Exam ILALFMC

Life Financial Management - Canada

Date: Tuesday, May 10, 2022

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.
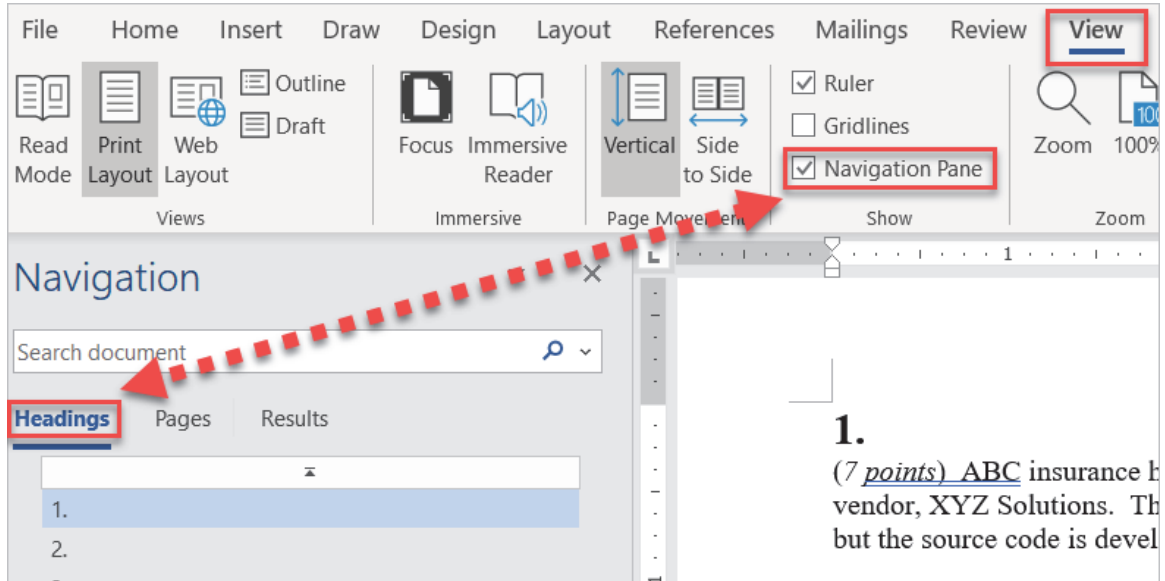
Written-Answer Instructions

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 = component1 + 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. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.

4. The Word and Excel documents that contain your answers must be uploaded before the five-minute upload period expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:

1.

(*10 points*) ABC Life Insurance is building an Economic Capital (EC) framework. Management is having a discussion regarding whether to use the finite risk horizon approach or the liability run off approach.

(a)　(*6 points*) Compare and contrast the two approaches based on each of the following management considerations:

　　(i)　We use buy-and-hold strategy for fixed interest investment and intend to closely match assets and liabilities.

> ANSWER:

　　(ii)　We want to know how many assets are required to cover liabilities with some degree of security.

> ANSWER:

　　(iii)　We closely monitor changes in market conditions and respond accordingly. We want to reflect these actions in the Economic Capital framework.

> ANSWER:

　　(iv)　We believe that yield curves eventually go back to normal after extreme market events.

> ANSWER:

　　(v)　We want to be consistent with the reality of capital management and regulatory reporting that requires capital to be calculated on an annual basis.

> ANSWER:

　　(vi)　We hope to easily calibrate EC to a target security level.

> ANSWER:

1. Continued

ABC has a liability cash flow projection model for reserve calculation. The model uses a population mortality table plus a PAD as base mortality table; it uses average historical mortality improvement derived from data from the past century. The discount rate is prescribed by regulation.

ABC observes mortality volatilities from various sources and decides to modify this model to do a stochastic projection for economic capital.

(b)　(*4 points*)　Recommend changes to the current liability projection model in order to accomplish ABC's intended objective.

