**Q1.** A smoke detector is routinely inspected. 80% of the detectors found inoperative had experienced a power surge, and 10% of those found in operating condition had experienced a power surge. 20% of the detectors inspected have failed. What is probability of a detector failing given it experiences a power surge?

**Q2.** The time to failure of a typical household refrigerator has the following PDF:

$$f\left(t\right)=\frac{t}{18} 0\leq t\leq 6 yr $$

1. What is the reliability of the refrigerator for the first year?
2. What is the probability that a refrigerator will fail during the first month?
3. Given the refrigerator has survived its first month, what is the probability that it will survive the rest of the year?

**Q3.** Wadih Company manufactures gizmos for use on widgets. The time to failure, in years, of these gizmos has the following PDF:

$$f\left(t\right)= \frac{200}{(t+10)^{3}} for t\geq 0$$

1. Derive the reliability function and determine the reliability for the first year of operation.
2. Compute the MTTF.
3. What is the design life for a reliability of 0.95?
4. Median time of failure

**Q4.** The time to failure, in years, of a product has the following PDF:

$$f\left(x\right)=\left\{\begin{array}{c}a\left(x^{2}+1\right), 0<x<10\\0, otherwise\end{array}\right.$$

 Find value of a.