MAP 4176 / 5178
Test 11

Name: Key
Date: April 12, 2017

Show all work for full credit, use correct notation., and clearly mark your answer.

For Numbers 1 through 4, use the following:

For a fully discrete whole insurance of 10,000 on (50), you are given:

(i) Mortality follows the ILT

(ii) $i = 0.06$

(iii) The annual gross premium is 1.3 times the annual net premium.

(iv) A settlement expense of 500 is owed at the time the death benefit is paid.

(v) Per policy expense are:
100 in the first year; 10 in renewal years

(vi) Percent of premium expenses are:
60% in the first year; 5% in renewal years

$$\pi^n = \frac{10000 A_{50}}{\ddot{a}_{50}} \overset{ILT}{=} 187.72\ldots$$

$$\Rightarrow \pi^g = 1.3\pi^n = 244.04\ldots$$

1. Calculate the gross premium reserve at time $t = 10$.

$$ {}_{10}V^g = 10500 A_{60} + .05\pi^g \ddot{a}_{60} + 10\ddot{a}_{60} - \pi^g \cdot \ddot{a}_{60} $$

$$ = 10500 A_{60} + 10\ddot{a}_{60} - .95(244.04\ldots)\cdot \ddot{a}_{60} $$

$$ = 1403 $$

2. Calculate the net premium reserve at time $t = 10$.

$$ {}_{10}V^n = 10000\left(1 - \frac{\ddot{a}_{60}}{\ddot{a}_{50}}\right) = 1599 $$

3. Calculate the expense reserve at time $t = 10$.

$$ {}_{10}V^e = {}_{10}V^g - {}_{10}V^n = -196 $$

4. Calculate the full preliminary term reserve at time $t = 10$, ${}_{10}V^{FPT}$.

$${}_{10}V^{FPT}_{50} = {}_{9}V^{\wedge}_{51} = 10000\left(1 - \frac{\ddot{a}_{60}}{\ddot{a}_{51}}\right) = 1479$$

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

(i) The death benefit is 10,000. There is a settlement expense of 100.

(ii) The withdrawal benefit for year 11, paid at EOY, is 1500.

(iii) The annual gross premium is 300

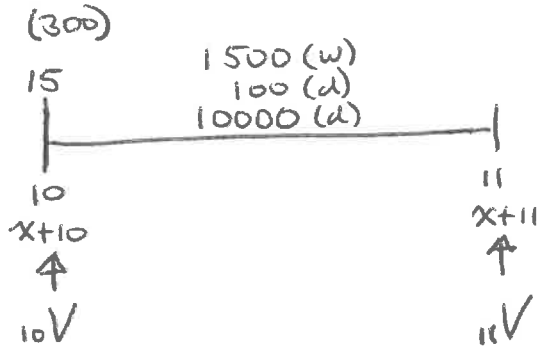
(iv) Expenses paid at the beginning of year 11 are 5% of gross premium

(v) $v = 0.9$ → $.05(300) = 15$

(vi) $q^{(d)}_{x+10} = .02$ and $q^{(w)}_{x+10} = .10$

(vii) The gross premium reserve at time 11 is 230.

Determine the gross premium reserve at time 10



$$q^{(t)}_{x+10} = q^{(d)}_{x+10} + q^{(w)}_{x+10} = .12$$

$$p^{(t)}_{x+10} = .88$$

$${}_{10}V = (10100)v\,q^{(d)}_{x+10} + 1500v\,q^{(w)}_{x+10} + 15 - 300 + {}_{11}V \cdot v\,p^{(t)}_{x+10}$$

$$= 10100(.02)(.9) + 1500(.9)(.1) + 15 - 300 + 230(.9)(.88)$$

$$\therefore {}_{10}V = 213.96$$