SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

AFTERNOON SESSION

Date: Thursday, April 30, 2015
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 5 questions numbered 8 through 12 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.

475 N. Martingale Road
Schaumburg, IL 60173-2226

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****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 8

8. (*9 points*) You are a valuation actuary working for a major Canadian Life insurance company.

(a) (*3 points*) For a block of policies issued after 1990, you are given:

Average interest rate on Government of Canada bonds	2.0%
Average experience rating refund reserve	300,000
Average life reserves for taxable life insurance policies	6,000,000
Reduction for changes in experience rating refund reserve	1,000
Amounts reported to policyholders as taxable income	15,000
Investment loss carryforward	2,000

Calculate the investment income tax. Show all work.

(b) (*6 points*) You are given:

Calendar Year	2014	2015	2016	2017	2018
Liability Cash Flows with Margin		150	200	350	500
Maximum Tax Actuarial Reserve (MTAR) at end of year	900	850	720	450	0

- Tax rate is 30%
- Pre-tax earned rates on in-force assets is 5%
- Assets and liabilities are perfectly matched under CALM
- The only difference between the GAAP future income and taxable future income is due to temporary timing differences
- There are no underclaims nor tax loss carryforwards

Calculate the Future Tax Carve-Out using the Discounting Approach for 2016 year-end. Show all work.

9. (*7 points*) You are given the following assumptions:

- Liability cash flow at the end of year 10 is 100,000 Canadian Dollars (CAD)
- Assets backing the above liability are denominated in Euros (EUR)
- Current spot rate: 1.00 EUR buys 1.40 CAD
- EUR 10-year risk free rate is 0.90%
- CAD 10-year risk free rate is 2.10%
- The historical standard deviation of the change in the exchange rate from EUR to CAD over 10 year periods is 0.115

Calculate the PfAD (in CAD) that a Canadian insurer should hold for the currency risk. Show all work.

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10. (*8 points*) Maple Life is a Canadian life insurance company selling segregated fund products.

(a) (*2 points*) With reference to the CIA Educational Note: Considerations in Valuation of Segregated Fund Products:

(i) Compare the two approaches that can be used to value additional benefits associated with policies for which an Allowance for Acquisition Expense (AAE) is being amortized.

(ii) Assess the appropriateness of each of the following Conditional Tail Expectation (CTE) levels for the purpose of testing the recoverability of the AAE:

- CTE(0)
- CTE(70)
- CTE(95)

(b) (*3 points*) You have been given the following liabilities without margins for two cohorts of segregated fund policies that have previously been valued separately:

Cohort 1 – with one year left to maturity:

Year	Claims at Year-End	Fee Income at Year-Start	Liability without Floor	Liability with Floor
0			1,423	1,423
1	2,000	500	0	0

Cohort 2 – with two years left to maturity:

Year	Claims at Year-End	Fee Income at Year-Start	Liability without Floor	Liability with Floor
0			(588)	0
1	0	300	(300)	0
2	0	300	0	0

Calculate the aggregate liability at time zero using the CIA recommended approach assuming a discount rate of 4%. Show all work.

10. **Continued**

(c) (*3 points*) Maple Life has a hedging program in place for its segregated fund guarantees. It utilizes the following in its application of CALM for this product:

- Only the hedge assets held at the valuation date are projected
- Only real-world scenarios are used
- Best-estimate actuarial assumptions are used
- CALM reserves = CTE(85) of required assets
- A floor of zero is used for reserves
- Model calibrated to company-specific criteria

Assess the validity of the above as per the recommendations in the Report of the Task Force on Segregated Fund Liability and Capital Methodologies.

11. (*9 points*) WAN Life is a large Canadian insurance company seeking to sell its closed-block annual renewable term business to OBI Financial, a small Canadian insurance company, via assumption reinsurance. This would reduce WAN Life's non-participating block by 10% of the total amount insured.

In order to value the block of business, WAN Life provided OBI Financial the following:

- A comprehensive listing of policyholder coverage information
- Seriatim mortality and lapse experience for this block

Both companies have valued this block. WAN Life has prepared its metrics using its company's aggregate non-participating mortality and lapse assumptions. OBI Financial has valued the block based on the data provided by WAN Life. The two companies have produced the following metrics for the block as at the proposed transaction date:

	OBI Financial	WAN Life
Canadian GAAP reserves (in millions)	10	6
Assets (in millions)	14	8
Hurdle Rate	15%	10%

Distributable Earnings at the end of each year from the transaction date:

	Millions	
Year	OBI Financial	WAN Life
1	0.5	0.8
2	0.8	0.9
3	1.25	1.0
4	2.0	1.0

Assume 0% corporate tax rate and no transaction costs.

(a) (*2 points*) Explain why OBI Financial and WAN Life have calculated different values for the Canadian GAAP reserves.

(b) (*2 points*) Explain why WAN Life may need to hold more required capital than OBI Financial for C2 and C3 risks.

(c) (*5 points*) Recommend whether these companies should proceed with an assumption reinsurance transaction. Justify your answer.

12. (*7 points*) Stellar Life operates in both Canada and the United States. The company determines its capital requirements using Minimum Continuing Capital and Surplus Requirements (MCCSR) for the Canadian division and Risk Based Capital (RBC) for the U.S. division.

You are given:

- The whole life insurance contracts are backed by a mix of corporate bonds and cash held on premises
- There is no asset risk-affiliates (C-0) risk

(a) (*5 points*) Critique the following methodology used for calculating the required capital under each regime:

	Canada (MCCSR)	United States (RBC)
Asset (Default) Risk	For portion backed by bonds: Factor based on bond rating is applied to asset market value For portion backed by cash: 2% of cash holdings	For portion backed by bonds: Factor for bonds based on the NAIC asset class designation
Insurance Risk	Mortality Risk: Factor applied to the net amount at risk Lapse Risk: Factor applied to policy liability amounts	Factor applied to the net amount at risk
Interest Rate Risk	Factor applied to the net amount at risk	Factor for medium risk category applied to policy liability amounts
Business Risk	Factor applied to premium income	Factor applied to premium income

(b) (*2 points*) The calculated RBC ratio and MCCSR ratio are both close to 110%. Stellar Life reported its RBC ratio to its U.S. regulator and its MCCSR ratio to OSFI. Describe the supervisory action which would be taken in each jurisdiction.

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

USE THIS PAGE FOR YOUR SCRATCH WORK