STT 455 Review Problems for Finals
December 3, 2014

1. A 100,000 fully discrete whole life insurance policy is issued to (45). You are given:

   - Expenses are paid at the beginning of each year consisting of:

	% of Premium	Per Policy
First year	20%	55
Renewal years	5%	10

   - Mortality follows the `Illustrative Life Table`.
   - $i = 6\%$

   Calculate the gross annual premium.

2. For a fully continuous whole life insurance of 100 issued to (x), you are given:

   - $\mu_{x+t} = 0.01$, for $t > 0$
   - The force of interest at time t is $\delta_t = \begin{cases} 0.04, & \text{for } 0 < t \leq 10, \\ 0.05, & \text{for } t > 10 \end{cases}$

   Calculate the annual benefit premium.

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

   - $\delta = 0.05$
   - $\bar{A}_x = 0.50$
   - ${}^2\bar{A}_x = 0.30$
   - Expenses are: (a) 0.02 initial expense, and (b) 0.005 per year, payable continuously.
   - The gross premium is the benefit premium plus 0.007.
   - L_0^g is the loss-at-issue random variable for this policy.

   Calculate $\text{Var}\,[L_0^g]$.

4. For a 2-year term life insurance policy on (x), you are given:

   - The benefit is 10 payable at the end of the year of death.
   - The premium is payable once each year at the beginning of the year.
   - The expenses are 0.40 at policy issue and 0.10 at the beginning of the second year.
   - $q_x = 0.05$
   - $q_{x+1} = 0.08$

- $i = 5\%$

Calculate the gross annual premium.

5. For a special fully discrete whole life insurance on (50), you are given:

   - The benefit is 200,000 if death occurs for years 1 to 10 and reduces to 150,000 if death occurs thereafter.
   - The annual benefit premium is P for years 1 to 10, $0.75P$ for years 11 to 20, and 0 thereafter.
   - Mortality follows the `Illustrative Life Table`.
   - $i = 6\%$

   Calculate P.

6. For a fully discrete whole life insurance of 1000 on (40), you are given:

   - The annual premium is 11.35.
   - Mortality follows the `Illustrative Life Table`.
   - $i = 6\%$
   - L_0 is the loss-at-issue for this policy.

   Calculate $\Pr[L_0 > 200]$.