SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

AFTERNOON SESSION

Date: Thursday, April 26, 2018
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 4 questions numbered 7 through 10 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

Printed in the U.S.A.
Exam ILALFVC Front Cover

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

7. (*10 points*) You are the valuation actuary for a Canadian life insurance company which holds a block of term life policies valued under CALM. The current investment strategy is to invest free cashflows into 1-year risk-free zero-coupon bonds. You are given:

Time	**0**	**1**	**2**	**3**
Liability Cashflow	-1,000	500	500	700

Risk-Free Rate	4.55%
Promulgated Ultimate Rate of Return - High	9.60%
Promulgated Ultimate Rate of Return - Mid	4.00%
Promulgated Ultimate Rate of Return - Low	1.30%
Prescribed scenario with largest insurance contract liability	Scenario 1

(a) (*3 points*) Calculate the following items:

(i) Insurance contract liability

(ii) Interest Rate Risk Provision for Adverse Deviation (PfAD)

Show all work.

7. Continued

(b) (*3 points*) Your Chief Actuary has reviewed the results and would like to simulate the Interest Rate Risk using a Stochastic Interest Rate Model.

You are given the following calibration criteria at the 60-year horizon:

Table I		Long-Term Rate	Short-Term Rate	Slope
Left Tail Percentile	25th	5.00%	3.00%	0.00%
Right Tail Percentile	75th	8.00%	7.25%	1.50%

An interest rate scenario generator produced the following results at duration 60:

Run	60-Year Results	
	Long Term	Short Term
1	3.50%	3.25%
2	2.50%	2.75%
3	8.75%	7.50%
4	9.00%	8.00%
5	4.75%	5.00%

(i) Explain the approach proposed by the Actuarial Standards Board for assessing the criteria shown in Table I

(ii) Determine whether the output from the model satisfies each criteria. Show all work.

(c) (*4 points*) The Chief Actuary feels there is too much interest rate risk in the product, so she decides to change the investment strategy to 90% 1-year risk-free zero-coupon bonds and 10% Canadian equity. She states that a return of 6% per annum is appropriate for Canadian Equity.

(i) (*1 point*) Describe the considerations the Chief Actuary would have used in setting this rate of return.

(ii) (*3 points*) Calculate the CALM Liability using the new reinvestment strategy. Show all work.

8. (*9 points*) BDC Life is a Canadian insurance company reporting reserves under CALM.

(a) (*2 points*) Explain differences in the unit expense valuation assumptions for Universal Life (UL) Insurance products versus Whole Life Insurance products.

(b) (*7 points*) BDC Life is replacing its existing Universal Life product with a similar product with additional features:

- Two investment options whose returns are linked to popular market indices. One of the options doubles the return on the index, whether it is positive or negative.
- A segregated fund investment option.
- The option to switch from a yearly-renewable term cost-of-insurance (COI) option to a level COI option.
- The option to convert at attained age 75 to a guaranteed paid-up policy with fixed cash values.

You are given the following background information about BDC Life:

- BDC Life's existing traditional product line has recently experienced significant growth.
- BDC management has successfully reduced unit expenses over the past few years.
- Sales projections for the new UL product call for doubling in-force volume within 5 years.
- BDC plans to market the new UL product aggressively.

Recommend changes, if any, to the valuation expense assumptions used for the new enhanced UL product given the information above, with respect to the following:

(i) (*5 points*) Best estimate assumptions

(ii) (*2 points*) Margins for adverse deviation

Justify your recommendations.

THIS PAGE INTENTIONALLY LEFT BLANK

9. (*12 points*)

(a) (*2 points*)

(i) Identify the types of provisions for adverse deviations (PfADs) that can be included in the Surplus Allowance under LICAT.

(ii) Explain the reasons for the exclusion of certain types of PfADs in the Surplus Allowance.

(b) (*10 points*) You are given the following for SSM, a Canadian life insurance company:

Net Tier 1 Capital	12,000
Net Tier 2 Capital	7,000
Surplus Allowance	1,000
Eligible Deposits	500
Credit Risk Component	1,000
Market Risk Component	2,000
Lapse Risk Component	3,000
Operational Risk Component	3,000
Total Net Amount at Risk	1,000,000
Total Face Amount	3,500,000
Next year's expected claims	30,000
Standard deviation of next year's projected net death claims	3,889
Present value (PV) of best estimate cash flows (CFs)	16,000
Change in PV of CFs (i.e. PV shocked CFs - PV best estimate CFs) for each 10% increase in mortality assumptions	2,000
Change in PV of CFs for each 10% reduction in future mortality improvement assumptions in the first 25 years	400
PV of shocked CFs with the following absolute increase in deaths in the year following the reporting date:	
1 per thousand	17,500
1.2 per thousand	17,700
2 per thousand	18,000

9. Continued

Assumptions:

- It is appropriate to approximate the mortality risk component by grossing up the shocked impact proportionally
- Insurance risk is comprised of mortality and lapse risk only
- Assume no diversification benefits between risks

(i) (*2 points*) Determine the shock level for the mortality level risk component. Show all work.

(ii) (*4 points*) Determine the overall risk requirement for mortality risk. Show all work.

(iii) (*1 point*) Explain the difference between the Life Insurance Capital Adequacy Test (LICAT) Total Ratio and LICAT Core Ratio.

(iv) (*3 points*) Determine the LICAT Total and Core Ratios and assess whether they meet minimum and supervisory levels.

10. (*9 points*)

(a) (*2 points*) Determine whether the given situations create a 'permanent' or 'temporary' tax difference for Canadian insurers. Justify your response.

(i) Income from Canadian subsidiaries

(ii) Real estate re-valuation

(iii) Net capital gains on real estate

(iv) Differences between GAAP and tax reserves

(b) (*3 points*) Determine whether the following are considered sources of recovery for tax losses which can be used in the valuation of policy liabilities. Justify your response.

(i) Expected releases of provisions for adverse deviation (PfAD) in the insurance contracts

(ii) Taxable investment income on current surplus

(iii) Taxable income arising from annuity contracts

(iv) Future new business arising from the sale of new insurance contracts

(v) Renewals of group life and health business

(vi) Expected gains from future mortality improvements on insurance contracts

10. Continued

(c) (*4 points*) You are given the following information with respect to a Canadian insurance company valuation on December 31, 2018:

Year End Values	**2018**	**2019**	**2020**
Statutory reserves	1,200	1,100	0
Maximum Tax Actuarial Reserves	1,000	950	0

- Corporate Tax Rate = 40%
- Discount Rate = 5%
- GAAP and Tax Asset values are the same

Calculate the insurance contract liability after carve-out as at year-end 2018.

Show all work.

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

USE THIS PAGE FOR YOUR SCRATCH WORK