SOCIETY OF ACTUARIES
Life Pricing

Exam ILA LP

MORNING SESSION

Date: Wednesday, October 30, 2013
Time: 8:30 a.m. – 11:45 a.m.

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 since 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 ILA LP.

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.

475 N. Martingale Road
Schaumburg, IL 60173-2226

Printed in the U.S.A.
Exam ILA LP-Front Cover

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

1. (*8 points*) CDL Bank plans to enter the life insurance market with new products which target families that have a 20 to 30 year residential mortgage and wish to insure the life of the primary income earner.

(a) (*3 points*) Evaluate the suitability of a Term product versus a Universal Life product with respect to the following:

(i) Intended length of time for the life insurance protection

(ii) Premium and charge structure

(iii) Death Benefit options available

(b) (*3 points*) CDL plans to launch a competitively priced non-participating decreasing Term life product.

(i) Explain why an attained age premium scale is not suitable.

(ii) Describe the challenges presented by the following select and ultimate premium scales:

- Renewal premiums are set **lower** than a newly issued policy at that age
- Renewal premiums are set **higher** than a newly issued policy at that age

(c) (*2 points*) CDL proposes adding a conversion option to the decreasing term product. Explain why mortality anti-selection occurs on policies converted from decreasing term products.

2. (*15 points*)

(a) (*4 points*) Compare and contrast the criteria to meet the Definition of Life Insurance in the U.S. and to meet the Exempt Test Policy (ETP) definition in Canada.

You are given the following for parts (b) through (e):

- Male: Age 45
- Cost of Insurance (COI): Yearly Renewable Term
- Death benefit: 1,000,000 plus account value (Option 2)
- Coverage: Ends at age 100
- No surrender charges
- Maximum Tax Actuarial Reserve (MTAR) is equal to the cash surrender value.
- Expenses and COI: Taken out at the beginning of the year
- Interest: 3.5%
- Premium load: 5%

(b) (*3 points*) You are given:

Year	Age	Premium	COI	Account Value	Death Benefit	Net Single Premium with 2001 CSO*	Accumulated fund for a benchmark policy age 45*	NCPI
1	45	35,000	3,000	31,309	1,031,309	0.1608	0.0314	1,054
2	46	35,000	3,600	63,808	1,063,808	0.1707	0.0628	1,268
3	47	35,000	4,200	95,686	1,095,686	0.1786	0.0942	1,500
4	48		5,700	89,786	1,089,786	0.1895	0.1256	

*Face Amount: 1

Determine the maximum premium that can be paid in year 4 to pass:

(i) The Cash Value Accumulation Test (CVAT) for a U.S. policy.

(ii) The exempt test for a Canadian policy without having to create a new ETP

Show all calculations.

2. Continued

(c) (*2 points*) You are given:

- The accumulated fund for a benchmark policy with a face amount of 1 issued at age 48 is 0.04 for year 1.
- The COI for year 4 is 5.7 per thousand of net amount at risk.
- The policyholder would like to pay a 125,000 premium at the beginning of year 4.
- The policyholder does not want to pay any tax.

Recommend, using numerical examples, how to maintain the exempt status in Canada.

(d) (*2 points*) You are given:

Age 45	Guideline Single Premium (GSP)	Guideline Level Premium (GLP) Option 2
Net Single Premium	0.1858	1.06010
Annuity Factor		17.56197

The policyholder would like to pay a 150,000 premium at the beginning of year 4. Determine if the policy would pass the U.S. Guideline Premium Test at the end of year 4. Show all work.

(e) (*4 points*) The policyholder requests a partial withdrawal of 75,000 at the end of year 3.

Calculate:

(i) The taxable gain and the Adjusted Cost Base (ACB) after the partial withdrawal on a Canadian policy.

(ii) The taxable gain for a U.S. policy and the basis after the partial withdrawal.

Show all work.

3. (*11 points*) ECC Life is proposing to launch a Single Premium Equity Indexed Annuity (EIA).

(a) (*1 point*) Explain how each of the following product features will affect the cost of the EIA:

(i) Participation rate

(ii) Cap

(iii) Margin

(b) (*1 point*) List four major differences between a Variable Annuity and an EIA. Assume each only has one fund available.

(c) (*3 points*) You are given:

Premium (*P*)	100,000
Index	S&P 500
Index Period	5 year
GMAV(*t*)*	$0.9 \times P \times 1.03^t$
Participation Rate	100%

*Guaranteed Minimum Account Value at end of year *t*

Year(*t*)	**S&P 500 Level**
0	1,000
1	1,050
2	900
3	1,100
4	1,025
5	1,045

Calculate the final account value using each of the following methods:

(i) Point to Point

(ii) Average Index Growth

(iii) High Water Mark

(iv) Point to Point with annual ratchet

Show your work.

3. Continued

(d) (*4 points*) You are given:

Index	S&P 500
S&P Level	1000
Index Period	5 Years
Index Growth Method	Point to Point
Ratchet	None
Earned Rate	4.00%
Incurred Expenses	1% of premium
GMAV(*t*)	$0.9 \times \text{Premium} \times 1.03^t$
Participation Rate	100%

The EIA will be funded using a combination of 5-year bonds and 5-year options. You are given:

5-year S&P 500 Option Prices		
Strike Level*	**Put**	**Call**
1000	49	111
1010	52	106
1020	56	102
1030	60	97
1040	64	93
1050	68	89
1060	72	85
1070	76	81
1080	81	77

*Interpolate prices linearly between Strike Levels

Assume no lapses and no mortality.
Determine the profit as a percentage of premium if the EIA uses:

(i) A point to point growth method

(ii) A point to point growth method with a cap of 8%

Show your work.

