

LAST NAME: \_\_\_\_\_ FIRST NAME: \_\_\_\_\_ STU. #: \_\_\_\_\_

Concordia University  
ACTU-357 Test 2, Tuesday, November 9th, 2010

DURATION: **75** min. TOTAL MARKS: **29** (The value of each question is indicated in parentheses)  
Present your solutions in the space provided. Use the back of the pages if you need extra space. **Show all of your work.** The only aid permitted is a calculator. Good luck!

**Question 1 (7)** A special fully **continuous** whole life **annuity** contract is issued to (30). You are given that

$$\pi_t = \begin{cases} Pe^{0.02t}, & 0 < t < 20 \\ 0, & o.w. \end{cases}, \quad g_t = \begin{cases} Se^{0.01t}, & t > 30 \\ 0, & o.w. \end{cases}, \quad \text{and } \delta = 0.08.$$

Define the prospective loss random variable at time 5 and give an expression for  $Var[_5L|T(30) > 5]$  in terms of actuarial symbols.

**Question 2 (6)** A special fully **discrete** 30-payment years, 20-year **deferred** insurance contract of 10,000 is issued to (30). The death benefit during the deferred period is 50% of the terminal reserve. You are given that the annual premium is 28,  $d = 10\%$ ,  $A_{61} = 0.28$ , and  $q_x = 0.04$  for  $x = 0, 1, \dots, 70$ . Find the prospective reserve at time 5.

**Question 3 (5)** A special **semicontinuous** 3-year **endowment** insurance contract is issued to (35). The death and survival benefits are 100 plus 25% of the sum of the premiums paid by (35). You are given that the annual premium is 165,  $\delta = 10\%$ , and  $\mu_{36.5}(t) = 0.02$  for  $t > 0$ . Find the reserve at time 1.5.

**Question 4 (11)** A special fully **discrete** 10-payment years, 20-year **term** life insurance contract is issued to (40). You are given:

- $b_{k+1} = 100(1.2)^k$  for  $k = 0, 1, \dots, 19$
- $\pi_k = \begin{cases} 13, & k = 0, \dots, 5 \\ 6.5, & k = 6, \dots, 9 \end{cases}$
- $\mu(x) = 1/(100 - x)$  for  $0 < x < 100$  and  $d = 10\%$

**(a) (3 marks)** Define the prospective loss random variable at time 3 .

**(b) (4 marks)** Given that reserve at time 15 is  $V$ , give the reserve at time 3 in terms of actuarial symbols.

**(c) (4 marks)** Find  $P[{}_3L \leq 155 | T(40) \geq 3]$ .