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**SOCIETY OF ACTUARIES**  
**Life Finance & Valuation - Canada**

# **Exam ILALFVC**

## **MORNING SESSION**

**Date:** Thursday, October 30, 2014

**Time:** 8:30 a.m. – 11:45 a.m.

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### **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 7 questions numbered 1 through 7.
  - b) The afternoon session consists of 4 questions numbered 8 through 11.

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.





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

**1.** (9 points) Pelican Life is a mid-size company with a long history of specializing in traditional life products with a relatively small but stable customer base. In recent years it has been trying to expand its business by entering the Universal Life (UL) market.

(a) (5 points)

- (i) (1 point) List the categories of reserve reviewing techniques.
- (ii) (2 points) Recommend two appropriate reviewing techniques for Pelican Life's business and justify your choices.
- (iii) (2 points) Pelican recently began issuing a disabled life product. You have been asked to verify the reserves for this block of business and are given the following claims data:

Incurred Month	Claims Paid as of Dec. 31	Cumulative Completion Factor
Jul	260	1.00
Aug	220	1.20
Sep	250	1.50
Oct	150	2.00
Nov	100	2.60
Dec	80	3.20

Calculate the total claims reserve as of Dec. 31. Show all work.

(b) (2 points) Pelican Life is now subject to the requirements of the Sarbanes-Oxley Act (SOX). The company has provided you with the following information about their practices:

Practice A: *Each year, Pelican's internal audit department assesses the effectiveness of the company's internal controls over financial reporting. The manager of Pelican's audit department signs a statement attesting that no controls failed.*

## 1. Continued

Practice B: *In the actuarial department, errors in the actuarial valuation systems are the main risk to accurately determining reserves. Controls will be placed on the programs and spreadsheets used in calculating reserves.*

Critique each of these practices.

- (c) (2 points) Pelican is domiciled in Canada and sells business in both Canada and the U.S. Recently, Pelican began listing its shares on the New York Stock Exchange in order to take advantage of the U.S. capital markets. Pelican has a large number of policies that were issued many years ago backed by long term assets.
- (i) Outline the procedure for obtaining the value of the long term assets under Fair Value Accounting.
  - (ii) Explain how the implementation of International Accounting Standards would benefit Pelican.

2. (9 points) XYZ Life is reviewing the impact of the accounting changes from the proposed IFRS accounting standards using the June 2013 releases of the IASB and FASB Exposure Drafts.

(a) (2 points) Analyze how each of the following insurance contracts is measured under the proposed IFRS accounting standards using the June 2013 releases of the IASB and FASB Exposure Drafts.

- (i) Variable Deferred Annuity.
- (ii) Non-Proportional Life Reinsurance Ceded.
- (iii) Annually Repriced Hospitalization Individual Health Contract.
- (iv) Extended Auto Warranty.

(b) (7 points) XYZ Life has a 5-year term product with the following characteristics:

- Level premiums for the first 5 years
- After the first 5 years, policyholder can renew at annual rates subject to a guaranteed maximum premium

(i) (4 points) Critique the discount rate with reference to the proposed standards:

Current risk free rate: 10 year U.S. Treasury	3.00%
Market risk for expected credit losses	+1.25%
Non-performance (“own credit”) risk	+ 1.10%
Discount Rate	= 5.35%

(ii) (3 points) Identify which of the following statements are false and recommend changes to make the statements true.

Statement 1: *The renewals after the 5-year term are considered beyond the contract boundary since the company can re-assess the risk and set new premiums.*

Statement 2: *Because the coverage period of the insurance contract is not one year or less, the company should use the Premium Allocation Approach for this product.*

Statement 3: *As the company receives cash for premiums, the liability will increase.*

3. (8 points) Your company is considering an acquisition and are given the following output of the inforce business from the company's valuation models. No capital contributions or shareholder distributions were included.

Time ( $t$ )	Surplus at time $t$	Required Capital at time $t$	After-tax return on assets supporting surplus
0	10,000	4,000	4.00%
1	13,000	3,500	4.00%
2	14,000	3,500	4.00%
3	14,500	3,000	4.00%
4	15,000	3,000	4.00%
5	16,000	2,500	4.00%
After $t = 5$ , inforce business has all run off			

- (a) (1 point) Describe items that should be considered to perform an actuarial appraisal for the potential acquisition.
- (b) (4 points) Calculate the following assuming a risk discount rate of 10%:
- Present Value of Cost of Capital
  - Present Value of After Tax Statutory Book Profits
  - Inforce Business Value

Show all work.

- (c) (2 points) Assume:
- A portion of the required capital is funded by a debt level of 2,000 at all times  $t$ .
  - A constant after tax cost of debt of 6%.

Calculate the Present Value of Cost of Capital. Show all work.

- (d) (1 point) Calculate the Embedded Value assuming that the current book value of assets equals the realizable market value. Show all work.

4. (8 points) You are the actuary responsible for the valuation of a Canadian segregated fund product with a 100% guaranteed maturity benefit at the end of 10 years. You have asked your co-op student to read the CIA Consolidated Standards of Practice, as well as the CIA's Educational Note "Considerations in the Valuation of Segregated Fund Products" from November 2007 and report back how it relates to this block of business.

