SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

AFTERNOON SESSION

Date: Thursday, May 5, 2016
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 5 questions numbered 7 through 11 for a total of 40 points. 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 ILALFVC.

6. Be sure your essay answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

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****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 7

7. (*9 points*) You are given:

Industry Data	Actual/Expected mortality ratio by claim count		
	Non-Smoker	Smoker	Total
Fully Underwritten	68%	85%	71%
Simplified Issue	88%	98%	92%

Company Data	Actual/Expected mortality ratio by claim count			Expected number of claims	
	Non-Smoker	Smoker	Total	Non-smoker	Smoker
Fully Underwritten	62%	78%	68%	200	50

(a) (*1 point*) Describe the key advantages and disadvantages of the Normalized Method.

(b) (*4 points*) Calculate the expected mortality ratio for fully underwritten business under the Normalized Method, assuming industry mortality at 100% and full credibility of 3,007 deaths. Show all work.

7. Continued

Your company is developing a simplified underwriting program available to issue ages 20 – 60 with face amounts below 500,000.

You are given:

	Inforce distribution by policy count
Issue age 20 – 60	70%
Face amount < 500,000	50%
Smoker	10%

- The mortality of smokers is 250% of the non-smokers
- The mortality of simplified underwriting applicants is 200% of the fully underwritten cases
- The duration 1 mortality rate assumed for a male non-smoker age 40 is 0.5 per 1000.

(c) (*2 points*) Calculate the company's new aggregate duration 1 mortality rate for a male age 40. Show all work.

(d) (*2 points*) Critique the following statements:

A. *We anticipate that the poor mortality risks would select simplified issue, which will reduce the fully underwritten mortality. We should use the lowest margin prescribed for the fully underwritten mortality MfAD ($3.75/e_x$), and double this margin for simplified issue ($7.5/e_x$).*

B. *The population mortality improvement rate is running higher than 2%. To build in conservatism, we should use 2% for all genders and ages as the mortality improvement assumptions for both the fully underwritten and the simplified issue products.*

8. (*8 points*) With regard to Embedded Value (EV):

(a) (*1 point*) Describe the differences in how economic and non-economic assumptions are developed.

(b) (*2 points*) Describe considerations when setting the following:

(i) Lapse rates

(ii) Investment assumptions

(c) (*5 points*) You are given:

- The annual aggregate expected contribution is 290 million.
- The value of new business in the current year is 85 million.
- The free surplus and required capital from the previous year were 200 million and 350 million, respectively.
- The pretax return on invested assets is 12.5%.
- The effective tax rate is 20%.
- The expected contribution from new business is equal to 50% of the expected contribution from inforce business in the current year.

Calculate:

(i) The risk discount rate.

(ii) The inforce book value at the beginning of the current year.

(iii) The book profit from new business in the current year. Assume expected inforce book value at the end of the current year is 1,000 million, and total book profit for the current year is 500 million.

Show all work.

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9. (*8 points*) You are given the following consolidated data for Mardella Life, a Canadian domiciled life insurance company:

MCCSR Components	**Amount**
C-1 risk	30
Mortality, Morbidity and Lapse Risk	50
C-3 risk	20
Common Shareholders' equity	90
Subordinated Debt	80
Goodwill	20
After-tax policy liabilities calculated using no mortality improvement	105
After-tax policy liabilities calculated using mortality improvement	100

(a) (*4 points*) Calculate the following MCCSR ratios and recommend actions (if any) based on the results. Show all work.

(i) Total Ratio

(ii) Tier 1 Ratio

(b) (*1 point*) Describe the primary differences between the overall MCCSR framework and the 6^{th} Quantitative Impact Study (QIS6) capital framework.

