King Fahd University of Petroleum & Minerals

First Major Examination

Faculty: Science	**Department: Mathematics**
Semester: 171	**Course Name: Actuarial Risk & Credibility Theory**
Instructor: Abedalhay Elmughrabi	**Course No: AS 483**
Exam Date: March 12th, 2017	**Exam Time: 02:10 PM – 03:40 PM (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 random variables X and Y have joint density function

$$f(x,y) = e^{-2x-\frac{y}{2}}, \qquad 0 < x < \infty, \qquad 0 < y < \infty$$

Determine the mean excess loss function for the marginal distribution of X evaluated at X=4.

Questions 2 (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 3 (10 Points):

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

Questions 4 (10 Points):

Y is a mixture of two exponential distributions $f_Y(y) = \frac{1}{2}e^{-y} + \frac{1}{6}e^{-y/3}$. The random variable Z=2Y is a mixture of two exponentials. What are the means of those two exponential distributions?

Questions 5 (10 Points):

X has an exponential distribution with mean θ and θ has a uniform (0,100). Y has a Uniform distribution (0,α) and α has an exponential distribution with mean 100. Find $\frac{Var(X)}{Var(Y)}$

Questions 6 (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 7 (10 Points):

For a discrete distribution, you are given

- $p_0 = 0.8$
- $p_k = \frac{p_{k-1}}{4k}$ for k > 1

Calculate the mean and variance of the distribution?

Questions 8 (10 Points):

- In 1998, claim sizes follow a Pareto distribution with parameters θ (unknown) and $\alpha=2$.
- Inflation of 6% affects all claims uniformly from 1998 to 1999.
- r is the ratio of the proportion of claims that exceed d in 1999 to the proportion of claims that exceed d in 1998.

Determine the limit of r as d goes to infinity.

Questions 9 (10 Points):

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 have a Pareto distribution with parameters α and θ. Let $Y = \ln(1 + \frac{x}{\theta})$ Determine the name of the distribution of Y and its parameter(s).