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<div align="center">

ISyE 2027 E
Test 2

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Calculators, notes, and books are not allowed. Put your name on both sides of this sheet. Please stop when time is up. You may leave terms like $\binom{52}{5}$ and e^{-2} in your answers.

1. (30 points) What would be a reasonable guess for the distribution of each of the following random variables?

   (a) The number of fires in Atlanta this weekend.

   (b) Whether or not Atlanta city government has another ransomware attack next week.

   (c) The length of time until the next major fire in Atlanta.

2. (30 points) Suppose that the c.d.f. of X is $F(t) = \lfloor t \rfloor / 3$ for $0 \leqslant t \leqslant 3$.

   (a) Compute the mean of X.

   (b) Compute the second moment of X.

   (c) Compute $\mathbb{E}[2^X]$?

3. (30 points) Suppose that the c.d.f. of X is $F(t) = (t-1)^2$ for $1 \leqslant t \leqslant 2$.

   (a) Compute the mean of X.

   (b) Compute $\mathbb{E}[1/(X-1)]$.

   (c) Compute $\mathbb{P}\{X > 3/2\}$?

4. (30 points) Suppose a particular type of processor sells for \$200 and that there are two processors in stock at the beginning of the day. Assume that the demand D for processors during that day has a Poisson distribution with mean 3 processors.

   (a) Give an expression for the gross revenue R (that is, the money received for selling processors) as a function of the demand D.

   (b) What is the expected gross revenue?

   (c) What is the probability of selling both processors?

   (If you do not know how to determine the parameter for the distribution of D, leave the parameter as p, and you might get some credit.)

5. (30 points) Suppose that the time needed to do an endoscopic ultrasound consists of two parts: the first part is a fixed time taking 15 minutes and the second part is exponentially distributed with mean 30 minutes. Let T be the sum of the two parts.

   (a) Compute $\mathbb{P}\{T > 45 \text{ minutes}\}$.

   (b) Given that the procedure has been going on for 30 minutes and is not yet finished, what would the expected total time of the procedure be?

   (c) Compute the squared coefficient of variation of T.