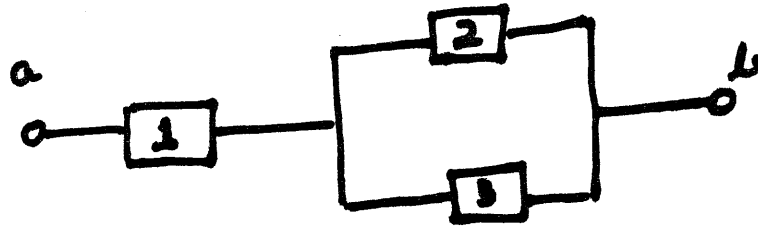


1. A failure-time distribution for the random variable  $T$  has a hazard function  $r(t) = \theta t$  for  $t > 0$  and  $\theta > 0$ .
- (a) Derive an expression for the corresponding survivor function,  $R(t)$ .
  - (b) Find the MTTF of the item.
  - (c) Find the median life time of the item.
  - (d) Study the aging property of this distribution.

2. Consider the following structure:



- Determine the structure function by use of appropriate pivotal decompositions.
- Find the minimal path sets and the minimal cut sets.
- Calculate the structural importance of each component.
- Suppose that each component has an exponential failure time with rate  $\lambda$ . Write an expression for the probability density function of the lifetime of the system.

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3. Consider an item with reliability function:

$$R(t) = \frac{1}{(t+1)^2} \quad \text{for } t > 0.$$

where the time  $t$  is measured in days.

- (a) Determine the MTTF of the item.
- (b) Find the median life of the item.
- (c) Find the MRL of the item age  $t=5$  days.
- (d) Make a sketch of  $MRL(t)$  as a function of the age  $t$ .



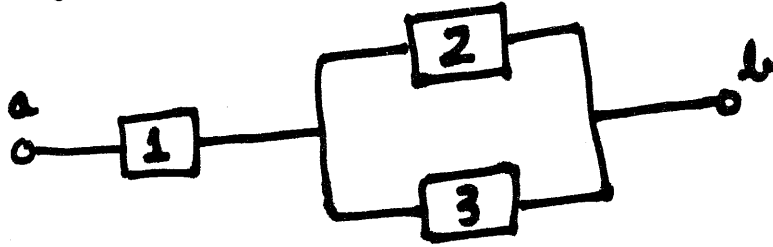
4. Consider a parallel system consisting of two independent components whose time to failure distributions are exponential with rates  $\lambda_1$  and  $\lambda_2$ , respectively ( $\lambda_1 \neq \lambda_2$ ).
- (a) Find the survivor function of the system.
  - (b) Find the mean time to failure of the system.
  - (c) Find the failure rate of the system.
  - (d) Study the ageing property of the system survivor function.

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5. Consider the following structure:



with three independent components with reliabilities  $p_1=0.75$ ,  $p_2=0.80$ , and  $p_3=0.85$ .

- (a) Find the reliability importance of component 1.
- (b) Find the criticality importance of component 2.
- (c) Find the improvement potential for component 3.
- (d) Find the risk achievement worth for component 1.



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