(Due Tuesday 03/26/2019 right before the class)

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(Your homework shall be stapled if it contains multiple pages.)

SPRING/2019/MA526: HOMEWORK 6

Instructor: Guangqu Zheng[1]; Grader: Chessa Mccalla[2]

Total points: 20

Q1 (2 + 2 + 2 points) An exponential random variable X with parameter λ, for $\lambda \in (0, \infty)$ has the following cumulative distribution function

$$F(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ 1 - e^{-\lambda x} & \text{if } x > 0 \end{cases}$$

Find the PDF, Find the expectation and variance of X.

Q2 (4pt) Suppose that airplane engines operate independently and fail with probability equal to 0.4. Assuming that a plane makes a safe flight if at least one-half of its engines run, determine whether a 4-engine plane or a 2- engine plane has the higher probability for a successful flight.

Q3 (3pt) A safety engineer claims that only 40% of all workers wear safety helmets when they eat lunch at the workplace. Assuming that this claim is right, find the probability that 4 of 6 workers randomly chosen will be wearing their helmets while having lunch at the workplace.

Q4 (3pt) Find the probability that a person flipping a coin gets the third head on the seventh flip.

Q5 (2+2 pt) Let X be a binomial random variable with parameters $(6, 0.4)$.

(1) Find the third moment $\mathbb{E}[X^3]$.

(2) Let Y be a Bernoulli$(1/2)$ random variable that is independent of X. Find the probability

$$\mathbb{P}\big(X + Y = 5\big)\,.$$

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