

MTH U481 : SPRING 2009: MORE PRACTICE PROBLEMS FOR QUIZ 2

1). The pdf is $f(x) = kx^2e^{-2x}$ for $x \geq 0$. Find k , $E[X]$ and $E[X^2]$.

Answer: $k = 4$, $E[X] = 3/2$, $E[X^2] = 3$

2). An airplane has four engines and needs two functioning engines in order to fly. Each engine fails independently with probability $p = 10^{-4}$. Find the probability that the airplane crashes.

Answer: $p^4 + 4p^3(1 - p)$

3). The pdf of a random variable X is given by

$$f_X(x) = \begin{cases} cx & 0 \leq x \leq 1 \\ 0 & 1 \leq x \leq 2 \\ c & 2 \leq x \leq 3 \\ c(x-2) & 3 \leq x \leq 4 \end{cases}$$

Find c and calculate the cdf of X .

Answer: $c = 1/3$

$$F_X(x) = \begin{cases} x^2/6 & 0 \leq x \leq 1 \\ 1/6 & 1 \leq x \leq 2 \\ 1/6 + (x-2)/3 & 2 \leq x \leq 3 \\ 1/3 + (x-2)^2/6 & 3 \leq x \leq 4 \end{cases}$$

4). The current in a resistor is a random variable X . The pdf of X is $f(x) = e^{-(x-1)}$ for $x \geq 1$. The power dissipated in the resistor is $Y = X^2$. Find the pdf of Y .

Answer: $e^{-(\sqrt{y}-1)}/(2\sqrt{y})$ for $y \geq 1$.