> ANSWER:

2.

(*8 points*) ALF Life is transitioning its term and ULSG blocks of business to calculate reserves using VM-20. ALF does not have a clearly defined hedging strategy on these products.

(a) (*2 points*) Regarding starting assets and the use of a discount rate, describe 2 approaches that can be used to calculate deterministic reserve.

> ANSWER:

(b) (*2 points*) Describe the purpose of the following exclusion tests:

(i) Deterministic Exclusion Test (DET)

> ANSWER:

(ii) Stochastic Exclusion Test (SET)

> ANSWER:

(c) (*2 points*) Critique the following statements:

A. *Term products are eligible for DET while ULSG is not. While premiums are low during the level period, there will always be more than enough premium post level period to fund the policy so that there's no need to calculate a deterministic reserve.*

> ANSWER:

B. *ALF's term and ULSG products are eligible for SET.*

> ANSWER:

2. Continued

(d)   (*2 points*) You are given one of the projected scenarios from ALF's cash flow model.

Projection period	0	1	2	3	4
Statement value of assets	2,000	400	-200	-650	1,000
One – Year Treasury Rate	N/A	1.00%	1.20%	1.50%	2.00%

Calculate the scenario reserve. Show all work.

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

3.

(*9 points*) SEG Life, a Canadian life insurance company in the segregated fund business, has both a large inforce block and new business market share.

(a)   (*2 points*) You are given the following information for the most recent IFRS 4 valuation:

- The liability for the segregated fund guarantees is set at CTE(70).
- Recoverability testing has confirmed that the allowance for acquisition expenses (AAE) is fully recoverable.

(i)   Compare the term of revenue recognition to the term of the AAE at the valuation date.

ANSWER:

(ii)   Explain why the term of the AAE may change at future valuation dates.

ANSWER:

(iii)   Describe the CIA Standards of Practice requirements for an appropriate method to write-down the AAE.

ANSWER:

(b)   (*1 point*) Critique the following:

- *A CTE(0) level for recognizing future cashflows should be used for the purpose of annual AAE recoverability testing.*

ANSWER:

(c)   (*3 points*) Compare and contrast the Bifurcated Approach and the Whole Contract Approach for segregated fund valuation.

ANSWER:

3. Continued

(d) (*3 points*) SEG Life is considering redesigning their segregated fund product for new sales. The options being considered are:

    A. The surrender charge period will be extended from five years to seven years
    B. The guaranteed benefits will decrease from 100% to 75% of the initial deposit
    C. Fund options are limited to Fixed Income assets only

Assess the impact of each of the above proposed options on:

(i)   the best estimate Surrender assumption

ANSWER:

(ii)   the best estimate Partial Withdrawal assumption

ANSWER:

4.

(*11 points*)

(a)   (*2 points*) Outline the requirements under the CIA Standards of Practice for the following when calculating IFRS 4 reserves for life insurance products:

(i)   Reinsurance recoverables

ANSWER:

(ii)   Amount of assets required to support contract liabilities

ANSWER:

(iii)   Renewal benefits

ANSWER:

(iv)   Forecasting cashflows

ANSWER:

(v)   Adopting a scenario

ANSWER:

4. Continued

(b)   (*5 points*) The following statements summarize how a company determines its best estimate assumptions and margins for adverse deviation (MfAD). Critique the following statements.

A.   *Considerations in properly estimating best estimate morbidity assumptions include operational risks, seasonal variations in experience, and contract wording to protect against the impact of medical advances.*

ANSWER:

B.   *Due to lack of credibility, an addition of 17.5% of the best estimate of morbidity termination rates is applied, and a subtraction of 17.5% of the best estimate morbidity incidence rates is applied. The MfAD would not reflect any expected correlation between incidence and termination rates.*

ANSWER:

C.   *Best estimate expense assumption in the valuation of insurance contracts considers overhead, marketing and premium taxes. Expenses are well understood and managed, so an MfAD of 2.5% is applied.*

ANSWER:

D.   *Death supported products include an MfAD of $-5/e_x$. Death supported products include all 20-year Term and Term-to-100 policies that are reinsured on at least an 80% quota share basis.*

ANSWER:

4. Continued

      E.   The best estimate assumption for mortgage asset depreciation considers assets that are impaired at the valuation date and includes loss of interest, loss of principal, and expense of managing depreciation. The MfAD for mortgage asset depreciation considers assets that are impaired after the valuation date.

