1 Introduction, Definitions & Overview

Reliability

- ... is a characteristic of an item, expressed by the probability that the item performs its required function under given conditions during a stated time interval, i.e. $(0, t]$
- Item = entity for investigation, i.e. component, assembly, equipment, subsystem, system
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2 Probability Theory and Reliability Analysis

Definitions:

- Experiment ϵ
- Sample space Ω
- Event E

An event E is a subset of the sample space Ω and the experiment ε yields a set of possible outcoms ($= E$) of the experiment

Certain Events follow Boolean Logic, an event E can occur or not occur, meaning an Indicator Variable X_E is 0 when E does not occur and 1 if E occurs

Uncertain Events follow can either be true or false, with each a probability associated to it. Event E in sample space Ω is triggered with a probability that the outcome has happened or not

Classical Probability

- The experiment ϵ has N possible, elementary, mutually exclusive and equally probable outcomes $A_1, A_2, ..., A_N \in \Omega$
- The event $E = A_1 \cup A_2 \cup ... \cup A_M$, $M \leq N$
- The probability of event E is defined as $p(E) = M/N$

Kolmogorov Axioms

1. $0 \leq P(E) \leq 1$
2. $P(\Omega) = 1$, $P(\emptyset) = 0$
3. Mutually exclusive events: $P(\cup_i E_i) = \sum p(E_i)$
4. Non-mutually exlusive events: $P(A \cup B) = P_A + P_B - P(A \cap B)$
5. Conditional probability: $P(A|B) = P(A \cap B)/P(B)$
6. Theorem of total probability: Given an event A in Ω where the space is consisting of exclusive and exhaustive events $\cup_j E_j = \Omega$: $P(A) = \Sigma_i(P(A|E_i)P(E_i))$

Random Variables

CDF

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