

Exercise 4

Renewal processes

The company A/S Satellite has some electronic control equipment which is stationed on earth. A critical component of this system has a life time distribution given by the Laplace transform $f^*(s)$:

$$f^*(s) = \frac{2}{3} \frac{1}{s+1} + \frac{2}{3} \frac{1}{(s+1)^2 + 1}$$

The time unit is one month. A component of this type is replaced immediately with a new one on failure.

- Question 1 Calculate mean and variance in the life time distribution of the components.
- Question 2 Determine the probability that 30 or more components has to be replaced during the time span of two years. The expression can be approximative.
- Question 3 Give an exact expression for the expected number of replacements during a time interval of length t , under the assumption that a new component was installed at $t = 0$.

At some point in time the information on the time in service of the component currently in service is lost.

- Question 4 Give an expression for the distribution of the remaining life time of the component.
- Question 5 Give an expression for the expected number of components, which will be replaced during a time interval of length t .