STAT 472 Test 2 Fall 2009

Instructions Assume uniform distribution of deaths over each year (UDD) whenever necessary to answer the question. You must indicate each time UDD is assumed. Be careful: Saying that you need UDD when you don't will be penalized.

"PTD" means "payable at the time of death" and "PYD" means "payable at the end of the year of death." "ILT data" means that mortality is described by the illustrative life table and $i = .06$.

Notation $T(x)$ is the time until death at age (x), $K(x)$ is the years until death at age (x).

1. We issue a \$10,000, PTD, whole life policy at age 30. Assume De Moivre mortality with $\omega = 100$ and $i = .06$. 10 pts.

   (a) What is the single payment benefit premium for the policy?

   (b) What is the annual benefit premium?

2. We issue a \$10,000, 10 year term policy at age 30, PTD, with ILT data. What is the monthly benefit premium? (I want a monthly payment, not an annual payment made in 12 installments.) 10 pts.

3. On January 1, 2002, Pat age 40 purchases a 5-payment, 10-year PTD term insurance of 100,000. Assume $i = .05$ and premiums of \$4,000 are payable annually at the beginning of each year for 5 years. Calculate the value of the loss function L if Pat dies on June 30, 2003. 10 pts.

4. We issue a completely continuous whole life, \$4,000 PTD policy (30) with De Moivre mortality, $\omega = 110$, $\delta = .04$, and premium $\pi = 100$. 10 pts.

   (a) Give the loss function L.

   (b) Find $P(L \geq 0)$ where "P" denotes "probability.".

5. We issue a 30 year, \$1000 term policy, PTD, at age 20. Assume that $\delta = .05$ and $\mu = .03$. 10 pts.

   (a) What is the single payment premium for this policy?

   (b) Suppose that the policy is paid with 3 premiums of 2, 5, and P paid at times $t = 0$, $t = 10$, and $t = 15$ respectively where t is years after 20. What is P?

6. Assume that for $i = .05$, $\ddot{a}_{30} = 12$. Compute the premiums for a whole life policy, PYD, paid with quarterly premiums, issued to a 30 year old. 10 pts.

7. Your age is 29 and you want to buy a 4-year term life policy with a benefit of 2,000 payable at the end of year of death and a premium $\pi = 200$ paid annually. (*Warning:* This is not the benefit premium.) Suppose that $i = 0.07$ and 15 pts.

$$p_{29} = 0.95,\ p_{30} = 0.93,\ p_{31} = 0.9, p_{32} = 0.87.$$

(a) Find the expected loss $E(L)$.

(b) Find the variance of L, $Var(L)$.

8. We have issued \$1,000 whole life policies, payable at the time of death, to each of 200 identically distributed, independent lives at age 27. Assume that $\delta = .02$, $\mu = .03$. Use the normal approximation to determine the size of the fund necessary to have on hand in order to be 90% certain of being able to pay any claim. 15 pts.

9. For a fully continuous whole life insurance of 10 on (x), you are given:

   (a) P is the benefit premium.

   (b) L is the loss-at-issue random variable with the premium equal to P.

   (c) L^* is the loss-at-issue random variable with the premium equal to $1.5P$.

   (d) $\overline{a}_x = 5$

   (e) $\delta = 0.04$.

   (f) $Var(L) = 50$.

   Calculate $Var(L^*)$. 10 pts.