

Exam ILALFMC

Life Financial Management - Canada

Date: Wednesday, November 4, 2020

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 11 questions numbered 1 through 11 with a total of 100 points.

The points for each question are indicated at the beginning of the question.

2. 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 provided in this document.

Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel document as directed within each question. Graders will only look at work in the indicated file.

a) In the Word document, answers should be entered in the box marked ANSWER within each question. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1, and x^2 can be typed as x^2.

b) In the Excel document formulas should be entered. For example, $X = \text{component1} + \text{component2}$. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.

c) Individual exams may provide additional directions that apply throughout the exam or to individual items.

2. The answer should be confined to the question as set.
3. The Word and Excel documents that contain your answers must be uploaded before time expires.

Recognized by the Canadian Institute of Actuaries.

1. (9 points)

(a) (2 points) With regard to solvency regulation:

- (i) List two reasons U.S. regulators would be interested in international regulatory developments.

ANSWER:

- (ii) Explain the shortcomings of the U.S. RBC factor-based approach compared to Solvency II's model-based approach.

ANSWER:

LHR Life is reviewing its economic capital.

- (b) (1 point) Describe the advantages and disadvantages of LHR operating at an economic capital ratio of 150% compared to 400%.

ANSWER:

- (c) (2 points) LHR is considering ways to reduce the economic capital being held for its block of Single Premium Immediate Annuities (SPIAs). Evaluate the effectiveness of each of the following techniques:

- (i) Diversification of risk through issuance of life insurance policies

ANSWER:

- (ii) Securitization of longevity risk through issuance of a 10-year longevity bond

ANSWER:

1. Continued

- (d) (4 points) LHR has three major business units, denoted X, Y, and Z. You are given the following information on the capital allocation to each unit:

Business unit	Stand-alone risk capital
X	390
Y	200
Z	325

Combination of business units	Required risk capital
X+Y	460
Y+Z	520
X+Z	600
X+Y+Z	700

The response for this part is to be provided in either the ANSWER box below or in the Excel document.

Critique the following statements:

- A. Unit X is the least profitable business unit due to its large risk capital requirement. If LHR decides to eliminate a business unit, it should eliminate X.

ANSWER:

- B. The required risk capital of the combined X+Y+Z should be allocated across the business units.

ANSWER:

- C. Having unallocated risk capital would indicate LHR is not covering all of its risks.

ANSWER:

2. (9 points)

(a) (5 points) AKL Life Insurance Company is a public company that was recently assigned a negative outlook by A.M. Best.

(i) (3.5 points) Describe the process followed by A.M. Best that results in the rating agency assigning a negative outlook to an insurance company.

ANSWER:

(ii) (1.5 points) List three potential impacts of the negative outlook on AKL's day-to-day operations.

ANSWER:

AKL has the following Best's Capital Adequacy Ratio (BCAR) components:

C1-Non Eq	15
C1-Eq	5
C2	5
C3-Int	15
C3-Mkt	5
C4	2
Available Capital	100

Net Required Capital =

$$\sqrt{(C1\text{-Non Eq} + C3\text{-Int})^2 + (C1\text{-Eq} + C3\text{-Mkt})^2 + (C2)^2} + C4$$

(b) (1 point) Calculate the BCAR for AKL. Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel document.

2. Continued

- (c) (3 points) AKL is considering buying a block of term life insurance business and selling a block of variable annuity (VA) business. Each transaction would impact capital as follows:

	Buy term	Sell VA	Both
Change in Net Required Capital	1	-2	-1
Change in Available Capital	-2	1	-1

- (i) Recommend whether AKL should buy the term life insurance block, sell the variable annuity block, do both or do neither based on the BCAR score only.

The response for this part is to be provided in the Excel document.

- (ii) Identify two considerations other than the BCAR score that should be taken into account when making the recommendation.

ANSWER:

3. (5 points)

(a) (3 points) For a typical structure of a Special Purpose Vehicle (SPV) used to obtain financing:

(i) Describe the entities involved.

ANSWER:

(ii) Describe the interactions between them.

