EXERCISES S-38.215: WEEK 2

Exercise 5

Consider the basic fluid queue model presented in lecture 2. Adapt the continuous-time approach to the model with a finite buffer of size K. Find an expression for the fraction of fluid that will overflow.

Exercise 6

Consider the basic fluid queue model presented in lecture 2. Adapt the continuous-time and the discrete-time approach to the model with Erlang-2 distributed on-times (take e.g. $\lambda = 1$ and $\mu = 6$).

Exercise 7

Consider the basic fluid queue model presented in lecture 2. Let B be the length of a period during which uninterruptedly fluid comes out of the buffer. Show that the Laplace-Stieltjes transform $E(e^{-sB})$ is given by

$$E(e^{-sB}) = \frac{\mu + 2s + \lambda - \sqrt{(\mu + 2s + \lambda)^2 - 4\lambda\mu}}{2\lambda}.$$

Hint: either derive a system of differential equations for the functions

$$\phi_i(x) := E(e^{-sB} | I(0) = i, Z(0) = x),$$

or use the relation between the basic fluid queue model and the ordinary $M/M/1$ queue.