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**SOCIETY OF ACTUARIES**  
**Life Pricing**

# **Exam ILALP**

## **MORNING SESSION**

**Date:** Wednesday, April 29, 2015

**Time:** 8:30 a.m. – 11:45 a.m.

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### **INSTRUCTIONS TO CANDIDATES**

#### **General Instructions**

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).
  - a) The morning session consists of 6 questions numbered 1 through 6.
  - b) The afternoon session consists of 4 questions numbered 7 through 10.The points for each question are indicated at the beginning of the question.
2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.
3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

#### **Written-Answer Instructions**

1. Write your candidate number at the top of each sheet. Your name must not appear.
2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.
3. The answer should be confined to the question as set.
4. When you are asked to calculate, show all your work including any applicable formulas.
5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam ILALP.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.





**\*\*BEGINNING OF EXAMINATION\*\***  
**Morning Session**

**1.** (10 points)

- (a) (4 points) Compare and contrast policyholder tax treatment of a full policy surrender versus a partial surrender on a whole life policy in both the US and Canada.
- (b) (4 points) For a certain whole life policy you are given:

Policy Year ( $t$ )	20	21	22
Increase in Cash Surrender Value (CSV) in year $t$	20,000	20,000	20,000
Premium paid at beginning of year $t$	10,000	10,000	10,000
Net Cost of Pure Insurance (NCPI) in year $t$	1,000	1,000	1,000

Assume:

- CSVs are zero for the first 19 years
- Partial surrenders of 20,000 occur at the end of policy year 21, and 30,000 at the end of policy year 22

Calculate the tax payable for each partial policy surrender assuming a 40% tax rate and the policy is:

- (i) A US policy treated as Life Insurance, according to IRC 7702/7702A, assuming the non-taxable portion at the end of year 19 is zero.
- (ii) A US policy treated as a Modified Endowment, according to IRC 7702/7702A, assuming the non-taxable portion at the end of year 19 is zero.
- (iii) An exempt Canadian policy, assuming the Adjusted Cost Base (ACB) at the end of year 19 is zero.

# 1. Continued

(c) (2 points)

- (i) Describe the tax advantages of marketing a Prescribed Annuity Contract in Canada.
- (ii) For a specific prescribed life annuity in Canada, you are given:
  - Annual annuity payment: 25,000
  - Adjusted purchase price: 150,000
  - Interest rate: 5%
  - Annuitant age: 61
  - Expected lifetime of annuitant: 15 years

Calculate the taxable amount of each annuity payment.

**2.** (5 points)

- (a) (2 points) Describe the US tax impact for benefits paid and premiums received when adding a Long Term Care (LTC) rider to a whole life policy.
- (i) Assuming the whole life policy is treated as Life Insurance, according to IRC 7702/7702A
  - (ii) Assuming the whole life policy is treated as a Modified Endowment, according to IRC 7702/7702A
- (b) (2 points) Describe the US tax impact on benefits paid and premiums received when adding an LTC rider to an immediate annuity:
- (i) Assuming the immediate annuity is qualified
  - (ii) Assuming the immediate annuity is non-qualified
- (c) (1 point) Recommend a product structure that minimizes the LTC tax impact on:
- (i) A whole life policy
  - (ii) An immediate annuity

**3.** (8 points)

(a) (3 points) Assess the implications of combining experience for 10-year term and whole life business for the following assumptions:

(i) Mortality

(ii) Lapses

(b) (5 points) For a level-pay 10-year term life insurance product on a 40-year-old you are given:

- Normal lapses for this product are 5% per year
- Total lapses are 55% at the end of year 10
- 50% of the additional lapses are selective lapses
- $q_{[40]}$  is 0.50 per 1,000
- $q_{50}$  is 4.50 per 1,000
- $q_{[40]+10}$  is 3.70 per 1,000
- $q'_{[40]+10}$  is 1.10 per 1,000 (select mortality)

(i) Calculate the deteriorated mortality of the remaining group assuming preservation of total deaths. Show all work.

(ii) Using the additional information below:

- 10% of total lapses at end of year 10 are assumed to be conversions
- Conversion mortality is assumed to be 110% of normal mortality

Recalculate the deteriorated mortality of the remaining group assuming preservation of total deaths. Show all work.