ANSWER:

(b) (2 points) Describe two key benefits and two key risks to a company sponsoring an SPV.

ANSWER:

4. (7 points)

- (a) (2 points) Describe how the introduction of the new tax exemption rules in 2017 impacted the level of tax-exempt accumulation within a life insurance policy.

ANSWER:

- (b) (5 points) You are given the following information for a UL policy issued at age 40:

Level Face Amount = 100,000

Policy Year	Beginning of Year Projected Account Value at Issue
1	0
2	4,445
3	6,000
4	7,815
5	9,490
6+	0

You are given the following actuarial present value functions, where $A_{x:\overline{n}|}$ is the present value of a life insurance policy which endows at attained age $x+n$:

$$A_{x:\overline{n}|} = x/150 + n/1000, \text{ for when the annual interest rate is 3.5\%}$$

$$A_{x:\overline{n}|} = x/200 + n/400, \text{ for when the annual interest rate is 4.0\%}$$

Determine the tax-exempt status at issue of the above policy:

- (i) issued in 2015
(ii) issued in 2020

Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel document.

5. (11 points)

- (a) (2 points) Describe four sources of profits or losses under the IFRS 17 General Measurement Approach.

ANSWER:

- (b) (6 points) Critique the following statements with respect to IFRS 17.

A. *IFRS 17 valuation includes both cash flows that relate directly or indirectly to the fulfilment of an insurance contract. Expenses such as claims handling costs, policy administration costs, and overhead are included. However, expenses from abnormal amounts of wasted labour, tax payments, and receipts the insurer does not pay or receive in a fiduciary capacity should be excluded.*

ANSWER:

B. *The inclusion of acquisition expenses in the present value of future cash flows reduces the Contractual Service Margin (CSM), and results in the deferral of those expenses to be recognized in profit later. This is similar to the DAC asset that is held on the balance sheet and amortized over time under IFRS 4.*

ANSWER:

5. Continued

C. *The IFRS 17 Standard does not specify any particular method to determine coverage units, so the actuary could apply judgment. Coverage units reflect the quantity of the benefits provided under a contract and its expected coverage duration. The quantity of benefits is based on the benefits expected to be incurred by the insurer. Coverage units should be calculated net of reinsurance. For practical reasons, to simplify calculations, coverage units can be based on the present value of benefits provided without discounting.*

ANSWER:

D. *Insurance contract liabilities of short-term insurance contracts will decrease when moving from IFRS 4 to IFRS 17.*

ANSWER:

(c) (3 points) Recommend an appropriate IFRS 17 contract boundary for the following annuity product. Justify your answer.

- Single premium fixed annuity with a deferral period of 10 years.
- Annuity benefits are based on the book value at the end of the deferral period with a minimum of 30 basis points (bps) annuitization rate.
- Risk Free Rate = 40 bps

ANSWER:

6. (12 points)

- (a) (7 points) You are given the following information about groups of insurance contracts that were issued in prior years:

		Impact of Current Year Assumption Changes on the Fulfilment Cash Flows		
IFRS 17 Group	CSM at beginning of current year	Mortality	Lapse	Discount Rates
A	50,000	25,000	(4,000)	8,000
B	10,000	15,000	(2,000)	6,000

IFRS 17 Group	Interest Rate for Current Year			Coverage Units	
	At Current Period Start	At Current Period End	At Initial Recognition	Current Service	Future Service
A	4.2%	4.0%	5.0%	5,000,000	60,000,000
B	4.2%	4.0%	4.5%	3,000,000	50,000,000

The IFRS 17 general measurement approach is used for this block of business.

Calculate the CSM for each of Groups A and B at the end of the current year. Show all work, including writing out relevant formulas used in any calculations.

