King Fahd University of Petroleum & Minerals

First Major Examination

Faculty: Science	Department: Mathematics
Semester: 182	Course Name: Actuarial Risk & Credibility Theory
Instructor: Abedalhay Elmughrabi	Course No: AS 483
Exam Date: February 12th, 2018	Exam Time: 90 minuets

Student Name:	ID No.:

Question No.	Question Full Marks	Question Obtained Marks
1	10 points	
2	10 points	
3	10 points	
4	10 points	
5	10 points	
6	10 points	
7	10 points	
8	10 points	
9	10 points	
10	10 points	
Total	100	Obtained Total:

Exam Instructions

1. Fill in all information required.

2. The exam is composed of **10** questions.

3. Only the following is allowed to be on your desk: SOA approved calculator, pen/pencil, eraser, and sharpener.

4. Calculators cannot be exchanged during the examination.

5. No use of smart devices with communications capabilities (mini laptops, pens, watches, phones, etc.)

6. Cell phones must be turned off and placed under your bench facedown.

7. No questions are allowed during the exam.

8. All material related to the course should be put away

9. Final correct answers have significant weights

10. Answers without calculations/steps will receive zero marks.

11. Be clean, neat and tidy, else your work may not be marked

12. Students must not communicate with one another in any manner whatsoever during the examination.

GOOD LUCK

Questions 1 (10 Points):

The loss severity random variable X follows the exponential distribution with mean 10,000.
Determine the coefficient of variation of the excess loss variable $Y = (X - 30{,}000)_+$

Questions 2 (10 Points):

Let X have a Burr distribution with parameters $\alpha=1$, $\gamma=2$, and $\theta=\sqrt{1{,}000}$ and let Y have a Pareto distribution with parameters $\alpha=1$ and $\theta=1{,}000$. Let Z be a mixture of X and Y with equal weight on each component. Determine the median of Z.

Questions 3 (10 Points):

The amount of money in dollars that Clark received in 2010 from his investment in futures follows a Pareto distribution with parameters $\alpha = 3$ and θ. Annual inflation in the US from 2010 to 2011 is i%. The 80th percentile of the earning size in 2010 equals the mean earning size in 2011. If Clark's investment income keeps up with inflation but is otherwise unaffected, determine i?

Questions 4 (10 Points):

For a frequency distribution in the (a,b,0) class, you are given

- $p_k = 0.0768$
- $p_{k+1} = p_{k+2} = 0.08192$
- $p_{k+3} = 0.0786432$

  Determine the mean of this distribution.

Questions 5 (10 Points):

Bob is a carnival operator of a game in which a player receives a prize worth $W = 2^N$ if the player has N successes, $N = 0, 1, 2, 3,\ldots$ Bob models the probability of success for a player as follows:

(i) N has a Poisson distribution with mean Λ

(ii) Λ has a uniform distribution on the interval $(0, 4)$.

Calculate E[W]

Questions 6 (10 Points):

Prove that the Negative Binomial distribution is a member of the C(a,b,0) class of discrete distributions. Obtain the values of a and b as per the definition.

Questions 7 (10 Points):

Actuaries have modeled auto windshield claim frequencies. They have concluded that the number of windshield claims filed per year per driver follows the Poisson distribution with parameter λ, where λ follows the gamma distribution with mean 3 and variance 3.

Calculate the probability that a driver selected at random will file no more than 1 windshield claim next year.

Questions 8 (10 Points):

X is a random variable for losses. X follows a beta distribution with $\theta=1000$, a=2, b=1. Calculate $\mathrm{TVaR}_{0.90}(X)$

The random variable N follows a zero modified Poisson distribution. You are given:

$P(N=1)=0.25$
$P(N=2)=0.1$

Calculate the probability of 0?

Questions 10 (10 Points):

Let X be a Pareto distribution with parameters $\alpha = 4$ and $\theta = 340$: Let Y be a Pareto distribution with parameters $\alpha = 6$ and $\theta = 340$: Which of these has a heavier right tail relative to the other?