Module 3 Section 5 Exercises:

1. For a fully discrete 2-year endowment insurance on \((x)\), you are given
   (i) The death benefit is 3000 in year 1 and 2000 in year 2
   (ii) The maturity benefit is 1000
   (iii) Expenses, payable at the beginning of the year are:
         (a) Taxes are 2% of the gross premium
         (b) Commissions are 3% of the gross premium
         (c) Other expenses are 15 in the first year and 2 in the second year
   (iv) \(i = 0.04\), \(p_x = 0.9\), and \(p_{x+1} = 0.8\)

   Determine the annual gross premium using the equivalence principle.

2. For a semi-continuous \(n\)-year term insurance of 1000 issued to \((x)\), you are given:
   (i) deaths are uniformly distributed between integer ages
   (ii) \(i = 0.05\)
   (iii) \(1000P_{\frac{x-1}{n}} = 6.73\)
   (iv) Expenses are 10 payable at the beginning of each year

   Determine the annual gross premium using the equivalence principle.

3. For a fully discrete whole life insurance of 100,000 on \((35)\) you are given:
   (i) Percent of premium expenses are 10% per year.
   (ii) Per policy expenses are 25 per year.
   (iii) Per thousand expenses are 2.50 per year.
   (iv) All expenses are paid at the beginning of the year.
   (v) \(1000P_{35} = 8.36\)

   Determine the expense loading, i.e. expense premium.
4. For a fully discrete 15-payment whole life insurance of 100,000 on (x), you are given:

(i) \(100,000A_x = 51,481.97\)

(ii) \(a_{x:14|} = 10.35\)

(iii) \(d = .02913\)

(iv) Expenses are incurred at the beginning of the year.

(v) Percent of premium expenses are 10% in the first year and 2% thereafter.

(vi) Per policy expenses are 10 in the first year and 5 in each year thereafter until death.

Determine the gross annual premium using the equivalence principle.

5. For a fully continuous whole life insurance of 1 on (x), you are given:

(i) \(\delta = 0.04\)

(ii) \(\bar{a}_x = 12\)

(iii) Expenses are

- (a) 0.02 initial expense
- (b) 0.003 per year, payable continuously

(iv) The gross premium is the net premium plus 0.0066.

Determine the expected loss-at-issue.