

## HOMEWORK 4, ACTS 4306

For each problem, you need to choose a correct answer among 5 given answers.

1. In modeling the number of claims filed by an individual under an automobile policy during a three-year period, an actuary makes the simplifying assumption that for all integers  $n \geq 0$ ,  $p_{n+1} = (1/5)p_n$ , where  $p_n$  represents the probability that the policyholder files  $n$  claims during the period. Under this assumption, what is the probability that a policyholder files more than one claim during the period?

[A] 0.04   [B] 0.16   [C] 0.2   [D] 0.8   [E] 0.96

2. In a small metropolitan area, annual losses due to storm, fire and theft are independently distributed random variables. The pdf's are:

	Storm	Fire	Theft
$f(x)$	$e^{-x}$	$\frac{2e^{-2x/3}}{3}$	$\frac{5e^{-5x/12}}{12}$

Determine the probability that the maximum of these losses exceeds 3.

[A] 0.13   [B] 0.21   [C] 0.24   [D] 0.25   [E] 0.30

3. A group of insurance policy covers the medical claims of the employees of a small company. The value,  $V$ , of the claims made in one year is described by  $V = (100,000)Y$  where  $Y$  is a random variable with density function  $f(y) = k(1 - y)^4 I(0 < y < 1)$  where  $k$  is a constant. What is the conditional probability that  $V$  exceeds 40,000, given that  $V$  exceeds 10,000?

[A] 0.08   [B] 0.13   [C] 0.17   [D] 0.20   [E] 0.51

4. An insurance company insures a large number of homes. The insured value,  $X$  of a randomly selected home is assumed to follow a distribution with density function  $f(x) = 3x^{-4} I(x > 1)$ . Given that a randomly selected home is insured for at least 1.5, what is the probability that it is insured for less than 2?

[A] .578   [B] .684   [C].704   [D].829   [E].875

5. Two life insurance policies, each with a death benefit of 10,000 and one-time premium of 500, are sold to a couple, one for each person. The policies will expire at the end of the tenth year. The probability that only the wife will survive at least ten years is 0.025, the probability that only the husband will survive at least ten years is 0.01, and the probability that both of them will survive at least ten years is 0.96. What is the expected excess of premiums over the claims, given that the husband survives at least 10 years?

[A] 350   [B] 385   [C] 397   [D] 870   [E] 897

6. An insurance policy pays the total of the first 3 claims in a year. If there is one claim during the year, the amount claimed is uniformly distributed between 200 and 600. If there are two claims then the total amount claimed is uniformly distributed between 300 and 1100, and if there are three claims in the year, the total amount claimed is uniformly distributed

between 600 and 2100. The probabilities of 0,1,2, and 3 claims in the year are .5, .3, .1, and .1, respectively. Find the probability that the insurer pays at least 600 in total claims for the year.

[A] .1 [B] .12 [C] .14 [D] .16 [E] .18

7. The loss due to a fire in a commercial building is modeled by a random variable  $X$  with density function  $f(x) = (0.005)(20 - x)I(0 < x < 20)$ . Given that a fire loss exceeds 8, what is the probability that it exceeds 16?

[A]  $1/25$  [B]  $1/9$  [C]  $1/8$  [D]  $1/3$  [E]  $3/7$

8. The lifetime of a machine part has a continuous distribution on the interval  $(0, 40)$  with the probability density function  $f(x)$  proportional to  $(10 + x)^{-2}$ . Calculate the probability that the lifetime of the machine part is less than 6.

[A] 0.04 [B] 0.15 [C] 0.47 [D] 0.53 [E] 0.94