SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

MORNING SESSION

Date: Thursday, April 26, 2018
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. (*12 points*) ABC Life uses Market Consistent Embedded Value (MCEV) as one of its management performance metrics.

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

	Amount in millions
Opening MCEV	300
Closing MCEV	250
Opening adjustments	30
Closing adjustments	37
New business value	1
Operating variances	8
Economic variances	(5)
Expected existing business contribution using the reference rate	7
Expected existing business contribution using rate in excess of reference rate	2
Release of profits in the value of in-force business	3
Release of required capital	1

(i) Calculate the total return on MCEV. Show all work.

(ii) Calculate the operating return on MCEV. Show all work.

1. Continued

ABC Life is in the process of acquiring XYZ Life. XYZ performs Embedded Value (EV) calculations annually and does not calculate MCEV.

(b) (*2 points*) Assess concerns with performing an actuarial appraisal of XYZ using its latest EV results.

(c) (*4 points*) The following assumptions appear in XYZ's EV report:

A. *Persistency, mortality, and expense assumptions are best-estimate with provisions for adverse deviation.*

B. *Mortality improvement is included in the mortality assumptions. This is common industry practice.*

C. *Expenses consist of acquisition expenses (to the extent associated with existing business) and maintenance expenses. Overhead and one-time expenses are excluded.*

D. *Since non-economic assumptions used to calculate EV should be "entity-specific", the company's experience data was exclusively used to develop persistency, mortality, and expense assumptions. No industry data was used.*

Critique the appropriateness of each statement.

2. (*9 points*) LNT Life discontinued selling term life products several years ago. LNT has never used reinsurance on its term business, and it is now exploring the following options to cede 100% of the remaining inforce block at the end of 2018:

- Option 1: coinsurance with a 10% reinsurance allowance
- Option 2: modified coinsurance (mod-co) with a 10% reinsurance allowance and a 7% mod-co interest rate

Below are projected 2018 statutory financial statements for the block without reinsurance:

12/31/2018 Balance Sheet – Projected	
Assets	
Invested Assets	12,600
TOTAL ASSETS	12,600
Liabilities	
Policy Reserves	
Gross	9,500
Ceded	0
Net	9,500
TOTAL LIABILITIES	9,500
TOTAL SURPLUS AND CAPITAL	3,100

2018 Income Statement - Projected	
Revenue	
Premiums	
Gross	4,000
Ceded	0
Net	4,000
Investment Income	800
Reinsurance Allowance	0
Mod-co Adjustment	0
TOTAL REVENUE	4,800
Benefits	
Claims	
Gross	1,500
Ceded	0
Net	1,500
Reserve Increase	
Gross	1,000
Ceded	0
Net	1,000
TOTAL BENEFITS	2,500
TOTAL EXPENSES	300
NET INCOME	2,000

2. Continued

Assume:

- LNT earns investment income at a rate of 8%
- Cash flow during the year is not invested until the end of the year and therefore does not earn investment income during the year
- Income tax rate is 0%
- Any reinsurance arrangement would take effect at the end of 2018

(a) (*3 points*) Create LNT's projected 2018 term life income statements for each of the proposed reinsurance arrangements. Show all work.

(b) (*6 points*) You are given the following projected 2019 information for the term life block:

2019 Projected	
Premiums (gross)	3,500
Claims (gross)	500
Reserve Increase (gross)	1,000
Expenses	250

Calculate the projected 2019 net income for the block under each reinsurance arrangement. Show all work.

3. (*7 points*)

(a) (*1 point*) List the primary considerations for assessing the available capital elements of an insurer under the Life Insurance Capital Adequacy Test (LICAT).

(b) (*1 point*) Describe actions the Office of the Superintendent of Financial Institutions (OSFI) may take towards an insurer for not satisfying the Supervisory Target ratios.

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(c) (*3 points*) You are given a breakdown of the LICAT Total Ratio at December 31, 2018 under two registered reinsurance arrangements, YRT and Mod-co:

	No Reinsurance	**YRT**	**Mod-co**
Available Capital (A)	5,200	5,241	5,515
Surplus Allowance (B)	1,400	1,360	1,360
Eligible Deposits (C)	0	0	0
Numerator (D) = (A) + (B) + (C)	6,600	6,601	6,875
Diversified Risk Requirement (E)	2,900	2,840	2,840
Operational Risk (F)	2,800	2,802	2,884
Required Capital (G) = (E) + (F)	5,700	5,642	5,724
Scalar Multiplier = 1.05			
Base Solvency Buffer (H) = (G) x 1.05	5,985	5,924	6,010

Explain causes for the difference in the following components between the three arrangements:

(i) Surplus Allowance (B)

(ii) Diversified Risk Requirement (E)

(iii) Operational Risk (F)

(d) (*2 points*) Describe considerations when recognizing ceded liabilities for unregistered reinsurers under LICAT.

4. (*6 points*)

(a) (*1 points*) List the qualifications necessary to be an Appointed Actuary for a Canadian life insurance company.

