15.072
Homework Assignment 2

Problem 1 (a) **Exercise 2.2** Construct a counterexample for PASTA, for a queueing system with a Poisson arrival process for which the lack of anticipation assumption fails to hold.

(b) **Exercise 2.5** A random variable has an Erlang distribution with k phases (E_k), if it is distributed as the sum of k identical exponential random variables. Compute the functions $K(z,t)$ and $K_o(z,t)$ for a renewal process, in which the interarrival distribution is E_2 (Erlang distribution with two phases).

(c) **Exercise 3.1** Let Λ be the number of customers served in a busy period of an $M/GI/1$ queue. Compute $E[z^\Lambda]$.

Problem 2 1) Give a counterexample of the distributional law for a system that violates FIFO, i.e. it allows overtaking.

2) Give a counterexample of a single server queueing system where the distributional law for a system that violates FIFO, i.e. it allows overtaking.

Problem 3 Consider a queueing system with i.i.d. interarrival times where service time of a customer C_n is equal to $A_{n+1} = T_{n+1} - T_n$ - the interarrival time of the next customer. Assume there is exactly one customer at time 0 and the service time of this customer is T_1.