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 \( K_{z\l t} \) and \( K_{z\l t} \) for a renewal process, in which the interarrival distribution is \( E_2 \) (Erlang distribution with two phases).

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

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 \( T_1 \).