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

# Exam ILALP

## MORNING SESSION

**Date:** Wednesday, April 25, 2018

**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) Your company is developing a level death benefit universal life product for sale in the US. The product will be sold with a chronic illness accelerated benefit rider and a disability waiver rider.
- (a) (1 point) Describe the three common chronic illness acceleration rider designs.
- (b) (1 point) Describe additional underwriting risk control measures your company should consider when developing the rider.
- (c) (3 points) Assess whether each the following will receive favorable tax treatment under section 101(g) of the Internal Revenue Code:
- (i) Unable to perform at least three activities of daily living due to a loss of functional capacity.
  - (ii) The only insurance protection provided under the universal life policy and chronic illness acceleration rider is coverage of qualified long-term care services.
  - (iii) Chronic illness acceleration rider reimburses for all expenses incurred.
- Justify your answer.
- (d) (5 points) You are given the following information about the proposed UL product design:
- The guaranteed minimum interest rate applied to the policy account value is 3%.
  - The annual administrative charge is 60 on a current basis and 100 on a guaranteed basis.
  - The premium load is 7%, on both current and guaranteed bases.
  - The chronic illness rider qualifies for favorable tax treatment under section 101(g) of the Internal Revenue Code.

## 1. Continued

You are also given the following information for 100,000 policy on a female insured, age 55:

- The annual deduction for the chronic illness rider is 900, payable until maturity.
- The annual deduction for the disability waiver rider is 500, payable until the insured attains age 65.

Interest Rate	$A_{55}$	$\ddot{a}_{55}$	$\ddot{a}_{55:10}$
3%	0.436	18.442	8.313
4%	0.345	16.207	7.909
6%	0.225	12.870	7.184

Compute the Guideline Single Premium and Guideline Level Premium under section 7702 of the Internal Revenue Code.

Show all work.

2. (9 points) XYZ Life markets various whole life insurance products in the US and Canada.

- (a) (2 points) Describe the principles which should be followed in analyzing the mortality and persistency experience of XYZ's whole life insurance block of business.
- (b) (3 points) The most recent experience study showed significant differences in mortality and persistency experience compared to previous experience studies. This experience was used to price a new product and filed with the Department of Insurance. An error was discovered in the data and corrected results now show minor differences from previous experience studies.

List disclosures required by the Proposed ASOP—Setting Assumptions.

- (c) (4 points) XYZ used the Forced Method to end the mortality table at attained age 100.

Calculate mortality rates to age 120 using two alternative methods that are less conservative than the Forced Method, using the mortality table below:

Age (x)	$q_x$
96	0.36
97	0.40
98	0.45
99	0.55
100	1.00

Show all work.

3. (9 points) MBB Life has been selling term and participating whole life insurance products for the past ten years. The term life insurance product allows conversion to MBB's participating whole life insurance products.

- (a) (1 point) Describe a term conversion privilege.
- (b) (2 points) Explain two primary ways to cover the cost of anti-selective mortality due to term conversions.
- (c) (5 points) MBB's prior dividend scale is consistent with the scale that was in place when MBB began issuing participating business. The following table shows prior and current dividend scales as of the end of 2017:

Time	Prior Scale	Current Scale
2017	10	10
2018	12	11
2019	14	12
2020	16	13
2021	12	14

- (i) Compare and contrast the following methods for changing a dividend scale:
- Pegging method
  - Substitution method
- (ii) Calculate the present value of the future dividend scale as of the end of 2018 using the two methods above and an interest rate of 3%. Show all work.
- (iii) Recommend a method that MBB should use to change the dividend scale. Justify your answer.
- (d) (1 point) List the four main sources of earnings that drive a dividend scale.

4. (12 points) IJK Life sells Variable Annuities with Guaranteed Minimum Income Benefits as well as 10-Year Term Insurance products.

IJK has recently concluded that no changes are needed to their current products because each product's Embedded Value meets company benchmarks.

IJK is considering the use of an Economic Value framework to improve their risk profile.

- (a) (2 points) List the disadvantages of using Economic Value in the evaluation of IJK's products.
- (b) (1 point) Explain how a Replicating Portfolio could be used within the Economic Value Framework.
- (c) (6 points) You are given the following information for IJK's Variable Annuity product:

	<b>Amount (millions)</b>
Total Assets (Beginning of period)	120
Premiums	40
Claims	20
Expenses	2
Economic Liabilities (Beginning of period)	45
Economic Liabilities (End of period)	60
Base cost of capital	9
Risk capital cost	1

Return on invested assets is 10%

Return on replicating portfolio is 5%

#### 4. Continued

- (i) (1 point) Describe the benefits of using a treasury function to measure a product's performance.
- (ii) (3 points) Calculate the economic profit for each of the following components:
- Insurance
  - Investment
  - Treasury

Show all work.

- (iii) (1 point) Assess whether product performance is acceptable.
- (iv) (1 point) List two ways to increase product performance based on the calculations above.
- (d) (3 points) IJK is also considering moving from traditional pricing methods to risk based pricing using a market consistent approach.

Assess the effects on profit margin for each of IJK's products with respect to the following:

- Investment guarantees
- Asset returns
- Insurance adjustability

**5.** (14 points) LWS Life offers a portfolio of life insurance, health insurance and annuity products.

(a) (1 point) Describe the key risks associated with a standalone Long-Term Care Insurance (LTCI) product

(b) (11 points) LTCI sales have been declining. LWS is considering offering a LTCI and annuity combination product.

(i) (2 points) Describe how LTCI combination products reduce risk versus a standalone LTCI, which provides the same LTCI benefit amount.

(ii) (1 point) Describe the benefits to consumers of LTCI combination products with extension of benefit riders.

(iii) (4 points) You are given the following sensitivity test scenarios for a proposed LTCI and annuity combination product:

<b>Scenario</b>	<b>Sensitivity</b>
A	80% of Active Life Mortality
B	130% Annual Lapse rate
C	110% LTC Incidence Rates
D	115% Claim Termination Rates

Assess the impact on product profitability for each scenario. Justify your answer.

(iv) (4 points) Recommend a LTCI and annuity combination product that minimizes the risk to LWS for each of the following product designs:

A. LTCI and annuity combination with a 2 year acceleration benefits, without inflation

B. LTCI and annuity combination with a 2 year acceleration benefit and 4 year extension of benefit rider, without inflation

C. LTCI and annuity combination with a 3 year acceleration benefit and 3 year extension of benefit rider with inflation

Justify your answer.

**5. Continued**

- (c) (2 points) The CEO has proposed to stop the sale of critical illness products because the premium is expensive and LWS also sells disability income insurance.

Critique the CEO's proposal. Justify your answer.

**6.** (6 points)

(a) (2 points) ABC Life's primary focus is on Term Life insurance and Universal Life insurance with Secondary Guarantees (ULSG).

(i) Explain three different reserve components and their mechanics under VM-20.

(ii) Describe the advantages and disadvantages with delayed adoption of VM-20.

(b) (4 points) ABC recently launched a new term life product sold through its brokerage channel. You have been asked to conduct an experience study on the first year lapses.

(i) You are given the following:

- 49 of 784 policies lapsed in the first policy year.
- Expected first year lapse rate is 5%

Determine if the first year lapse assumption is appropriate assuming a 95% confidence interval. Show all work.

(ii) Identify two different methods to enhance credibility in setting the lapse assumption.

(iii) A lapse study shows significant differences from the industry survey.

Explain the possible causes of these differences.

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**

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