4. (13 points) ABC sells only annuity products. To increase sales, management is recommending ABC launch a single premium annuity/Long Term Care (LTC) combination product.

The three designs considered for the annuity/LTC combination are:

- (i) Tail design
  - (ii) Coinsurance design
  - (iii) Pool design
- (a) (1 point) Describe the three annuity/LTC combination designs.
  - (b) (2 points) Compare and contrast these three designs.
  - (c) (3 points) Describe from ABC's stand point:
    - (i) The benefits of an annuity/LTC combination product over a stand-alone LTC product
    - (ii) The target market for the annuity/LTC combination product
    - (iii) The distribution channels to consider for an annuity/LTC combination product
  - (d) (3 points) You are given:

<u>Category</u>	<u>Current ABC Annuity Assumption</u>
Mortality	100% Annuity 2000 ALB
Surrender Charge (by year)	7%, 5%, 4%, 3%, 0%, 0% thereafter
Lapses (by year)	1%, 3%, 5%, 7%, 30%, 10% thereafter
Acquisition Expenses	200 year 1
Maintenance Expenses	30 each year

Recommend changes to ABC's current annuity pricing assumptions to be used with a single premium annuity/LTC combination product. Justify your answer.

- (e) (1 point) Explain the benefits of using the Interstate Compact for this product.

**4. Continued**

- (f) (2 points) ABC also recently bought a block of inforce annuity/LTC combination contracts. Senior management wants to increase the LTC charge by 40%. Describe what you need to do to in order to comply with the recommended practices of ASOP No. 2 Nonguaranteed Charges or Benefits for Life Insurance Policies and Annuity Contracts.
- (g) (1 point) Recommend how you would stochastically determine the cost of an LTC rider with a design that ties the LTC benefit amounts to account values.

5. (12 points) XYZ is a well-established life insurance company in North America and wants to expand into Mauritius.

XYZ has no previous experience in Mauritius but was able to build an 80-duration mortality table based on historical mortality data for the general population.

- (a) (1 point) List reasons that mortality experience varies from country to country.

XYZ is planning to launch the following two products:

Product Name	FastFive	MyLife
Product	5 Year Term, non-renewable	Whole Life
Underwriting	Guaranteed issue	Fully underwritten
Minimum Face Amount	10,000	50,000
Cash Surrender Value	0	0
Risk Classes	Aggregate	Preferred, Non-Smoker, Smoker
Conversion Options	Convert to MyLife without underwriting at the end of 5 years	Not available
Pricing Strategy	Predatory pricing	Adaptive pricing

- (b) (3 points) Recommend steps to construct a mortality table for MyLife, a new whole life product.
- (c) (4 points) Critique the design of the proposed products.

The pricing actuary proposes to use the following assumptions for the proposed products:

Mortality: Select and Ultimate Mortality Table, developed by XYZ  
 Lapse: 5% flat for all durations  
 Expense: Issue cost: 50  
 Maintenance: 4% of premium

- (d) (4 points) Critique the appropriateness of these assumptions for the proposed products.

**6.** (12 points) DEF Life is an industry leader in the Canadian Life insurance market. DEF is introducing a Critical Illness (CI) insurance product.

- (a) (2 points) Explain the differences between CI and life insurance in terms of:
- (i) Payout trigger
  - (ii) Policyholder benefits
  - (iii) Underwriting
- (b) (3 points) Describe issues DEF should consider for the CI product regarding:
- (i) Product Design
  - (ii) Implementation
  - (iii) Canadian Regulatory / Tax Implications
- (c) (4 points) DEF is considering the following four product designs for the CI product:
- (i) 10-year renewable term to age 75 (Term 10).
  - (ii) Level term to age 75 (Term to 75).
  - (iii) Level term to age 100 (Term to 100).
  - (iv) Level term to age 100 with 100% Return of Premium on Surrender available in the 15th policy year.

Describe the pattern of annual lapse rates for each product design. Justify your answer.

- (d) (3 points) DEF is considering varying its pricing lapse assumption for the Term 10 product by premium payment mode. Propose monthly lapse skewness patterns at durations 9, 10 and 11 for monthly premium payment and annual premium payment. Justify your proposal.

**\*\*END OF EXAMINATION\*\***  
**Morning Session**

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