> ANSWER:

(c)   (*4 points*) 10 years ago MCB Insurance entered into the annuity market in Canada.

You are given:

- There were 1,500 annuitant death claims over ten years
- A reliable administration process has been established and followed
- The business mix of the portfolio is predominantly a wide range of blue collar (i.e. manual labour) industries
- The COVID-19 pandemic has caused deaths in the portfolio; however, it is not clear if this will result in a permanent change in the expected assumption
- The current annuitant mortality Provision for Adverse Deviation (PfAD) is 5,000,000.
- The current annuitant mortality MfAD of 6.5% was set when MCB entered the annuity market 10 years ago.

(i)   (*1 point*) Provide a rationale for setting the initial MfAD at 6.5%.

> ANSWER:

(ii)   (*2 points*) Recommend an updated MfAD.

> ANSWER:

(iii)   (*1 point*) Calculate the impact on the annuity block's PfAD from the recommended MfAD.

> ANSWER:

5.

(*9 points*) A Canadian life insurance company started selling Level COI Universal Life (LCOI UL) policies 10 years ago. New sales have doubled over the last 3 years. There are 10,000 policies currently inforce, most of them large joint last-to-die policies sold in the estate market. You are asked to review the lapse assumption for this product.

(a)   (*2 points*) Explain characteristics of the company's block of LCOI UL policies that will influence lapse experience.

> ANSWER:

The most recent internal lapse study shows the following lapse rates for the LCOI UL product:

Duration	Lapse Rate	Duration	Lapse Rate
1	3.3%	6	2.1%
2	2.7%	7	1.3%
3	3.0%	8	1.0%
4	2.2%	9	1.1%
5	1.5%	10	1.3%

You also have access to the most recent CIA LCOI UL lapse study, for which the aggregate lapse rates are as follows:

Table 1. Summary of valid records submitted by category. Volume in thousands.							
	Exposure		Lapses		Agg Lapse Rate		
	Count	Vol (000)	Count	Vol (000)	Count	Vol (000)	
All Guaranteed Policies	8,601,464	1,415,025,856	296,800	37,264,548	3.5%	2.6%	
less Riders	527,950	51,043,265	16,901	1,570,694	3.2%	3.1%	
Guaranteed, Base records	8,073,514	1,363,982,591	279,899	35,693,854	3.5%	2.6%	
less Joint	502,355	211,201,140	12,686	3,225,822	2.5%	1.5%	
Single, Gtd, Base records	7,571,160	1,152,781,451	267,213	32,468,032	3.5%	2.8%	
less Substd, Conv, GIE	1,001,454	161,646,860	28,879	4,320,969	2.9%	2.7%	
Standard subset of data	6,569,705	991,134,591	238,334	28,147,063	3.6%	2.8%	

5.   Continued

Table 3. Ungraduated lapse rates by duration for the current and prior studies. Includes guaranteed policies only. Volume is sum assured in thousands of dollars.

