Exam ILALFVC

Life Finance & Valuation - Canada
MORNING SESSION

Date: Thursday, November 1, 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.

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

1. (*11 points*)

(a) (*3 points*) Critique the following statements pertaining to IFRS 17:

A. *IFRS 17 allows multinational insurance companies to use different accounting policies to measure similar insurance contracts issued in different jurisdictions.*

B. *IFRS 17 requires insurance companies to recognize financial options and guarantees embedded within insurance contracts only when such options and guarantees are in the money.*

C. *IFRS 17 allows companies to determine how insurance contracts are aggregated for measurement purposes as long as relevant disclosures are provided.*

D. *IFRS 17 requires insurance companies to recognize losses on onerous contracts immediately in profit or loss.*

E. *IFRS 17 applies to both reinsurance and insurance contracts, but does not apply to investment contracts with discretionary participation features, which will be covered by IFRS 9.*

F. *IFRS 17 requires a company to recognize a group of insurance contracts when the coverage starts.*

(b) (*3 points*) Contrast the treatment of term life insurance under IFRS 17 and U.S. GAAP for each of the following:

(i) Revenue

(ii) Discount rate

(iii) Treatment of risk

(iv) Mortality assumptions

(v) Acquisition costs

1. Continued

(c) (*5 points*) You are given the following information for a term life block:

Item	Year 1	Year 2
Premium	1000	500
Commission	100	50
Acquisition Expense	75	0
Maintenance Expense	25	25
Death Benefit	150	300
Investment Income	200	250

Item	Time 0	End of Year 1	End of Year 2
U.S. GAAP Expense Reserve	0	-150	-100
U.S. GAAP Benefit Reserve	0	500	700
Present Value of Cash Flows	-950	-300	-175
Risk Margin	80	60	30

Question 1 continued on the next page.

1. Continued

Assume:

- No taxes
- Other comprehensive income is zero
- Contractual service margin amortizes linearly over 3 years
- No deviations from baseline assumptions occur

(i) Construct an income statement under U.S. GAAP and IFRS 17 using the following format:

U. S. GAAP	Year 1	Year 2
(+) Revenue		
(–) Benefits and Expenses		
(=) Profit		

IFRS 17	Year 1	Year 2
(+) Insurance Revenue		
(–) Incurred Claims & Expenses		
(=) Insurance Service Result		
(+) Investment Income		
(=) Profit		

Show all work.

(ii) Construct a balance sheet under U.S. GAAP and IFRS 17 using the following format:

U. S. GAAP	Time 0	End of Year 1	End of Year 2
(+) Financial Assets			
(–) Insurance Contract Liabilities			
(=) Equity			

IFRS 17	Time 0	End of Year 1	End of Year 2
(+) Financial Assets			
(–) Insurance Contract Liabilities			
(=) Equity			

Show all work.

2. (*9 points*) EON, a Canadian life insurance company, has a large non-segregated deferred annuity portfolio. EON recently launched its first segregated fund product, offering fixed income investments and investment guarantees.

The product features for the new product are as follows:

- At the end of 20 years, the policyholder receives the higher of the fund value and 100% of total cumulative deposits. The policyholder can elect to receive the payout in cash or to annuitize at a guaranteed interest rate of 4%.
- If death occurs before the end of year 20, the beneficiary is paid the higher of the fund value or 100% of the total cumulative deposits.

The annuitization feature for the new product is similar to the annuitization feature of EON's existing fixed deferred annuity product. EON plans to use its deferred annuity mortality, annuitization assumptions and a regime-switching lognormal interest rate model to calculate its segregated fund reserves. The company does not intend to hedge its liabilities or amortize its acquisition expenses.

(a) (*2 points*) Outline the segregated fund's valuation methodology under current Canadian standards of practice.

(b) (*4 points*) Using fixed-income returns for segregated fund guarantee valuation:

(i) (*2 points*) Describe the CIA's fixed income calibration criteria for segregated fund liabilities

(ii) (*1 point*) Explain the two alternatives which can be applied to the fixed income calibration criteria.

(iii) (*1 point*) Recommend the most appropriate alternative for EON. Justify your recommendation.

(c) (*3 points*) Propose mortality, withdrawal and policyholder option margins for adverse deviation for valuing the new segregated fund product under current Canadian standards. Justify your proposals.

3. (*13 points*) BAC Life has underwritten an annuity contract which will pay a benefit of 1 million after 20 years if the policyholder is alive. You are given:

Age	20
q_x For All Ages	30 per 1,000
Best Estimate Risk-Free Rate In All Periods	2.0%
Corporate A Spread (Current)	1.0%
Corporate A Spread (Historical)	2.0%
Asset Depreciation	0.3%
Non-Fixed Income (NFI) Capital Gains	6.0%
Promulgated Ultimate Rate of Return - High	10.0%
Promulgated Ultimate Rate of Return - Mid	5.2%
Promulgated Ultimate Rate of Return - Low	3.2%

Assume:

- The assets backing the liability are invested 50% in a 10-year A-Rated Corporate Bond and 50% in Canadian common shares.
- The asset portfolio is rebalanced only upon bond maturity at the same 50/50 allocation.
- No future mortality improvement.
- Margins for Adverse Deviation (MfADs) are at the high end of the range for all valuation assumptions.
- CALM Prescribed Scenario 1 results in the largest insurance contract liability.
- A change in non-fixed income capital gains at time zero results in the largest insurance contract liability.
- BAC's Appointed Actuary's Report states that Provisions for Adverse Deviation (PfADs) attributable to the LICAT Surplus Allowance are calculated before the other PfADs.

