MAP 4176 / 5178 Name:_____
Test 12 Date: April 10, 2019

Each problem is worth 10 points. Show all work for full credit, and use correct notation.

1. For a fully continuous whole life insurance of 1,000 issued to (30), you are given:
   (i) The level annual premium rate is determine using the equivalence principle.
   (ii) $\bar{A}_{30} = 0.10$
   (ii) $\bar{A}_{50} = 0.20$
   (iii) ${}^{2}\bar{A}_{50} = 0.06$

   Determine $Var({}_{20}L)$.

2. For a fully discrete 20-year endowment insurance of 5000 issued to (20), use the SULT actuarial assumptions to determine the net premium reserve at time $t = 10$.

3. For a fully continuous whole life insurance of 1000 on (40), you are given:
   (i) $\mu = 0.04$ and $\delta = 0.06$
   (ii) the annual gross premium (rate), payable continuously for a maximum of 10 years, is 72
   (iii) expenses are
      (a) an initial expense of 20
      (b) 3 per year, payable continuously for the lifetime of (40)

   Determine ${}_{20}V^{g}$, the gross premium reserve at time $t = 20$.

4. For a fully discrete whole life insurance issued to (20), you are given:

   (i) The death benefit is 100,000 in year 1; 200,000 in year 2; and X thereafter
   (ii) The premiums are 250 in year 1; 600 in year 2; and Y thereafter
   (iii) Using the SULT actuarial assumptions, ${}_0V = E\left[\,{}_0L\right] = 0$

   Using the SULT actuarial assumptions, determine the time 2 reserve, ${}_2V = E\left[\,{}_2L\right]$.

5. For a fully discrete 3-year endowment insurance of 1000 on (x), you are given:

   (i) Expenses, payable at the beginning of the year, are:

Year(s)	Percent of Premium	Per Policy
1	20%	15
2 and 3	8%	5

   (ii) The expense reserve at the end of year 2 is -23.64.
   (iii) The gross annual premium calculated using the equivalence principle is $G = 368.05$.
   (iv) $G = 1000P_{x:\overline{3}|} + P^e$, where P^e is the expense loading.

   Calculate $P_{x:\overline{3}|}$.