Study of 2005-2012				Duration	Study of 2002-2004			
Exposure		Lapse Rates			Exposure		Lapse Rates	
Count	Vol (000)	Count	Volume		Count	Vol (000)	Count	Volume
857,833	147,831,782	7.0%	4.7%	1	249,784	33,633,245	8.3%	5.2%
789,580	137,891,439	5.4%	4.1%	2	240,122	34,096,114	7.1%	5.4%
722,542	122,690,994	5.0%	4.1%	3	230,595	34,386,293	6.5%	5.1%
657,952	111,116,983	4.1%	3.2%	4	223,591	33,565,847	5.4%	4.0%
605,828	103,363,400	3.4%	2.6%	5	219,515	31,392,073	4.6%	3.6%
560,482	95,881,569	3.1%	2.3%	6	212,409	29,271,220	3.9%	3.1%
525,398	88,781,160	2.8%	2.1%	7	197,089	27,096,232	3.1%	2.4%
502,071	82,608,491	2.6%	2.0%	8	166,166	23,511,584	2.6%	2.1%
481,551	78,191,914	2.4%	2.0%	9	132,003	19,275,591	2.6%	2.2%
458,495	74,024,492	2.3%	1.8%	10	102,295	15,029,085	2.3%	2.0%
424,165	68,643,787	2.5%	1.9%	11	74,519	11,103,139	2.4%	1.9%
384,153	62,017,742	2.0%	1.6%	12	47,817	7,087,414	2.1%	1.7%
342,239	54,112,278	1.7%	1.3%	13	23,564	3,612,130	2.2%	1.8%
298,305	45,875,786	1.5%	1.2%	14	8,576	1,367,351	2.0%	1.5%
249,615	37,674,022	1.5%	1.1%	15	2,815	458,092	1.7%	1.4%
199,376	30,270,529	1.4%	1.0%	16				
155,783	23,417,556	1.3%	0.9%	17				
115,016	16,974,585	1.3%	1.0%	18				
86,188	12,338,375	1.3%	0.9%	19				
63,304	8,490,384	1.4%	1.0%	20				
43,558	5,351,951	1.5%	1.1%	21				
28,366	3,151,164	1.4%	1.2%	22				
18,335	1,831,616	1.2%	1.0%	23				
11,730	999,456	1.2%	1.1%	24				
7,924	627,408	1.4%	0.9%	25				
4,949	387,433	2.0%	1.6%	26				
2,873	231,580	1.6%	1.2%	27				
1,976	144,187	1.6%	2.1%	28				
1,129	65,525	2.0%	1.9%	29				
582	30,318	1.7%	0.9%	30				
171	7,948	0.6%	0.3%	31+				
8,601,464	1,415,025,856	3.5%	2.6%	All	2,130,860	304,885,411	4.8%	3.6%

(b)   (*5 points*) Propose a lapse assumption for the LCOI UL product. Justify your proposal.

ANSWER:

(c)   (*2 points*) Propose a margin for adverse deviations (MfAD) for the lapse assumptions. Justify your proposal.

ANSWER:

6.

(*10 points*) You are working on the implementation of IFRS 17 for the UL product at Star Life, a Canadian life insurance company. The liabilities for the UL product will be measured using the general measurement model (GMM).

(a)   (*2 points*)

(i)   Explain the purpose of the Risk Adjustment (RA) within the GMM.

ANSWER:

(ii)   List three risks to be included in the RA

ANSWER:

(iii)   List three risks to be excluded in the RA

ANSWER:

(b)   (*2 points*) Identify the considerations to use the current IFRS 4 MfADs as a starting point for calculating the IFRS 17 RA.

ANSWER:

(c)   (*2 points*) Describe two techniques which can be used to set the RA under an aggregate approach.

ANSWER:

6. Continued

(d)   (*4 points*) You are given the following information from a LICAT exercise:

- Present value of probability-weighted cash flows: 40,000
- Components of Base Solvency Buffer from LICAT:

Credit Risks	3,000
Market Risks	
Interest Rates	5,500
Others	3,500
Insurance Risks	
Level	10,000
Trend	8,000
Volatility	2,500
Catastrophe	2,000
Operational Risks	500
Diversification Adjustment	20%

Percentile	75%	85%	95%
Standard Normal Value	0.67449	1.036433	1.644854

(i)   (*1 point*) Describe an approach for using LICAT results to quantify an equivalent confidence level for IFRS 17 reporting.

