Dept of Mathematics and Statistics
King Fahd University of Petroleum & Minerals

AS381: Actuarial Contingencies I
Dr. Mohammad H. Omar
Major 1 Exam Term 151 FORM A
Thursday October 15 2015
3.30pm-4.50pm

Name_____ ID#:_____ Serial #:___

Instructions.

1. Please turn off your cell phones and place them under your chair. Any student caught with mobile phones on during the exam will be considered under the **cheating rules** of the University.
2. If you need to leave the room, please do so quietly so not to disturb others taking the test. No two person can leave the room at the same time. No extra time will be provided for the time missed outside the classroom.
3. Only materials provided by the instructor can be present on the table during the exam.
4. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.
5. Use the blank portions of each page for your work. Extra blank pages can be provided if necessary. If you use an extra page, indicate clearly what problem you are working on.
6. Only answers supported by work will be considered. Unsupported guesses will not be graded.
7. While every attempt is made to avoid defective questions, sometimes they do occur. In the rare event that you believe a question is defective, the instructor cannot give you any guidance beyond these instructions.
8. Mobile calculators, I-pad, or communicable devices are disallowed. Use regular scientific calculators or financail calculators only. Write important steps to arrive at the solution of the following problems.

The test is 80 minutes, GOOD LUCK, and you may begin now!

Question	Total Marks	Marks Obtained	Comments
1	5+6=11		
2	13		
3	10		
4	4+6=10		
5	3+4+4=11		
6	4+1=5		
Total	60		

Extra blank page

1. (5+6=11 points) A motor accident loss random variable X has a p.d.f given by

$$f(x) = \frac{1}{200} \qquad 0 < x < 200.$$

a) Calculate $E[X]$ and $Var(X)$

b) Consider a *proportional* insurance policy where $I(x) = cx \quad 0 < c < 1$, and a stop loss policy where $I_d(x) = \begin{cases} 0 & x < d \\ x - d & x \geq d. \end{cases}$

Determine c and d such that the **pure premium** is $P = 25$ in each case.

2. (13 points) Consider a portfolio of 36 insurance policies. For each policy, the probability q of a claim is $1/10$ and B, the benefit amount given that there is a claim, has a p.d.f.

$$f(y) = \begin{cases} \frac{4}{3} - y^2 & 0 < y < 1 \\ 0 & \text{elsewhere.} \end{cases}$$

Let S be the total claims for the portfolio. Using a normal approximation, estimate $\Pr(S > 4.7)$.

3. (10 points) Consider three independent accidental loss random variables X_1, X_2, and X_3. For $i = 1, 2, 3$, X_i has an exponential distribution and $E[X_i] = 2/i$. Derive the p.d.f of the total loss $S = X_1 + X_2 + X_3$ by the **convolution** process.

4. (3+3+4=10 points) On the basis of the illustrative life Table, evaluate the probability that (25) will

a) Live to 90
b) Die before 70
c) Die in the ninth decade of life.

5. (3+4+4=11 points) Consider a modification of De Moivre's law for an ARAMCO oil drilling machine given by

$$s(x) = \left(1 - \frac{x}{100}\right)^3 \qquad 0 \le x \le 100 \qquad .$$

Calculate

a) the force of mortality (or failure) of the machine, $\mu(x)$

b) ${}_tq_x$

c) the expected future lifetime $\mathring{e}_x$

6. (4+1=5 points) You are given the following extract from a select-and-ultimate mortality table with a 2-year select period:

x	$l_{[x]}$	$l_{[x]+1}$	$l_{[x]+2}$	$x+2$
60	80625	79954	78839	62
61	79137	78402	77252	63
62	77575	76770	75578	64

Assume that deaths are uniformly distributed between integral ages.

Calculate ${}_{0.9}q_{[60]+0.6}$.

(A) 0.0102

(B) 0.0103

(C) 0.0104

(D) 0.0105

(E) 0.0106

Final answer (1 point)
Work shown (4 points)

So Answer is (___)

END OF TEST PAPER