Mathematics of Life Contingencies. Math 3281 3.00 W

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Homework 7

Unless otherwise indicated, all lives in the following questions are subject to the same law of mortality and their times until death are independent random variables.

1. For a fully continuous whole life insurance of 1000 on (x),

   i) $\mu_X(t) = 0.04$

   ii) $\delta = 0.02$

   iii) The contract premium is 120% of the benefit premium.

   Calculate $E[{}_5L|T(x) > 5]$, the expected prospective loss at the end of the fifth year.

2. For a fully continuous 10-year deferred life annuity of 1 per year on (x), you are given:

   i) Premiums are payable only in the first 10 years.

   ii) Premiums are calculated using the equivalence principle.

   iii) $\mu = 0.01$.

   iv) $\delta = 0.06$.

   Calculate the reserve at the end of the fifth year.

3. A cohort of lives purchases insurance with a death benefit of 1 payable at the moment of death. The cohort is defined by the following information: $l_0 = 100,000$ and $\mu_x = 0.05$ for all x. $\delta = 0.1$.

   For each of the l_{40} survivors, determine the accumulated cost of insurance of that cohort at age 40 for the previous 10 years- that is, for the 10 years from ages 30 to 40.

4. You are given:

   i) $P_{45:\overline{20}|} = 0.03$

   ii) $A^{\ 1}_{45:\overline{15}|} = 0.06$

   iii) d=0.054

   iv) ${}_{15}k_{45} = 0.15$

   Calculate ${}_{15}V_{45:\overline{20}|}$.

5. For a 10-year deferred whole life annuity of 1 on (35) payable continuously:

   i) Mortality follows de Moivre's Law with w=85.

   ii) i=0.

   iii) Level benefit premiums are payable continuously for 10 years.

   Calculate the benefit reserve at the end of five years.

6. You are given:

   i) $P_x = 0.01212$

   ii) ${}_{20}P_x = 0.01508$

   iii) $P^{\ 1}_{x:\overline{10}|} = 0.06942$

   iv) ${}_{10}V_x = 0.1143$

   Calculate ${}^{20}_{10}V_x$.

7. You are given:

   i) $P_x = 0.09$

   ii) ${}_nV_x = 0.563$

   iii) $P^{\ 1}_{x:\overline{n}|} = 0.00864$

   Calculate $P^{\ 1}_{x:\overline{n}|}$

8. For a fully discrete endowment insurance of 10,000 maturing at age 65 on (35), you are given:

i) Mortality follows the illustrative life table.

ii) i=0.06.

Calculate the benefit reserve on this policy at the end of 10 years.

9. For fully discrete endowment insurances, you are given:

   i) The benefit reserve for a 30- year endowment insurance of 1000 on (40) at the end of 20 years is 500.

   ii) The net single premium for a 10-year endowment insurance of 1000 on (60) payable at the end of the year of death is 700.

   Calculate the net single premium for a 30- year endowment insurance of 1000 on (40).

10. You are given:

    i) The annual benefit premium for a fully continuous 20- year endowment insurance of 1000 on (55) is 15.

    ii) The annual benefit premium for a fully continuous 5 -year endowment insurance of 1000 on (70) is 121.

    iii) d=0.09

    Calculate the 15th terminal benefit reserve on the 20- year endowment insurance.

11. The net premium for a 10,000 whole life insurance policy issued to (40) is 4,000. At the end of 10 years, the benefit reserve on a 50,000 whole life insurance policy issued to (30) is 7,000. The net single premium for a 10,000 whole life insurance policy issued to (30) is P.

    Determine P.

12. You are given:

    i) $A_x = 20/(100 - x)$

ii) i=0.05

Calculate $1000_{30}V_{20}$.

13. A fully discrete whole life insurance policy paying 50,000 at the end of the year of death is issued to an individual age 36. The benefit reserve at the end of 10 years is 8,000.

    The benefit premium for this policy is 900 and the benefit premium for an identical policy issued to an individual age 46 is P.

    The effective annual rate of interest is 6%.

    Determine P.

GOOD LUCK!