ANSWER:

(ii)   (*3 points*) Calculate the minimum risk adjustment for non-financial risk required to get a confidence level corresponding to the 75th percentile given the data above. Show all work.

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

7.

(*6 points*) Company DEF sells a mix of 10-year term (T10) and whole life (WL) products. The T10 products can be renewed at guaranteed premium rates at the option of the policyholder. You are the actuary in charge of converting the modeling of reserves under CALM to IFRS 17. All policies were issued on the same date, at the start of Year 1. After inputting the assumptions into the modeling system, the following output is produced by the valuation system.

	T10	Whole Life
PV of premiums	13,000,000	14,000,000
PV of benefits	11,000,000	8,000,000
PV of directly attributable maintenance expenses	700,000	1,200,000
Directly attributable acquisition expenses	1,200,000	1,700,000
Risk Adjustment	1,000,000	1,600,000

Year	T10 Coverage Units	Whole Life Coverage Units
1	20,000,000	5,000,000
2	19,000,000	4,800,000
3	18,000,000	4,600,000
4	17,000,000	4,500,000
5	16,000,000	4,400,000
Total over Coverage Period	250,000,000	100,000,000

(a)   (*2 points*) Explain how the following IFRS 4 items would change under IFRS 17 for the T10 product

(i)   Classification of contracts

ANSWER:

(ii)   Term of the Liability

ANSWER:

(iii)   Determination of contract cashflows, including items included or excluded

ANSWER:

7. Continued

(b)   (*4 points*)

    (i)   (*2 points*) Calculate the total opening CSM for the portfolio containing both the T10 and whole life products.

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

    (ii)   (*2 points*) The insurance company updated the mortality assumption for years starting in year 2, which resulted in an increase in the best estimate liability of 1,000,000 for the T10 block, and a decrease in the best estimate liability of 1,100,000 for the whole life block.

        Calculate the CSM at the end of years 1 and 2 assuming a 0% interest rate.

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

8.
(*9 points*)

(a) (*6 points*) Critique the following statements with respect to IFRS 17 discount rates:

A. *The IFRS 17 discount rate applied to the estimates of future cash flows includes the effect of all factors that influence observable market prices (if any).*

> ANSWER:

B. *The bottom-up approach is based on a yield curve that reflects the current market rates of return implicit in a fair value measurement of a reference portfolio of assets and adjusted with a liquidity premium.*

> ANSWER:

C. *In Canada, it's reasonable to set the last observable point for Government of Canada bonds at 30 years.*

> ANSWER:

D. *In setting the long-term risk-free rate, the 'historical real interest rate + inflation target' approach has the advantage of data being easily available.*

> ANSWER:

E. *Cash Surrender Value will increase the liquidity of a Universal Life insurance contract, and surrender charges do not affect the liquidity of a Universal Life insurance contract.*

> ANSWER:

8. Continued

        F. A company has a Universal Life insurance product with cash flows that vary with returns on underlying items. Under the General Measurement Model (GMM), the discount rate used must reflect that variability.

> ANSWER:

(b)   (*3 points*) A company is developing a reference portfolio of assets to reflect the characteristics of its insurance contracts, and is considering either the Own Assets Portfolio approach or the Reference Portfolio approach.

    For each of the two approaches being considered:

    (i)   Describe the approach

> ANSWER:

    (ii)   Outline two advantages of the approach

> ANSWER:

    (iii)   Outline two disadvantages of the approach

> ANSWER:

9.

(*10 points*) Maple Leaf Life is a Canadian life insurer that primarily sells participating life insurance.

For the participating insurance product, the following two events occurred during the year:

1. Cash dividends are paid out to the policyholders.
2. Some policyholders have taken out policy loans.

(a)   (*2 points*)

(i)   Describe the impact of paying cash dividends with respect to Maple Leaf Life's income tax payable.

