MTH 421
Half Exam 2
Fall 2021

Show all work in a neat and organized fashion. Clearly indicate your answers.
50 points possible.

Besides the formula page, these formulas may or may not be useful.

For $G(p)$: $\quad P(X \leq t) = F(t) = 1 - q^t \quad P(X > t) = S(t) = q^t$

1. (10 pts.) An urn contains 2 red and 8 white marbles. A marble is drawn from the urn and set aside. Then a marble of the other color is put into the urn. Finally, a second marble is drawn from the urn and set aside. If the two selected marbles are of the same color, what is the probability that they are both red?

2. (10 pts.) An insurance policy on an electrical device pays a benefit of 7500 if the device fails during the first year. The amount of the benefit decreases by 2500 each successive year until it reaches 0. If the device has not failed by the beginning of any given year, the probability of failure during that year is 0.3.

What is the expected benefit under this policy?

3. (10 pts.) An actuary determines that the claim size for a certain class of accidents is a random variable, X, with moment generating function

$$M_X(t) = \frac{1}{(1-10t)^5}.$$

Calculate the standard deviation of the claim size for this class of accidents.

4. (10 pts.) In a lottery game, five balls are randomly drawn, without replacement, out of a drum containing balls numbered 1 through 53. The player selects five different numbers out of the first 53 positive integers. Find the probability of matching

(a) exactly five numbers

(b) exactly four numbers

(c) exactly three numbers

5. (10 pts.) Flaws in a certain type of drapery material appear on the average of one in 250 square feet. If we assume a Poisson distribution, find the probability of at most two flaws appearing in 800 square feet.