Module 4 Section 4 Exercises:

Unless told or implied otherwise, net premiums are level

1. Using ILT actuarial assumptions, determine the net premium reserve at time 10 for a fully discrete whole life insurance of 1000 issued to (30).

2. Using ILT actuarial assumptions, determine the net premium reserve at time 10 for a fully discrete 20-year endowment insurance of 1000 issued to (30).

3. A fully discrete whole life insurance issued to (30) pays 10000 at the end of the month of death. Premiums are paid at the beginning of each month. Using ILT actuarial assumptions and UDD, determine the net premium reserve at age 40.

4. For a fully continuous whole life insurance of 10000 issued to (30), you are given: $\bar{a}_{30} = 15$ and $\bar{a}_{40} = 14$. Determine the net premium reserve at age 40.

5. For a fully discrete whole life insurance of 1 issued to (30) with annual premiums determined by the equivalence principle, you are given: $A_{30} = 0.10$, $A_{40} = 0.16$, and ${}^2A_{40} = 0.05$. Determine $Var({}_{10}L)$.

6. Using $CF(\mu = .04, \delta = .06)$, for a fully continuous whole life insurance of 500 issued to (x) with premiums determined by the equivalence principle, determine $Var({}_{10}L)$.

7. A fully continuous whole life insurance of 300 is issued to (x). Premiums are determined using the equivalence principle. Determine $E[{}_{10}L]$, given $\delta = .05$ and
$$\mu_{x+t} = \begin{cases} 0.05 \text{ if } t \leq 10 \\ 0.10 \text{ if } t > 10 \end{cases}$$

8. A fully discrete whole life insurance issued to (30) has death benefit in the first year equal to 1000. Subsequent years' death benefit is 1000 more than the previous year's death benefit until reaching a death benefit of 9000. Thereafter the death benefit remains 9000. Premiums are X for the first 10 years and $9000P_{30}$ thereafter, but X is not determined using the equivalence principle. Given $\ddot{a}_{30} = 15.90$, and $\ddot{a}_{40} = 14.84$, determine ${}_{10}V$.

9. A fully discrete whole life insurance issued to (30) has death benefit equal to 9000 for the first 10 years. During year 11, the death benefit is 9900, and each subsequent year's death benefit is 10% more than the previous year's death benefit. The premiums are $9000P_{30}$ for the first 10 years and X thereafter, where X is determined using the equivalence principle. Given $\ddot{a}_{30} = 15.90$, and $\ddot{a}_{40} = 14.84$, determine ${}_{10}V$.

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

(i) $q_{x+k} = .005(k+1)$ for $k = 0,1,2 \ldots, 9$, and $i = .04$
(ii) the death benefit is $S_1 = 10000$ in year 1 and $S_2 = 5000$ in year 2
(iii) the death benefits in years 3 through 10, and the pure endowment, are 20000
(iv) premiums are determined using the equivalence principle
(v) the first year's premiums is 100 and the second year's premium is 50
(vi) the premiums in years 3 through 10 are level

Determine the reserve at time 2.

11. For a fully discrete 20 year term insurance of 1 issued to (30), you are given

(i) $P_{\overset{1}{30}:\overline{10|}} = .014452$
(ii) $P_{\overset{1}{30}:\overline{20|}} = .015337$
(iii) $\ddot{s}_{30:\overline{10|}} = 14.5057$

Determine the net premium reserve at duration 10.

12. Given the net premium reserve at time 10 for a fully discrete 20-year term insurance of S issued to (x) is 1000, determine the net premium reserve at time 10 for a semi-continuous 20-year term insurance of S issued to (x). Assume $i = 0.05$, and assume a uniform distribution of deaths between integer ages.