Question 3 Continued on Next Page

3. Continued

(e) (*2 points*) ECC is planning on launching their EIA in Australia, Canada and the United States.

Explain the minimum Non-forfeiture laws in each of the countries with respect to EIAs.

4. (*8 points*) JLB Company, which writes business in the U.S. and Canada, is developing a No-Lapse Guarantee Universal Life product with a Full Acceleration Critical Illness Rider.

(a)

(i) (*1 point*) Describe the availability and credibility of lapse rate experience in the U.S. and Canada for lapse-supported products.

(ii) (*2 points*) JLB proposes a level 5% lapse rate assumption at all durations. Critique this proposal based on available industry experience for No-Lapse Guarantee Universal Life policies.

(b)

(i) (*2 points*) Assess the need and marketability of the Full Acceleration Critical Illness Rider.

(ii) (*1 point*) Explain how a low interest rate environment can affect the marketability of this product.

(c)

(i) (*1 point*) Contrast the Standalone Critical Illness and the Full Acceleration Critical Illness product types.

(ii) (*1 point*) Explain how a reinsurer can add value to the design and pricing of a Critical Illness product.

5. (*5 points*) KBL Life plans to launch a single life Flexible Premium Universal Life product. You are given the following product specifications:

Product Name	FlexSelect
Death Benefit	Face amount plus account value
Issue Ages	20 to 70
Minimum Face Amount	10,000
Maximum Face Amount	1,000,000
Pricing Mortality Table	2008 VBT age last birthday
Guaranteed Maximum Annual Cost of Insurance	2001 CSO age last birthday, male/female, smoker distinct
Guaranteed Annual Interest Rate	1.5%
Surrender Charges	10% all policy years
Face Amount Increases	Fully underwritten with COIs based on current rates and ages

An actuarial student has prepared the following Actuarial Memorandum to be included in the policy form filing for the new product:

> *This actuarial memorandum covers FlexSelect which is a flexible premium adjustable life insurance product. Surrender charges are 10% of account value in all years.*
>
> *The guaranteed values are based on the 2001 CSO Male/Female table.*
>
> *Statutory reserves are based on the 2001 CSO table, and CRVM methodology.*
>
> *Minimum issue age is 20 with a maximum issue age of 70.*
>
> *After the first policy anniversary the policy face amount may be increased or decreased subject to the maximum and minimum face amounts.*
>
> *Face amount increases will be fully underwritten and the charges for the increased amount will be based upon insured's age at the time of increase.*

(a) (*2 points*) Describe the transmittal letter to be included in the policy form filing.

(b) (*3 points*) Critique the Actuarial Memorandum.

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6. (*13 points*) MAR Life sells term insurance in a highly competitive market.

(a) (*1 point*) List reasons why mortality and lapse experience can vary widely from company to company.

(b) (*3 points*) MAR was using industry data to set its mortality assumptions but wants to start using its own experience.

MAR's experience data for 30 year old male non-smokers in the last calendar year is as follows:

Number of lives	5000
Number of deaths	4

(i) Calculate the 95% confidence interval for the mortality rate. Show all work.

(ii) Evaluate whether this data should be used to set the mortality assumption.

(c) (*2 points*) MAR has a 10 year renewable term product (T10) with the following premiums at selected ages:

	Premium	
Issue age	Initial Term	First Renewal Term
30	595	1,965
40	685	4,975
50	1,665	12,045

The following table shows lapse experience for MAR by duration for this product:

Policy Duration	Lapse Rate
7	5.30%
8	5.10%
9	5.40%
10	58.70%
11	35.60%
12	18.30%
13	11.70%
14	9.50%
15	8.30%

6. Continued

(i) Explain the phenomenon that is occurring at policy duration 10.

(ii) Predict the impact of these lapse rates on mortality experience beyond policy duration 10.

(iii) Recommend a change to the premium structure to increase persistency. Justify your recommendation.

(d) (*1 point*) Explain the shortcomings of using Return on Investment as a profitability measure for new products.

(e) (*6 points*) MAR plans to launch a new Term 10 product to replace its existing product. The pricing team has compiled profitability results for four new Term 10 proposals:

Pricing Metric	Proposal A	Proposal B	Proposal C	Proposal D
Return on Investment (ROI)	15.50%	13.25%	15.50%	15.50%
Break Even Year	5	2	5	7
Value of New Business	40	50	150	10
New Business Strain	(80)	(100)	(400)	(40)

Note: New Business Strain = Distributable earnings in the first year.

Consider the following three scenarios:

Scenario 1	Shareholders are demanding an ROI of 15% and do not want to use significant capital for a long period of time.
Scenario 2	Senior management is only concerned about too many early lapses.
Scenario 3	Shareholders are willing to contribute significant capital but are looking for an ROI of at least 14%.

Recommend which proposal senior management should approve under each scenario. Justify your recommendation.

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

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