**Example Problems for Lecture on Quantitative Tools for Reliability Analysis**

**ECE 60872/CS 590 –Fault-Tolerant Computer System Design**

**School of Electrical and Computer Engineering**

**Purdue University**

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**1. Failure rate and Reliability**

Consider that the failure rate of a component is h(t) = 0t where 0>0 is a constant.

Which phase of the component’s life does this failure rate characterize?

What is the reliability of the component? What is the expected life of the component (i.e., its MTTF)?

**2. Weibull distribution**

The lifetime of a component is modeled by a Weibull distribution with shape parameter = 2. Starting with a large number of components it is seen that 15% of the components that have lasted 90 hours fail before 100 hours. What is the scale parameter ?

**3. Reliability of a parallel system**

Consider a parallel system of *n* independent components. Let *X* denote the lifetime of the overall system. Assume that the lifetime of each component, *Xi*, is exponentially distributed with parameter *λ* (all components have the same parameter). What is the reliability and MTTF of the parallel system?

**4. Reliability of a series system**

Consider a system made out of *n* components in series. Component *i* has lifetime *Xi* ~ WEI(*λi*, *α*). What can you say about the reliability of the overall system?

**5. Error distribution**

Consider that the measurement error is given by the variable X. We are interested in the distribution of the square of the error, i.e., of the variable *Y* = *X*2. Write down the cdf of *Y*, i.e., formulate *FY*(*y*).

If *X* ~ EXP(*λ*), what form does *FY*(*y*) take?