3. Continued

(a) (*3 points*) Determine the best estimate liability of the annuity contract at issue using the valuation assumptions given above. Show all work.

(b) (*5 points*) Calculate the total Provision for Adverse Deviation (PfAD). Show all work.

(c) (*4 points*) Determine the LICAT surplus allowance. Show all work.

(d) (*1 point*) You are given the following information:

Available Capital	50,000
Tier 1 Capital	30,000
Eligible Deposits	10,000
Base Solvency Buffer	55,000
Excess Deposits from an Unregistered Reinsurer	5,000

Calculate the LICAT Total and Core Ratios. Show all work.

4. (*10 points*) ABC Life, a Canadian life insurance company, has two inforce policies: a participating whole life policy issued in 2000 and a Single Premium Deferred Annuity issued in 2017.

You are given:

	Year	
Participating Whole Life Insurance	2016	2017
Gross Annual Premium	9,000	9,000
Reinsurance Premium	3,000	3,000
Annual Dividend paid in cash	1,000	1,000
Cash Surrender Value (Policy anniversary)	24,200	24,400
Year End Gross Statutory Reserve	33,100	33,500
Year End Net Statutory Reserve	31,600	32,000
Single Premium Deferred Annuity		
Single Premium	-	250,000
Commissions paid	-	2,500
Year End Net Statutory Reserve	-	245,000

The whole life policy is reinsured with a registered reinsurer. The policyholder purchased the life insurance policy while living in Ontario, where the premium tax rate is 2%. After the policy was issued, the policyholder moved to Nunavut where the premium tax rate is 3%.

(a) (*3 points*)

(i) Outline considerations in determining premium tax for these two policies.

(ii) Determine the premium tax payable in 2017 for these two policies. Show all work and justify your answer.

(b) (*4 points*) Taxable income reported for the participating whole life policy with respect to accrual taxation is 400.

The bond yield rate used for the Investment Income Tax (IIT) calculation is 2.39%.

(i) Describe the process for determining the bond yield rate used for the IIT calculation.

(ii) Determine the 2017 Investment Income Tax payable for these two policies. Show all work and justify your answer.

4. **Continued**

(c) (*3 points*) Assuming the following:

- ABC Life has no investment income in 2017
- The Single Premium Deferred Annuity has a period of coverage of 25 years.

(i) Construct the 2017 pre-tax statutory income statement for ABC Life.

(ii) Determine the business income for tax purposes by adjusting the pre-tax statutory income.

5. (*7 points*) CDN Life, a Canadian Life Insurer, is reviewing its mortality assumption. CDN sells life insurance through both captive agents and direct channels. The direct channel business uses a simplified underwriting process. CDN currently uses an industry mortality table and have been monitoring mortality experience for the past five years.

CDN has prepared a summary of their mortality experience:

Year	2013	2014	2015	2016	2017	5-yr Cumulative
Number of claims	366	350	313	286	271	1586
Actual/Expected	118.7%	113.3%	104.3%	95.3%	87.0%	103.7%

Percentile	90.0%	95.0%	97.5%	99.0%	99.5%
Z(p)	1.282	1.645	1.960	2.326	2.576

(a) (*3 points*) Determine if CDN's mortality experience falls within the error margin at the 95th percent confidence interval for:

(i) Annual experience

(ii) Cumulative experience

(b) (*1 point*) The Chief Actuary states that a key factor in the poor Actual/Expected experience is the result of using direct channels with a simplified underwriting process.

You are given the following:

- Simplified Underwriting would miss conditions present in 5% of the population.
- An additional 2% of people with existing conditions would seek insurance given the relaxed standards.
- Mortality for people with these conditions is double the average rate.
- CDN raised their assumed mortality rate to 5%, from 4.65% for policies sold using the direct channel.

Critique the Chief Actuary's statement. Show all work.

5. **Continued**

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

2017 Base Mortality	0.002
2018 Mortality Improvement Factor	0.0188
e_{45}	40
Diversification Factor	20%
Mortality Improvement MfAD	0.20%

Calculate the valuation mortality for 2018 for a female age 45 for the two following products. Show all work and justify any assumptions made.

(i) 10-year term insurance

(ii) Payout annuity

6. (*10 points*) With respect to Source of Earnings (SOE) analysis:

(a) (*2 points*)

(i) Define SOE analysis.

(ii) Outline the benefits of SOE.

(b) (*4 points*) You are given the following :

	2017	
Item	**Expected**	**Actual**
Premium	15.0	14.9
Product-related Investment Income	0.5	0.5
Surplus-related Investment Income	0.4	0.2
Benefits Paid on Decrements	1.5	1.7
Reserves Released on Decrements	0.3	0.4
Expenses	0.2	0.1
PfADs released	0.1	0.2
Pricing Gains/Losses	0.0	-1.0
Impact from all Assumption Changes	0.0	-5.0
Impact from Renegotiating Reinsurance Treaty	0.0	0.3
Surplus Expense	0.7	0.4
Error Correction	0.0	0.4

(i) Construct a Source of Earnings statement for 2017.

(ii) Recommend actions to improve earnings based on the results of the SOE.

(c) (*4 points*) A company is considering moving from a traditional SOE analysis to a market consistent embedded value (MCEV) earnings analysis.

Describe how the earning analysis will change under the MCEV approach versus the traditional SOE approach.

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

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