Math 5068

Homework 7

Due 3/28/18

1. The future lifetimes at birth of (40) and (50) are independent uniform distributions on [0,100]. Assuming δ = 0.05, find
   * 1. .
     2. 
2. You are pricing a special 3-year temporary life annuity-due on two lives each age *x*, with independent future lifetimes, each following the same mortality table. The annuity pays 10,000 if both persons are alive and 2000 if exactly one person is alive. You are given:
   1. **
   2. **
   3. *i* = 0.05

Calculate the actuarial present value of this annuity.

1. A husband and wife purchase a 3-year term insurance with a benefit of 100,000 payable at the end of the year of the first death. You are given:
   1. *i* = 0.08
   2. The lives are independent.

|  |  |  |
| --- | --- | --- |
| *k* | Men | Women |
| 0 | 0.08 | 0.06 |
| 1 | 0.10 | 0.10 |
| 2 | 0.12 | 0.13 |
| 3 | 0.14 | 0.17 |

* 1. The following mortality information:

Determine the actuarial present value of the insurance.

1. For a fully continuous last survivor insurance of 1000 issued on (x) and (y), you are given:
   1.  and  are independent.
   2. , *t* > 0
   3. , *t* > 0
   4. 
   5. Premiums are payable until the last death.

Calculate the probability that the loss at issue for this insurance will be greater than 0.

1. A fully continuous insurance policy is issued to (x) and (y). A death benefit of 10,000 is payable upon the second death. The premium is payable continuously until the last death. The rate of annual premiums is *K* while (x) is alive and then reduces to 0.5*K* upon the death of (x) if (x) dies before (y). You are given:
   1. 
   2. 
   3. 
   4. 

Calculate *K*

1. The curtate future lifetimes of a beneficiary, age (x), and her spouse, age (y) are subject to the following independent probabilities of death:

|  |  |  |
| --- | --- | --- |
| *k* |  |  |
| 0 | 0.25 | 0.50 |
| 1 | 0.75 | 0.50 |
| 2 | 1.00 | 1.00 |

Given *i* = 0.10, determine .

1. (x) and (y) are two lives with identical expected mortality. You are given:
   1. 
   2. , where  is the annual benefit premium for a fully discrete insurance of 1 on ()
   3. *d* = 0.06

Calculate the premium , the annual benefit premium for a fully discrete insurance of 1 on ().

1. John and Sally, 2 independent lives, purchased a continuous annuity of $10,000 per year payable as long as one of them survives. You are given that the force of mortality for John is 0.07 and for Sally it is 0.06. Given , determine the actuarial present value of this life annuity.
2. For a special fully continuous last survivor insurance of 1 on two independent lives (x) and (y) you are given:
   1. Death benefits are payable at the moment of the second death
   2. Level benefit premiums, , are payable only while (x) is alive and (y) is dead. No premiums are payable while both are alive or if (x) dies first.
   3. 
   4. , 
   5. , 

Calculate 1000.

1. For a last survivor insurance of 10,000 on independent lives (70) and (80), you are given:
   1. The benefit, payable at the end of the year of death is paid only if the second death occurs during year 5.
   2. Mortality follows the Illustrative Life Table.
   3. *i* = 0.03

Calculate the net single premium for this insurance.

1. For a special fully continuous last survivor insurance of 1 on (x) and (y), you are given:
   1.  and  are independent
   2.  = 0.08, t > 0
   3.  = 0.04 for 0 < t < 20 *and*  = 0.08 for t > 20
   4.  = 0.06
   5. Z1 = 

Calculate Var (Z1)

1. For two independent lives, (30) and (50), a continuous life annuity pays 100 per year for 30 years to (50), but only after (30)’s death. You are given:
2. 
3. 
4. 

Calculate the expected present value of the annuity.

1. Kevin and Kira excel at the newest video game at the local arcade, “Reversion”. The arcade has only one station for it. Kevin is playing. Kira is next in line. You are given:
2. Kevin will play until his parents call him to come home.
3. Kira will leave when her parents call her. She will start playing as soon as Kevin leaves if he is called first.
4. Each child is subject to a constant force of being called home: 0.7 per hour for Kevin; 0.6 per hour for Kira.
5. Calls are independent.
6. If Kira gets to play, she will score points at a rate of 100,000 per hour.

Calculate the expected number of points Kira will score before she leaves.

14. You are given:

* 1. Male mortality is based on a constant force of mortality with μ = 0.04
  2. Female mortality follows de Moivre’s law with 

For 2 independent lives, calculate the probability that a male age 50 dies before a female age 50

15. You are given:

* 1.  and  are independent
  2. Deaths of (30) and (40) are uniformly distributed over each year of age
  3. 
  4. 

2

Calculate 

1. You are given:
   1. 
   2. 
   3. 

Calculate 

1. For a special 5-year term insurance of 1 on two lives, Kathy and Stan, you are given:
   1. The future lifetimes of Kathy, age 30, and Stan, age 50, are independent.
   2. Kathy is subject to a constant force of mortality of 0.02 for 0 < t  5. Stan is subject to a constant force of mortality of 0.04 for 0 < t  5.
   3. The force of interest is 0.03
   4. The death benefit is payable at the moment of death of Kathy, provided Kathy dies first
   5. The policy pays nothing if Stan dies first

Calculate the single benefit premium for this insurance.

1. You are given:
   1. Z is the present value random variable for an insurance on the lives of (x) and

(y) where:

Z = vT(y) if T(x)  T(y)

0 if T(x) > T(y)

* 1. (x) is subject to the constant force of mortality 0.07
  2. (y) is subject to the constant force of mortality 0.09
  3. (x) and (y) are independent lives
  4. δ = 0.06

Calculate E(Z)

1. You are given:
   1. Mortality follows the Illustrative Life Table
   2. *i* = 0.06
   3. T(x) and T(y) are independent
   4. x = 40
   5. y = 40

Calculate 1000(A- A)

1. You are given:
   1. (70) and (75) are independent lives
   2. Mortality follows de Moivre’s law with ω = 100
   3. = 8.655

Calculate 