The time of an electronic component follows a distribution defined by

$$f(t) = \begin{cases} \lambda e^{-\lambda t} & t > 0 \\ 0 & t \leq 0 \end{cases}$$

where $\lambda = 0.0002/\text{hr}$.

(1) What is the CDF of the time to failure?

(2) What is the probability that the component can still work properly after it has been put into operation for 2,000 hr?

Solution

(1) The CDF of the time to failure of the electronic component

$$F(t) = \int_{-\infty}^{t} f(t)\,dt = \int_{0}^{t} \lambda e^{-\lambda t}\,dt = 1 - e^{-\lambda t}$$

(2) The probability that the component can still work properly after it has been put into operation for 2,000 hr

$$\Pr(T > 2000) = 1 - \Pr(T < 2000) = 1 - F(2000) = 1 - e^{-0.0002(2000)}$$
$$= 0.3279$$