<i>The response for this part is to be provided in the Excel spreadsheet.</i>

6. Continued

- (b) (5 points) You are given the following information for a Single Premium 3-Year Term Life insurance product:

Face Amount:	100,000
Single Premium:	1,000
Annual Expected Mortality Rate	0.1%
Annual Expected Lapse Rate	5.0%
Risk Free Rate	0.4%
Liquidity Adjustment	0.1%
Asset Earned Rate	1.5%
Risk Adjustment (as % of expected claims)	20.0%
Annual Attributable Maintenance Expense	75
Attributable Acquisition Expense (excluding Commissions)	200

Assume:

- The single premium is received at the start of year 1
- Acquisition expenses and commissions are incurred at the start of year 1
- Claims and maintenance expenses are incurred at the end of each year
- The IFRS 17 general measurement approach is used for this block of business.

Determine the maximum amount of commission that can be paid at time of issue without making this contract onerous at inception under the IFRS 17 standard. Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel spreadsheet.

7. (7 points)

- (a) (4 points) Describe the four principles of a sound Reinsurance Risk Management Policy.

ANSWER:

- (b) (3 points) Critique the following statements with respect to the valuation of gross policy liabilities and reinsurance recoverables under IFRS 4:

- A. *An insurer can offset reinsurance recoverables against the related gross liabilities; ceded liabilities are not required to be disclosed for financial reporting or regulatory purposes.*

ANSWER:

- B. *The actuary's report should describe the valuation and presentation of policy liabilities and reinsurance recoverables for the insurer's balance sheet and income statement, and the actuary's opinion on the appropriateness of those liabilities and recoverable and on the fairness of their presentation.*

ANSWER:

- C. *A simple "gross-up" of the net liability can be used to determine the gross liability for all elements of an insurer's net liability. The reinsurance recoverables can then be calculated as the difference between the gross and net liabilities.*

ANSWER:

- D. *Any provision for impairment of the reinsurance recoverables should be included in the gross liability*

ANSWER:

7. Continued

- E. Direct written contracts are to be classified as insurance contracts, financial instruments or service contracts. The corresponding ceded reinsurance contract must follow the classification of the direct contract.*

ANSWER:

- F. It is expected that margins would be consistent between the gross liability and the net liability.*

ANSWER:

8. (9 points)

- (a) (2 points) Describe four special considerations in determining economic best estimate valuation assumptions under CALM for UL policies that are not required for traditional whole life policies.

ANSWER:

- (b) (7 points) You are valuing the following two blocks of Universal Life policies under CALM:

	UL A	UL B
Underwriting	Simplified underwriting, preferred and standard risk	Fully underwritten, preferred and standard risk
Surrender charges	5% surrender charges grading off at 5 th policy anniversary; none thereafter	10% surrender charges grading off at 10 th policy anniversary; none thereafter
Persistency bonus	None	10% of premiums paid during the first 10 years payable at the end of year 20
Cost of insurance options	YRT	Level
Investment options	<ul style="list-style-type: none"> • 1 domestic equity fund • 1 fund with portfolio rate tied to Government of Canada Long-term Bond Yields • No administration charge for investment switches • Full Market Value Adjustment (MVA) on investment switches 	<ul style="list-style-type: none"> • 10 different foreign and domestic equity funds • 5 and 10-year GIC funds • 1 money market fund • Administration charge of 500 for investment switches • No Market Value Adjustment (MVA) on investment switches
Reinsurance	None	Quota share YRT
Marketing strategy and associated funding level	Death benefit protection with minimal funding	Investment and/or tax deferral purposes with maximum funding

8. Continued

Explain how the valuation assumptions including margins differ between the two blocks of business for the following assumptions:

(i) Mortality

ANSWER:

(ii) Expenses

ANSWER:

(iii) Lapses

ANSWER:

(iv) Premium persistency

ANSWER:

9. (9 points)

(a) (2 points) With respect to methods of valuing segregated fund policy liabilities:

- (i) Explain why avoiding excessive and unnecessary pro-cyclicality is a desirable feature.

ANSWER:

- (ii) List five other desirable features.

ANSWER:

(b) (3 points) With respect to hedging in the context of CALM valuations:

- (i) (1 point) Describe the steps required for a first-principles application of CALM with a dynamic hedging program.

ANSWER:

- (ii) (2 points) Describe the risks and costs of hedging to reflect in valuation.

ANSWER:

9. Continued

- (c) (4 points) NewCo Life recently introduced their first segregated fund product with guarantees. NewCo will dynamically hedge most, but not all, aspects of the liability.

