(c-r)$ and

$$F_1(K) = \frac{\mu}{\lambda+\mu}\left[1 + \frac{\mu}{\lambda+\mu}\frac{c-r}{2r-c}(1-e^{-\theta K})\right]^{-1}.$$

Furthermore, show that the fraction of time that the buffer is congested is given by $\lambda F_1(K)/\mu$.

Exercise 13:

Consider the basic fluid queue model with inflow regulated by an on-off source. Discuss what the effect on the buffer content is if the on-periods are given by

- a sum of a regularly varying period with index $-\nu_1$ and a regularly varying period with index $-\nu_2$;
- a mixture of a regularly varying period with index $-\nu_1$ and a regularly varying period with index $-\nu_2$ (i.e. a fraction of the on-periods is regularly varying with index $-\nu_1$ and the remainder of the on-periods is regularly varying with index $-\nu_2$).