

### Module 3 Section 2 Exercises:

1. Given a whole life insurance of 5000, issued to a 35 year old, with the death benefit payable at the end of the year of death and a single premium of 750, determine
  - (a) the amount of the loss-at-issue random variable if the 35 year old dies at age 44.2, using  $i = 0.06$
  - (b) the expected value of the loss-at-issue random variable using ILT actuarial assumptions
  - (c) the variance of the loss-at-issue random variable using ILT actuarial assumptions
  - (d) the event that corresponds to the value of the loss-at-issue random variable being greater than 250 using ILT actuarial assumptions
  - (e) the probability of the event in part (d) using ILT actuarial assumptions
  
2. For a 3-year semi-continuous endowment insurance issued to (40), you are given:
  - i) the death benefit is 10000 and is payable at the moment of death
  - ii) the amount of the pure endowment is 10000
  - iii) annual premiums are 3100
  - iv)  $i = .05$

Determine

- (a) the amount of the loss-at-issue random variable if (40) dies at age 41.5
- (b) the amount of the loss-at-issue random variable if (40) dies at age 44.5

3. For a fully discrete 2-year term insurance issued to (x), you are given:
  - i) the death benefit is 1000 in the first year and 5000 in the second year
  - ii)  $d = .1$
  - iii)  $p_x = 0.9$  and  $p_{x+1} = 0.8$

Determine

- (a) the annual premium which makes the expected loss-at-issue equal 0
- (b) the variance of the loss-at-issue random variable using the premium determined in part (a)
- (c) determine the probability of a gain on this policy using the premium determined in part (a)
- (d) the minimum premium which guarantees no loss during the first year
- (e) the minimum premium which guarantees a loss during the second year of at most 3000

4. For a 10-year fully discrete endowment insurance issued to (50), you are given:

i)  $\ddot{a}_{50:\overline{10}|} = 8$

ii)  $d = .05$

iii) the death benefit and the pure endowment are both equal to  $X$

iv) the annual premium is 150

v) the expected loss-at-issue is equal to 0

Determine  $X$ .

5. For a fully continuous whole life insurance of 10000 issued to  $(x)$ , you are given:

i)  $\delta = .04$

ii)  $\bar{A}_x = 0.6$

iii) the expected loss-at-issue is equal to 0

Determine the annual premium rate.

6. For a fully discrete insurance on lives (30) and (35), you are given:

i) a death benefit of 100,000 is paid at the end of the year of the last death

ii) premiums of 4000 are paid at the beginning of each year while both are alive

iii)  $A_{30} = 0.38$

iv)  $\ddot{a}_{50} = 9.4$

v)  $A_{30:50} = 0.6$

vi)  $d = .05$

Determine the expected loss-at-issue

7. A 20-year deferred whole life annuity due issued to (40) pays 60,000 at the beginning of each year. Premiums of 16,000 are paid at the beginning of each year during the deferred period. Determine the expected loss-at-issue using ILT assumptions.