ANSWER:

(ii)   Describe the impact of taking out policy loans with respect to the policyholders' income tax payable.

ANSWER:

9. Continued

(b) (*8 points*) Maple Leaf Life is exploring a new product to be launched in 2022 where the death benefit in any given year is indexed to the company's stock price. For a policy issued to a 50-year-old, you are given the following in the Excel file:

- The expected stock price over the projection period, which is projected to increase every five years
- The Exemption Test Policy accumulating fund rate issued at age n: ETP AF(n)
- The policy cash value rate: Pol CV
- The policy net premium reserve rate: Pol NPR

The ETP AF(n), Pol CV, and Pol NPR are expressed as rates per thousand of coverage. In addition, for tax-testing purposes, death benefit growth should be assigned to the ETP with the earliest issue date, where possible.

(i) (*1 point*) Describe the difference in tax treatment of an exempt policy verses a non-exempt policy.

ANSWER:

(ii) (*4 points*) Demonstrate that the policy is projected to pass tax exempt testing in year 15, but not in year 19.

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

(iii) (*2 points*) Determine a new Pol CV pattern to ensure the policy passes tax exempt testing in year 19.

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

(iv) (*1 point*) Critique the product design of indexing the death benefit to the company's stock price, and the potential impact on the tax-exempt test.

ANSWER:

10.

(*10 points*) A consultant is developing a proposal to use embedded value analysis for explaining the value of the company's business. The following statements from the consultant have been highlighted for your review before they will be included in the report to the company's CFO.

Critique each statement. Justify your answer.

A.   *The traditional, formula-based approaches of US statutory reserving provide a commonly used basis for assessing company solvency, but they fail to distinguish movements in reserve margins from economic earnings in a reporting period.*

ANSWER:

B.   *Embedded Value is a more effective accounting basis that addresses the criticisms of current accounting methods.*

ANSWER:

C.   *Embedded Value is the same as the actuarial appraisal value of a company when used for mergers and acquisitions.*

ANSWER:

D.   *When calculating the Adjusted Net Worth, both the Required Capital and Free Surplus are assumed to earn market rates of return.*

ANSWER:

E.   *It is common to use a Risk Discount Rate that is consistent with the reporting entity's cost of equity capital, provided that the rate reflects the risks inherent in the business.*

ANSWER:

10. Continued

F.   *It is essential to have a clearly defined process for the selection of assumptions in the calculation of the Embedded Value.*

> ANSWER:

G.   *All non-economic assumptions used in the Embedded Value calculation should be based on industry data plus a provision for adverse deviations.*

> ANSWER:

H.   *When calculating the Time Value of Financial Options and Guarantees (TVFOG) using stochastic scenarios, it is recommended to use "real-world" scenarios.*

> ANSWER:

I.   *The accurate calculation of the final Embedded Value is more important to investors than adequate disclosure of the movement.*

> ANSWER:

J.   *There is substantial subjectivity on the part of the company for the disclosure of sensitivity tests for assumptions used in their Embedded Value calculations.*

> ANSWER:

11.

(*8 points*) Company AWH sells annuities which have a guaranteed payout for the life of the policyholder. The investment portfolio is comprised of corporate bonds.

(a) (*3 points*) Describe the calculation of the components of the aggregate capital requirements in the Base Solvency Buffer used in the LICAT Total Ratio for company AWH.

ANSWER:

(b) (*2 points*) Describe the calculation of the capital requirements for company AWH under the International Capital Standard (ICS).

ANSWER:

(c) (*3 points*) Discuss why the level of the following required capital components may change if the company were to move from LICAT to ICS:

(i) Insurance risk component

ANSWER:

(ii) Interest rate risk component

ANSWER:

(iii) Credit risk component

ANSWER:

END OF EXAMINATION