SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

MORNING SESSION

Date: Thursday, April 27, 2017
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 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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Exam ILALFVC Front Cover

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

1. (*9 points*) XYZ is a holding company that owns two subsidiaries. Subsidiary B exclusively conducts banking activities, whereas Subsidiary L predominantly conducts life insurance activities. Each subsidiary prepares its own financial statements.

(a) (*2 points*) Management is concerned about potential financial statement volatility between the effective dates of IFRS 9 (effective January 1, 2018) and IFRS 4 (effective January 1, 2020 at the earliest). The IASB has developed proposals for dealing with this potential volatility.

Recommend a course of action for each subsidiary based upon these proposals. Justify your response.

(b) (*2 points*) For Subsidiary L's variable annuity portfolio, a consultant suggests using the replicating portfolio technique to determine the fulfillment of cash flows under IFRS 4.

(i) Describe the replicating portfolio technique.

(ii) Assess the appropriateness of using the replicating portfolio technique for a variable annuity portfolio.

1. Continued

(c) (*5 points*) You are provided the following information for Subsidiary L's non-participating 3-year term life portfolio:

(in millions)	Year 1	Year 2	Year 3
Best Estimate Premium	100	100	100
Best Estimate Claims	70	75	80
Required Capital	320	280	220
Actual Claims Incurred	80	90	65

Assume:

- There are no expenses
- Discount rate = 0%
- Risk free rate = 0%
- The cost of capital methodology is used to measure the uncertainty of the amount and timing of cash flows
- Cost of capital = 6%
- The contractual service margin is amortized linearly
- No interest is accrued on the contractual service margin
- The measurement model uses the building block approach under the IFRS 4 Revised Exposure Draft

Calculate the following:

(i) Best estimate liability at inception

(ii) Risk adjustment (or margin for uncertainties) at inception

(iii) Contractual service margin at inception

(iv) Insurance contract revenue for year 1

(v) Underwriting results for year 1

Show all work.

2. (*10 points*)

(a) (*4 points*) Compare and contrast the following measures used to determine the value of a block of life insurance:

- Embedded Value (EV);
- Market Consistent Embedded Value (MCEV); and
- Actuarial Appraisal Value (AAV)

(b) (*3 points*) ABC, a European multi-line insurance company, is purchasing DEF Life, a small privately held U.S. life insurer with Universal Life, Term Life, Fixed Deferred Annuities, and Variable Deferred Annuities.

ABC uses MCEV to evaluate its own financial performance.

Critique the following statements made by the CEO of ABC about valuing DEF's business:

A. The MCEV earnings for Fixed Deferred Annuities will look horrible, since a risk-free rate must be used for discounting and projecting investment income.

B. Since our incentive compensation is based on operating MCEV earnings, we're taking a big gamble that interest rates will increase in the short term.

C. MCEV doesn't do a great job incorporating cost of capital for the Term Insurance block.

D. The AAV may overstate the value of the Variable Annuity block.

2. Continued

(c) (*3 points*) You are given the following information for DEF's in-force business on December 31, 2017 and expected new business for 2018:

Values as of December 31, 2017	Business Inforce On December 31, 2017	Expected New Business Sold in 2018
PV of Premiums	160	20
PV of Benefits and Expenses	140	15
PV of Investment Income on Assets Backing Reserves	50	10
Initial Required Capital	30	5
PV of Investment Income on Required Capital	10	4
Initial Free Surplus	25	N/A
PV of Investment Income on Free Surplus	5	2
Sum of Discounted Required Capital at each EOY	200	40

Assume:

- Additional sales occur in 2019 and 2020, which are identical to the sales in 2018
- No sales are assumed to occur after 2020
- Risk-free rate = 3%
- Pre-tax Cost of Capital Rate = 15%
- After-tax Cost of Capital Rate = 10%

Calculate the Actuarial Appraisal Value on December 31, 2017. Show all work.

3. (*11 points*)

(a) (*3 points*) Describe the steps and considerations required for the identification of an embedded derivative within a life insurance contract according to IFRS 4, as per the CIA Research Paper on IFRS: Embedded Derivatives and Derivatives under IFRS.