Discuss the appropriateness of each of the student's statements:

- (i) (2 points) It is appropriate to write down the acquisition expenses (AAE) using a fixed proportion of the revenue from collected expense charges (MERs) for this block, where the time taken to write down the AAE will depend on market performance.
- (ii) (1 point) It is appropriate to calculate a liability using an approach that does not explicitly test the recoverability of the unamortized AAE.
- (iii) (3 points) The "Bifurcated Approach" of valuing the block of business is better than the "Whole Contract" approach for the following reasons:
- The bifurcated approach produces a lower reserve;
  - The bifurcated approach produces a more stable reserve;
  - The bifurcated approach defers the writing down of the AAE as long as possible;
  - The bifurcated approach allows for more appropriate modeling of hedged liabilities.
- (iv) (1 point) It is never appropriate to hold a liability less than zero for this block of business.
- (v) (1 point) It is impossible to determine a C-3 risk for this block of business so setting it to zero is appropriate.



**5.** (7 points) With respect to the Minimum Continuing Capital and Surplus Requirement (MCCSR), Own Risk and Solvency Assessments (ORSA) and the Life Insurance Regulatory Framework changes:

- (a) (1 point) State the relationship, using a formula, between a company's assets, liabilities and capital for the revised regulatory capital requirements under the LIFR changes.
- (b) (2 points) Explain the impact the LIFR changes will have on each of the following:
  - (i) Policyholders, creditors and industry stakeholders;
  - (ii) Life insurance companies;
  - (iii) The Office of the Superintendent of Financial Institutions (OSFI);
  - (iv) Level and quality of regulatory capital for a going and gone concern.
- (c) (4 points) Given each of the following statements:
  - (i) Under ORSA the insurer only needs to focus on its four major risks (insurance, market, credit and operational risks);
  - (ii) Both large and small insurers must use the same sophisticated methods to estimate the amount of capital needed if the risk profiles are identical;
  - (iii) Internal Capital Targets may be set equal to the Supervisory Level plus an applicable margin if deemed to be more conservative than the company's own assessment of its risk;
  - (iv) The Chief Risk Officer is responsible for signing off on the insurance company's ORSA.

Evaluate the validity of each statement based on OSFI's Own Risk and Solvency Assessment along with any applicable modifications to ensure compliance. Justify your answer.

6. (13 points) ABC Insurance Co. is an established Canadian individual disability income insurer with operations in Canada and with a new operation in the United States. In the past, ABC has looked at capital from a statutory balance sheet perspective but is now implementing an economic capital framework.

(a) (2 points) Describe the advantages and disadvantages of ABC implementing an economic capital framework.

(b) (5 points) With regards to ABC's individual disability income product:

(i) (4 points) You are given the following:

MCCSR Risk Component	Amount (in millions)
Asset default (C-1) risk	3
Lapse risk	7
Mortality risk	0
Changes in interest rate environment (C-3) risk	6
Foreign exchange risk	0

- ABC's internal target capital ratio is 180%
- Annual earned premiums are 40 million
- Premiums are non-cancellable
- All policies have more than 5 years of premiums until they expire
- Disability income claim reserves are 70 million of which 20 million have a benefit period of 1 year or less remaining
- The product provides a monthly disability benefit for up to 2 years
- There are no negative reserves
- There is no reinsurance
- The individual disability product is the only product ABC sells in Canada

Determine the available capital under Minimum Continuing Capital Surplus Requirement (MCCSR).

(ii) (1 point) Describe each of the following requirements and identify the minimum Net Tier 1 Ratio and Total Ratio to meet each requirement:

- The Supervisory Target Capital Ratio
- The Minimum Capital Ratio

## 6. Continued

- (c) (6 points) With respect to ABC's economic capital:
- (i) (1 point) Define the aspects of the morbidity risk ABC should consider in their economic capital model.
  - (ii) (1 point) List a possible catastrophic event that could impact disability incidence and termination rates.
  - (iii) (4 points) You are given the following correlation matrix and economic capital requirement for the Underwriting & Demographic risks:

<b>Risk</b>	<b>Mortality</b>	<b>Morbidity - Incidence</b>	<b>Morbidity - Recovery</b>	<b>Lapse</b>	<b>Expense</b>
<b>Mortality</b>	1.00	0.25	0	0	0.25
<b>Morbidity - Incidence</b>	0.25	1.00	-0.75	0	0.75
<b>Morbidity - Recovery</b>	0	-0.75	1.00	-0.50	0.75
<b>Lapse</b>	0	0	-0.50	1.00	0.25
<b>Expense</b>	0.25	0.75	0.75	0.25	1.00
<b>Economic Capital</b>	1	14	27	7	4

Calculate the Economic Capital required for the Underwriting & Demographic risks with and without the diversification benefit. Show all work.

7. (6 points) Life Insurance Company A has the following liability risk profile as of year-end 2012:

	Individual Disability Income (in millions)	Individual Critical Illness (in millions)	Individual Long-Term Care (in millions)
New claims	6.80	8.16	4.45
Continuing claims	2.20	0.00	10.40

Life Insurance Company A is considering a reinsurance arrangement with Reinsurer B.

- (a) (1 point) Identify two differences between YRT and coinsurance agreements.
- (b) (5 points) Reinsurer B will only offer YRT reinsurance with a 50% quota-share arrangement for one of the three lines of business Life Insurance Company A sells. Recommend the line of business Life Insurance Company A should be ceding. Justify your recommendation.

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**

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