9. Continued

(c) (*3 points*)

Mardella Life recently acquired two Index Linked Universal Life blocks of business. You are given:

	Block L	**Block M**
Asset Market Value	250	150
Time In-Force	60 months	21 months

- Liabilities from both blocks are backed by assets that earn Fund X returns
- Policies in Block L credit interest based on the return of Fund X
- Policies in Block M credit interest based on the return of Fund W

Historical fund statistics, calculated on a weekly basis for each quarter-end's prior 52-week period, are shown below:

Fund return statistics	**Q1**	**Q2**	**Q3**	**Q4**
Standard Deviation (X)	0.090	0.055	0.150	0.190
Standard Deviation (W)	0.095	0.054	0.150	0.200
Correlation (X,W)	0.900	0.960	0.900	0.970

At acquisition, Mardella Life's Common Shareholder Equity is reduced by 18.

(i) Calculate the change in Total Ratio for Mardella Life due to this acquisition. Show all work.

(ii) Assess the company's capital position post acquisition and recommend actions (if any).

10. (*7 points)* MLB Life issues a three-year term product to a 55 year old female with a 10,000,000 face amount. Premium rates are 0.55 per thousand. The product incurs the following expenses:

- 600 per policy at issue
- 50 per policy annually (including the first year)

MLB has the following reinsurance offers from NHL Re:

1. Coinsurance with a 10% annual expense allowance and a 2 million retention limit.

2. YRT using 60% of the Industry Mortality Table with an annual cession fee of 20 and a 3 million retention limit.

Industry Mortality Table for females:

Attained Age	55	56	57
Rate/1000	0.65	0.80	1.60

MLB's mortality assumption for females:

Attained Age	55	56	57
Rate/1000	0.35	0.65	0.74

All assets and cash flows are invested in cash.

(a) (*5 points*) Calculate the following for each reinsurance offer under the Canadian Asset Liability Method (CALM), assuming no margins for adverse deviation, income tax or premium tax:

(i) Gross contract liability at issue

(ii) Reinsurance asset at issue

Show all work.

(b) (*1 point*) Explain why NHL Re's assumed liabilities would not equal MLB Life's reinsurance asset.

(c) (*1 point*) Describe how an impairment of NHL Re would affect MLB's balance sheet for each of the reinsurance offers.

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11. (*8 points*) LT Life is a Canadian insurer with U.S. branch operations. It has ceded 20% of its business on a quota share basis.

You are given the following regarding the 2015 tax year in millions of Canadian dollars:

	Canadian Business	U.S. Business
Premium Income	40	30
Reinsurance Premium Paid	8	6
Claims Paid	30	90
Reinsurance Claims Received	6	18
Investment Income	12	80
Increase in Maximum Tax Actuarial Reserve (MTAR)	7	35
Dividends Paid	3	15
Investment Income Tax (IIT) Paid	1	Not Applicable
Premium Tax Paid	To be calculated	0.5
Other Expenses and Commissions	0	0

The following assets backing the Canadian business have been deemed to be uncollectable during 2015:

- 2 million in residential mortgages
- 1 million in life insurance premiums receivable
- 3 million in doubtful corporate bonds.

11. Continued

The company's Canadian sales, income and inforce book of business is split evenly between Ontario and Quebec.

The 2015 premium tax rate for Ontario is 2% and for Quebec is 2.3%. Assume no Quebec compensation tax.

(a) (*1 point*) Calculate the premium tax payable for Canadian business in 2015. Show all work.

(b) (*5 points*) Calculate LT Life's Canadian Federal and Quebec Taxable Income for 2015. Justify all values used, including any assumptions made. Show all work.

(c) (*2 points*) Assess the accuracy of each of the following statements regarding the calculation of LT Life's 2015 Canadian taxes payable:

A. The method used to determine the MTAR is:

- *Pre-1996 policies: 1.5 Year Full Preliminary Term*
- *Post-1995 policies: As reported in the financial statements*

B. IIT is calculated using a tax rate of 10% of the Corporate Bond yield multiplied by (MTARs less Policy Loans) on all life insurance policies.

C. The transfer of a debt security between the life and non-life business does not affect the tax treatment of that security.

****END OF EXAMINATION****
Afternoon Session

USE THIS PAGE FOR YOUR SCRATCH WORK