(b) (*5 points*) Arthur is the Appointed Actuary of ABC Company, a major Canadian life insurer. Below are his major actions as Appointed Actuary in 2018.

January 1: *Arthur is appointed as the Appointed Actuary by the board of directors. To help with the transition, Arthur chooses the previous Appointed Actuary, who is recently retired, to be his peer reviewer*.

February 28: *Arthur submits the Appointed Actuary Report to OSFI. He schedules a meeting for the following week with the peer reviewer to review the report.*

March 12: *Arthur is made aware that a 1 million dollar bond in the company's portfolio has a high probability of defaulting in the near future. He reports the matter immediately to senior management and sends a copy of the report to the board of directors. The report includes a recommendation to sell the bond with a one-month deadline.*

May 30: *Arthur's team completes a par block dividend review. The experience of the par block is worse than expected. The team recommends that the policyholder dividend be reduced by half in accordance with the dividend policy. Arthur opines that the recommendation is fair and approves the change. The new dividend comes into effect on June 15, 2018.*

August 1: *Arthur reports the second quarter's financial results and the dividend changes to the board of directors.*

August 30: *Arthur is notified about a lawsuit brought against the company by a class of non-participating policyholders. It is expected that the legal fees for the lawsuit will be significant. Arthur reduces the policyholder dividend to offset the legal fees and potential for lawsuit settlement. The changes come into effect on September 30, 2018.*

Critique the appropriateness of each of Arthur's actions.

5. (*13 points*)

(a) (*2 points*) Describe considerations for determining if a contract qualifies as an insurance contract for IFRS accounting purposes.

(b) (*3 points*) Assess whether the following contracts would be classified as insurance contracts under IFRS. Justify your assessment.

(i) A contract that pays the accumulated value of a single premium deposit at the maturity of a contract, or at death if earlier. Payments at death are subject to a market value adjustment.

(ii) A Universal Life contract where the accumulation rate of the policyholder account is tied to the return of an external index.

(iii) A contract to provide administration and record keeping services for a block of life insurance policies.

(iv) A life contingent payout annuity with a guaranteed benefit period of 5 years.

(v) A contract that pays the contract purchaser if a particular bond defaults.

(vi) A contract a golfer purchases to offset some of the cost incurred if they hit a hole-in-one, as this requires purchasing expensive gifts for friends and colleagues.

(c) (*3 points*) XYZ Insurance Company currently sells only 10 year term insurance and segregated funds products.

(i) Recommend the appropriate IFRS 17 measurement approach for each product.

(ii) Describe the effect of discount rate changes on the Contractual Service Margin (CSM) for each of the two products.

5. Continued

(d) (*5 points*) XYZ starts to sell two new single-premium term insurance products, Product A and Product B. The term of each product is 2 years. You are given the following cash flows and assumptions:

Cash flow projection at inception	**Product A**	**Product B**
Time 0 Premium	5000	2500
Year 1: Claims and expenses (with CALM margin)	1500	1200
Year 2: Claims and expenses (with CALM margin)	2000	1800

All claims and expenses occur at the end of the policy year.

CALM Margin (MfAD) on claims and expenses	15%
CALM valuation interest rate	6%
Observable market rate from similar instruments	4%
IFRS 17 Risk Adjustment	10% of undiscounted cash outflows

Calculate the insurance contract liability at inception for each product under:

(i) CALM

(ii) IFRS 17

Show all work.

6. (*13 points*)

(a) (*4 points*) You are determining the December 31, 2018 insurance contract liabilities for this policy using the Canadian Asset Liability Method (CALM).

You are given the following Canadian insurance contract liability cash flows:

Year	**2019**	**2020**	**2021**
Cash flow	100	1,200	1,200

The following two Government of Canada bonds are used to support the policy liability:

	Bond A	**Bond B**
Face Amount	1,000	1,000
Market Value at December 31, 2018	1,100	1,200
Coupon Rate	10%	10%
Maturity Date	December 31, 2020	December 31, 2021

Assume the following:

- The base scenario reinvestment rate is 5%
- The reinvestment rate in the prescribed scenario with the largest insurance contract liabilities is 2%.
- All asset and liability cash flows occur at the end of the year.

Calculate the interest rate risk provision for adverse deviation (PfAD). Show all work.

(b) (*1 point*) Describe how interest rate risk is reflected under the IFRS 17 framework.

(c) (*5 points*) Consider a Canadian dollar liability of 10,000 payable at the end of five years. The assets backing this liability are denominated in U.S. dollars. Currency forwards are not readily available. You are given:

- Current spot rate: 1.00 U.S. dollar buys 1.30 Canadian dollar
- Canadian risk-free rate = 2.50%
- U.S. risk-free rate = 2.75%
- Historical standard deviation = 0.030

Determine the Provision for Adverse Deviation for currency risk under CALM.

6. Continued

(d) (*3 points*) A Guaranteed Annuity Option gives a policyholder the right to purchase a payout annuity at a guaranteed price at a later date.

(i) Describe the key non-economic assumptions for the valuation of a Guaranteed Annuity Option.

(ii) Describe the considerations for determining the MfAD for each assumption.

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

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