Name: _____

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ISyE 2027
Test 3

Calculators, notes, and books are not allowed. Please show your work in the bluebook and transfer your answers to the back of this sheet. "See bluebook" is not an answer. When finished, make sure your name is on the bluebook, the test, and the answer sheet, place the test/answer sheet into the blue book, and hand them in.

1. (30 points) Suppose you are working at a vehicle emissions inspection station. What would be a reasonable guess for the distribution of the following random variables. (a) the combined weight of the drivers of the next 30 vehicles tested? (b) the number of cars tested until a blue Ford fails? (c) the number of cars that pass out of the next 30 vehicles? (d) the number of cars arriving to be tested tomorrow morning? (e) the length of time until a blue Ford arrives for testing?

2. (30 points) Suppose that a worker needs to drive a random distance L feet to retrieve an item at the location. Assume that it takes 10 seconds to remove the item from the container. Assume that the total round trip travel time plus removal time is $T = L/4 + 10$. Assume that L has a mean of 50 feet and a variance of 176 square feet. Determine (a) the mean of T, (b) the variance of T, (c) the speed the worker travels in feet per second.

3. (30 points) Suppose that you are dealt 6 cards from a standard deck. (a) What is the probability of two triples? (b) What is the probability of 4 of one kind and 2 of another? (c) Let X be the number of red kings, and Y the number of black kings dealt. Determine the joint p.m.f. of X and Y. Please leave your answers in a form with terms like $\binom{n}{k}$.

4. (30 points) Let X be a discrete r.v. with p.m.f. $\Pr\{X = k\} = c|k + 1|$ for $-2 \leq k \leq 2$. Compute (a) $\Pr\{X \leq 0\}$, (b) the mean of X, and (c) $\mathrm{E}[X^2]$.

5. (30 points) Suppose we have items stored along an aisle that is 50 feet long. Twenty percent of the items cause 90% of the activity, and these items have been stored in the first 10 feet. A worker walks from the beginning of the aisle to retrieve the next item. Let Y be the distance walked. (a) What is the mean of Y? (b) What is the median of Y (c) What is the probability that Y is less than 5 feet?

6. (30 points) Suppose that $\Pr\{X = i, Y = j\} = c$ for $0 < i \leq 3$, $0 < j \leq 3$ and $i + j < 6$. Determine (a) $\Pr\{X = 1\}$, (b) $\Pr\{Y = 1 \mid X = 1\}$, and (c) $\mathrm{E}[X^2 Y]$.

7. (30 points) Suppose a worker needs to process 36 orders. The time to process each item has a Pareto-Levy distribution with a mean of 10 minutes and a variance of 100 minutes^2. Assume that the processing times of the jobs are i.i.d. (a) Approximately what is the probability that the worker finishes in less than 7 hours? (b) What is the probability that the worker finishes more than 4 hours? (c) Roughly how much time would the worker need so that the probability of finishing within that time be 97.5%?