King Fahd University of Petroleum & Minerals

First Major Examination

Faculty: Science	**Department: Mathematics**
Semester: 172	**Course Name: Actuarial Risk & Credibility Theory**
Instructor: Abedalhay Elmughrabi	**Course No: AS 483**
Exam Date: February 25th, 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):

Losses X follow a normal distribution. You are given

(i) $TVaR_{0.5}=67.55$

(ii) $TVaR_{0.8}=80.79$

Determine $TVaR_{0.9}(X)$

Questions 2 (10 Points):

The loss random variable X has an exponential distribution with mean $\frac{1}{\lambda}$ and an ordinary deductible is applied to all losses. The variance of the cost per payment random variable (excess loss random variable) is 25,600. The variance of the cost per loss random variable is 20,480. Find the amount of the deductible d?

Questions 3 (10 Points):

Loss sizes follow a spliced distribution. Losses below 500 follow an exponential distribution with $\theta=250$. Loss sizes above 500 have a density which is a multiple, k, of the density of a Weibull distribution with parameters $\tau=2$ and $\theta=400$. Determine k.

Questions 4 (10 Points):

For a commercial fire coverage

- In 2001, loss sizes follow a Pareto distribution with parameters $\alpha=4$ and θ.
- In 2002, there is uniform inflation at rate r.
- The 65^{th} percentile of loss size in 2002 equals the mean loss size in 2001.
- Determine r.

Questions 5 (10 Points):

Customers arrive at a bank at a Poisson rate of λ per minute. λ varies by day according to an exponential distribution with mean 2.

Calculate the probability of at least 2 customers arriving in a minute on a random day.

Questions 6 (10 Points):

Claim frequency follows a distribution in the (a,b,0) class. You are given that

(i) The probability of 4 claims is 0.066116

(ii) The probability of 5 claims is 0.068761

(iii) The probability of 6 claims is 0.068761

Calculate the probability of no claims.

Questions 7 (10 Points):

For a distribution from the (a,b,1) class, $P_1^M = 0.4, P_2^M = 0.2, P_3^M = 0.1$. Determine P_0^M

Questions 8 (10 Points):

A claim count distribution can be expressed as an equally weighted mixture of two logarithmic distributions, one with $\beta=0.2$ and one with $\beta=0.4$.
Determine the variance of claim counts.

Questions 9 (10 Points):

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

- $P_k = 0.0768$
- $P_{k+1} = P_{k+2} = 0.08192$
- $P_{k+3} = 0.0786432$

Calculate the mean of this distribution?

Questions 10 (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 $Y = (X - 30{,}000)_+$