HOMEWORK 8, ACTS 4306

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

1. A company prices its hurricane insurance using the following assumptions:
(i) In any calendar year, there can be at most one hurricane.
(ii) In any calendar year, the probability of a hurricane is .05.
(iii) The number of hurricanes in any calendar year is independent of the number of hurricanes in any other calendar year.

Using the company's assumptions, calculate the probability that there are fewer than 3 hurricanes in a 20-year period.

[A] .06 [B] .19 [C] .38 [D] .62 [E] .92

2. A study is being conducted in which the health of two independent groups of ten policyholders is being monitored over a one-year period of time. Individual participants drop out before the end of the study with probability .2, independently of the other participants. What is the probability that at least 9 participants complete the study in one of the two groups, but not in both groups?

[A] .096 [B] .192 [C] .235 [D] .376 [E] .469

3. A hospital receives 1/5 of its flu vaccine shipments from Company A and the remainder from other companies. Each shipment contains a very large number of vaccine vials. For company A's shipments, 10% of vials are ineffective. For every other company, 2% of the vials are ineffective. The hospital tests 30 randomly selected vials from a shipment and finds that one vial is ineffective. What is the probability that this shipment came from company A?

[A] .10 [B] .14 [C] .37 [D] .63 [E] .86

4. A company establishes a fund of 120 from which it wants to pay an amount, C, to any of its 20 employees who achieve a high performance level during the coming year. Each employee has a 2% chance of achieving a high performance level during the coming year, independent of any other employee. Determine the maximum of C for which the probability of less than 1% that the fund will be inadequate to cover all payments for high performance.

[A] 24 [B] 30 [C] 40 [D] 60 [E] 120

5. The number of days that elapse between the beginning of a calendar year and the moment a high-risk driver is involved in an accident is considered to be a random variable with the pdf ce^{-cx}. An insurance company expects that 30% of high-risk drivers will be involved in an accident during the first 50 days of a calendar year. What proportion of high-risk drivers are expected to be involved in an accident during the first 80 days of a calendar year?

[A] .15 [B] .34 [C] .43 [D] .57 [E] .66

6. An actuary has discovered that policyholders are three times as likely to file two claims

as to file four claims. If the number of claims filed has a Poisson distribution, what is the variance of the number of claims filed?

[A] $3^{-1/2}$ [B] 1 [C] $2^{1/2}$ [D] 2 [E] 4

7. An insurance policy on an electrical device pays a benefit of 4000 if the device fails during the first year. The amount of the benefit decreases by 1000 each successive year until it reaches 0. If the device has not failed by the beginning of each year, the probability of failure during that year is 0.4. What is the expected benefit under this policy?

[A] 2234 [B] 2400 [C] 2500 [D] 2677 [E] 2694

8. A tour operator has a bus that can accommodate 20 tourists. The operator knows that tourists may not show up, so he sells 21 tickets. The probability that an individual tourist will not show up is 0.02, independent of all other tourists. Each ticket costs 50, and is non-refundable if a tourist fails to show up. If a tourist shows up and a seat is not available, the tour operator has to pay 100, which is the ticket cost plus 50 penalty, to the tourist. What is the expected revenue of the tour operator?

[A] 935 [B] 950 [C] 967 [D] 976 [E] 985

9. A large pool of adults earning their first driver's license includes 50% low-risk drivers, 30% moderate-risk drivers, and 20% high-risk drivers. Because these drivers have no prior driving record, an insurance company considers each driver to be randomly selected from the pool. This month, the insurance company writes 4 new policies for adults earning their first driver's license. What is the probability that these 4 will contain two more high-risk drivers than low-risk drivers?

[A] .006 [B] .012 [C] .018 [D] .049 [E] .073

10. An actuary works on 10 fire and 15 flood claims. Let X denote the number of fire claims in a selection of 10 claims selected at random and without replacement from the considered 25 claims. Find the ratio $\mathrm{Var}(X)/E(X)$.

[A] 1/8 [B] 3/16 [C] 2/8 [D] 5/16 [E] 3/8