For valuation, NewCo is considering using either the Adapted Risk Neutral Method or the Hedge Cost Method as an approximation to the First Principles Stochastic-on-Stochastic Method.

- (i) (1 point) List the pros and cons of both approximation methods.

ANSWER:

- (ii) (3 points) Recommend an approximation method. Justify your answer.

ANSWER:

10. (12 points)

You are given the following for ABC Life:

Net Tier 1 Capital	22,000
Net Tier 2 Capital	8,000
Surplus Allowance	1,200
Eligible Deposits	700
Credit Risk Component	1,200
Market Risk Component	3,000
Gross Written Premium in Past 12 Months	5,000
Business Volume Required Capital Factor for Direct Written Premiums	2.50%
General Required Capital Factor for Credit, Insurance and Market Risk	5.75%
Total Net Amount at Risk	2,000,000
Total Face Amount	3,500,000
Next Year's Expected Claims	40,000
Standard Deviation of Next Year's Projected Net Death Claims	3,875
Present Value (PV) of Best Estimate Cash Flows (CFs)	20,000
Change in PV of CFs for Each 10% Increase in Mortality Assumptions	2,300
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 1 per 1000 Increase in Deaths in the Year Following the Reporting Date	22,500
PV of Shocked CFs with +/-30% Change in Lapses in the First Year Following the Reporting Date	20,500
PV of Shocked CFs with +/-60% Change in Lapses in the First Year Following the Reporting Date	21,300
PV of Shocked CFs with Absolute 20% Increase in Lapses in the First Year Following the Reporting Date	21,000

Correlation Coefficient	Mortality Risk	Lapse Risk
Mortality Risk	1	0.5
Lapse Risk	0.5	1

Assume:

- All business sold by ABC Life is non-par.
- There is no large increase in business volume.
- There is no reinsurance.
- The mortality risk component can be approximated by grossing up the shocked impact proportionally.

10. Continued

- (a) (10 points) Calculate the following, with respect to LICAT:
- (i) The total mortality risk capital requirement.
 - (ii) The lapse risk capital requirement.
 - (iii) The operational risk capital requirement.
 - (iv) The diversified risk capital requirement.
 - (v) The total insurance risk capital requirement.

Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel spreadsheet.

- (b) (2 points)
- (i) Calculate the Core LICAT ratio.
 - (ii) Calculate the Total LICAT ratio.
 - (iii) Comment on the capital standing of this company.

Show all work, including writing out relevant formulas used in any calculations.

The response for this part is to be provided in the Excel spreadsheet.

11. (10 points) Critique the following statements regarding VM-20 and ASU 2018-12:

- A. *For life insurance contracts, VM-20 and ASU 2018-12 only apply to policies issued after the regulations' effective dates.*

ANSWER:

- B. *The ASU 2018-12 policyholder benefit liability for a traditional whole life insurance contract will be calculated as the higher of the net premium reserve and the policy cash value.*

ANSWER:

- C. *Under ASU 2018-12, DAC for UL contracts will be changed to be amortized on a straight-line basis. There is no change in the amortization method for other contract types.*

ANSWER:

- D. *Scenario reserves are required for all life policies under VM-20.*

ANSWER:

- E. *Deterministic reserves should be calculated based on prescribed assumptions under VM-20.*

ANSWER:

11. Continued

- F. *Under ASU 2018-12, the net premium ratio for the policyholder benefit liability should be calculated on a seriatim basis and updated quarterly.*

ANSWER:

- G. *The discount rates used for ASU 2018-12 reserve calculations should be based on the company's expected portfolio yield without margin.*

ANSWER:

- H. *Best estimate assumptions should be used for the policy benefit liability under ASU 2018-12 and the deterministic reserve under VM-20.*

ANSWER:

- I. *The ceded net premium reserve under VM-20 is calculated the same as the ceded deterministic reserve.*

ANSWER:

- J. *Annuity contracts are excluded from VM-20 and ASU 2018-12.*

ANSWER:

****END OF EXAMINATION****