(b) (*8 points*) You are given the following information on a Universal Life insurance product with Yearly Renewable Term (YRT) cost of insurance (COI) rates:

Feature	Details
Death Benefit Options	a. Level Death Benefit b. Face amount plus account value c. Face amount indexed using Consumer Price Index d. Special indexed option, with annual percentage adjustments to existing death benefit equal to 25% of total return on policyholder account value
Surrender values	1% of original death benefit multiplied by number of years in force
Investment Options on Account Value	Index-linked: 1. Return equal to Canadian TSX Composite less 2.50% 2. Return equal to U.S. S&P 500 less 2.75%, adjusted for currency exchange 3. Return equal to U.S. S&P 500 less 3.00%, unadjusted for currency exchange 4. Return equal to 300% of [Canadian TSX Composite less 2.50%] Guaranteed: 10-year Guaranteed Investment Certificate (GIC) with minimum of 90% of Government of Canada Long-term bond yield The policyholder can switch investment options three times without market value adjustment during the lifetime of the contract. Any fund transfers/switches thereafter are subject to market value adjustments.

Recommend the appropriate IFRS treatment for a Canadian insurer with respect to derivatives and embedded derivatives. Justify your recommendations.

4. (*10 points*) Lan Life has a liability of 10 million due in 30 years.

The investment strategy is to back this liability using 15-year Junior Issue Zero-Coupon A-Rated Corporate Bonds. You are given the following best estimate assumptions:

Risk Free Rate	2.00%
Current 15-Year Corporate A Credit Spread	1.00%
Asset Depreciation	0.10%

The historical 15-year corporate A credit spreads are:

Source	Data Period	Average
PC Bond	10 years	1.00%
Bank of Canada	15 years	1.35%
Bloomberg	20 years	1.25%

(a) (*1 point*) Recommend a margin for adverse deviation for the asset depreciation assumption.

(b) (*6 points*) Calculate the combined provision for adverse deviation for asset depreciation and credit spreads. Show all work.

(c) (*3 points*) Critique the following statement:

"The best estimate annual growth assumption for diversified U.S. equities is 8%. The reserve can be reduced to approximately one million if the liability is backed with equities instead of corporate A bonds."

5. (*9 points*)

(a) (*2.5 points*) With respect to the SOA Research Paper on Economic Capital for Life Insurance companies and OSFI's Life Insurance Capital Framework (LICF) Standard Approach:

(i) Describe the two common approaches to economic capital.

(ii) Identify the approach prescribed by the revised LICF.

(iii) Describe the five core concepts of the revised LICF.

(b) (*1 point*) Contrast the difference in approach to interest rate risk between MCCSR and LICF.

(c) (*4 points*) Describe credits available within LICF to a life insurance company.

(d) (*1.5 points*) Describe the Base Solvency Buffer introduced under the Life Insurance Capital Adequacy Test (LICAT).

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6. (*11 points*) Roma Life is a Canadian Life Insurance Company.

(a) (*2 points*) Prior to reporting under IFRS 4, Roma Life included prudence in its reported insurance liabilities on a net basis.

Describe two possible approaches that can be used under IFRS 4 for Roma Life to retain the same level of prudence.

(b) (*2 points*) Summarize the categories of practices and procedures laid out in OSFI Guideline B-3 with regards to reinsurance agreements.

(c) (*7 points*) You are given:

Whole Life Policy Specifications:

- Face amount of 500,000
- Annual premium of 3,000
- First year commission of 90%
- Renewal commission of 5%
- Acquisition expenses (excluding commission) of 5,000
- Maintenance expenses (excluding commission) of 30 per year
- Premium tax rate of 2%
- Cash value rate per 1000 of face amount:

End of Year 1	End of Year 2
4	11

Reinsurance Offer Specifications:

- YRT reinsurance
- Company retains 200,000 at issue
- Retention calculated using the pro-rata method
- Net amount at risk defined as face amount minus cash value
- No allowances
- Premium tax is reimbursed at a rate of 2%
- Reinsurance premium rates per 1000 of face amount:

Year 1	Year 2
0.70	0.85

6. Continued

Financial Assumptions:

- Initial surplus of 25,000 is available
- Interest on surplus and reserves is 5%
- Investment income is earned only on assets present at the beginning of the calendar year and not on cash flows.
- No gain or loss at issue
- No income taxes apply
- No inflation applies on maintenance expenses
- There are no claims or surrenders in the first 2 years
- Reserve per 1000 of face amount:

	End of Year 1	End of Year 2
Gross	9	15
Ceded	2	5

(i) (*5 points*) Build the following financial statements for the policy above on an IFRS basis assuming you have entered into the reinsurance agreement:

- Balance sheet at the end of year 1
- Income statement for year 2

Show all work.

(ii) (*2 points*) Recommend changes to the reinsurance offer that would reduce new business strain. Justify your recommendation.

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

USE THIS PAGE FOR YOUR SCRATCH WORK