

## ISyE 6739 – Group Activity 2

Names:

**Problem 1:** Hint: you need to find the sum of a geometric series.

The probability distribution of the discrete random variable  $x$  is  $p(x) = kr^x$ ,  $0 < r < 1$ . Find the appropriate value for  $k$  if  $x = 0, 1, \dots$

**Problem 2:** Hint: for part b, you shall find the expected value of the profit. Note that if the product fails during the warranty period, there is no profit.

A manufacturer of electronic calculators offers a one-year warranty. If the calculator fails for any reason during this period, it is replaced. The time to failure is well modeled by the following probability distribution:

$$f(x) = 0.125e^{-0.125x} \quad x > 0$$

- (a) What percentage of the calculators will fail within the warranty period?
- (b) The manufacturing cost of a calculator is \$50, and the profit per sale is \$25. What is the effect of warranty replacement on profit?

**Problem 3:** Assume  $X$  is discrete.

$$3-51. \oplus F(x) = \begin{cases} 0 & x < -10 \\ 0.25 & -10 \leq x < 30 \\ 0.75 & 30 \leq x < 50 \\ 1 & 50 \leq x \end{cases}$$

- (a)  $P(X \leq 50)$
- (b)  $P(X \leq 40)$
- (c)  $P(40 \leq X \leq 60)$
- (d)  $P(X < 0)$
- (e)  $P(0 \leq X < 10)$
- (f)  $P(-10 < X < 10)$

**Problem 4:** Only part a

**4-233.** The two-parameter exponential distribution uses a different range for the random variable  $X$ , namely,  $0 \leq \gamma \leq x$  for a constant  $\gamma$  (and this equals the usual exponential distribution in the special case that  $\gamma = 0$ ). The probability density function for  $X$  is  $f(x) = \lambda \exp[-\lambda(x - \gamma)]$  for  $0 \leq \gamma \leq x$  and  $0 < \lambda$ . Determine the following in terms of the parameters  $\lambda$  and  $\gamma$ :

- (a) Mean and variance of  $X$ .
- (b)  $P(X < \gamma + 1/\lambda)$

**Problem 5:** Assume  $X$  is continuous RV with  $f(x) = 1/(b-a)$ ;  $a \leq x \leq b$ . Find mean and standard deviation of  $X$ . What is the mean and the variance if  $a=0$  and  $b=1$ ?

**Problem 6:** In a steel sheet manufacturing process, both the length and width of produced sheets are normal random variables with mean 10 and 15, respectively, and standard deviation 1. The correlation between length and width is 0.5. What is the mean and standard deviation of the perimeter of the produced still sheet If the produced sheets are exactly rectangular?