MAP 4176 / 5178
Test 10

Name:_____

Date: April 6, 2016

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

All questions use the following:

For a fully discrete whole insurance of 40,000 on (40), you are given:

(i) $A_{40} = 0.2$ $\ddot{a}_{40} = \frac{1-.2}{.05} = 16$

(ii) $A_{50} = 0.3$ $\ddot{a}_{50} = \frac{1-.3}{.05} = 14$

(iii) $d = 0.05$

(iv) The annual gross premium is 1.2 times the annual net premium.

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

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

(vi) Percent of premium expenses are:
50% in the first year; 5% in renewal years

(vii) $p_{40} = 0.995$

(viii) $p_{50} = 0.990$

$\Pi^{\wedge} = \frac{40000 A_{40}}{\ddot{a}_{40}} = \frac{40000 A_{40} \cdot d}{1 - A_{40}} = 500$

$\Pi^{g} = 1.2(500) = 600$

B & E

270 =30
$.45\Pi^g + .05\Pi^g$
90 + 10

10 =30
$.05\Pi^g$
10

500 500
40000 40000

0 1 10 11
40 41 50

1. Show that the gross premium reserve at time $t = 10$ is 4310.

$$ {}_{10}V^{g} = 40500A_{50} + 40\cdot\ddot{a}_{50} - 600\ddot{a}_{50} $$

$$ = 4310 $$

2. Show that the net premium reserve at time $t = 10$ is 5000.

$$ {}_{10}V^{n} = 40000A_{50} - 500\ddot{a}_{50} = 5000 $$

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

$$ {}_{10}V^{e} = {}_{10}V^{g} - {}_{10}V^{n} = -690 $$

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

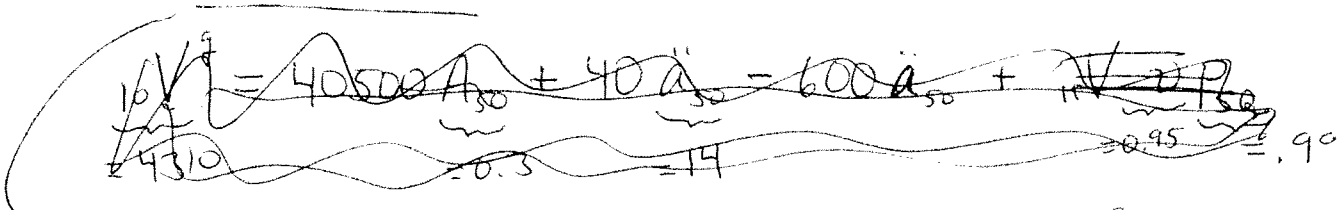
$$ {}_{10}V^{FPT}_{40} = {}_{9}V^{n}_{41} = 40000\left(1 - \frac{\ddot{a}_{50}}{\ddot{a}_{41}}\right) \qquad \ddot{a}_{40} = 1 + vp_{40}\cdot\ddot{a}_{41} \Rightarrow \ddot{a}_{41} = 15.868817 $$

$$ \Rightarrow {}_{10}V^{FPT} = 4710.67 $$

(OR) $$ {}_{10}V^{FPT} = 40000A_{50} - \tilde{\pi}\,\ddot{a}_{50} \quad \text{where} \quad \tilde{\pi} = \frac{40000A_{41}}{\ddot{a}_{41}} = \frac{40000(1-d\ddot{a}_{41})}{\ddot{a}_{41}} $$

$$ \Rightarrow {}_{10}V^{FPT} = 4710.67 $$

5. Use 1-year recursion to calculate the gross premium reserve at time $t = 11$.




$$ {}_{10}V^{g} = 40500\,v\,q_{50} + 40 - 600 + {}_{11}V^{g}\cdot v\,p_{50} $$

$$ 4310 = 40500(.95)(.01) - 560 + {}_{11}V^{g}(.95)(.99) $$

$$ \Rightarrow {}_{11}V^{g} = 4769.01 $$