

Exam ILALPM

Date: Wednesday, May 11, 2022

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 10 questions numbered 1 through 10 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.

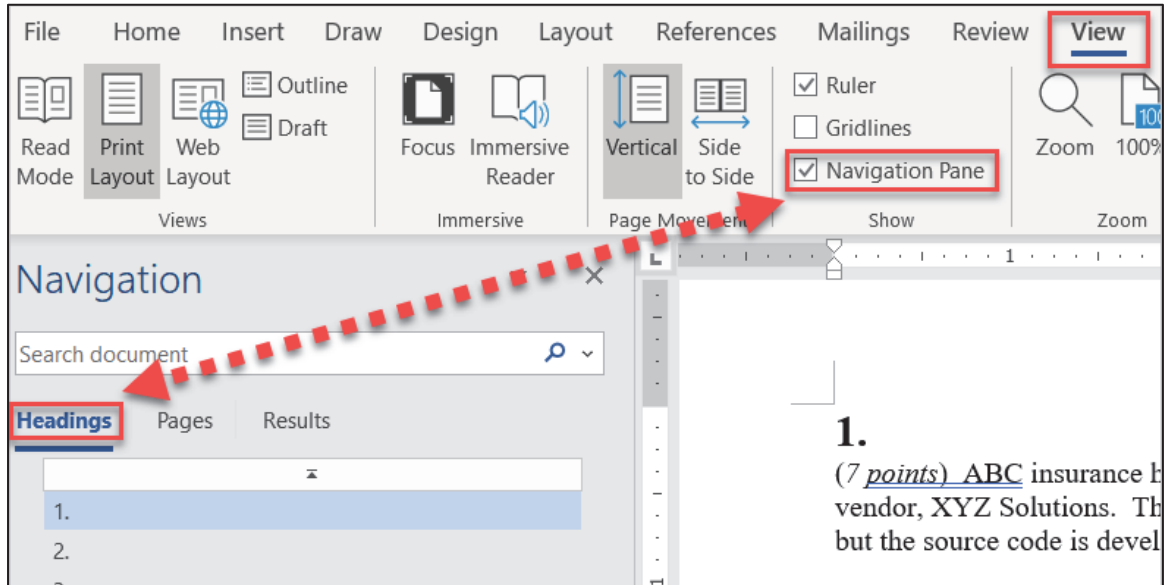
Written-Answer Instructions

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. 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.

(7 points)

(a) (2 points)

- (i) List the three components of a life insurer's earnings analysis.
- (ii) List the drivers and indicators for each component.

ANSWER:

ABC Life is conducting a mortality experience study on a policy count basis. The study period is from Jan 1, 2020 to Dec 31, 2020, which was during the COVID-19 pandemic. The following information is provided for the study:

Policyholder	Entry Date	Exit Date	Exit Cause
1	May 15, 2020	12/31/2020	End of study period
2	Jan 1, 2020	8/15/2020	Lapse
3	Apr 15, 2020	12/31/2020	End of study period
4	Jan 1, 2020	12/1/2020	Death
5	Mar 15, 2020	7/15/2020	Death
6	Jan 1, 2020	12/31/2020	End of study period
7	Feb 15, 2020	12/31/2020	End of study period
8	Aug 15, 2020	10/15/2020	Lapse

An actuarial student performed the study and calculated a relatively high mortality rate. However, results are expected to decrease in coming years as we exit the pandemic.

(b) (3 points)

- (i) (2 points) Calculate the total exposure using the daily rate exposure method for the study population assuming an annual adjustment of 365.25. Show all work.

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

- (ii) (1 point) Explain why using the daily rate exposure method, rather than the annual rate exposure method, is more accurate in this case.

ANSWER:

1. Continued

- (c) (2 points) Recommend experience assumption methodology improvements to enhance the quality of the experience study. Justify your answer.

ANSWER:

2.

(11 points) Your company is launching a new 10-year level premium term product with annually increasing renewable premiums after 10 years. The pricing actuary has developed three potential premium scales for the product.

You have been provided the following:

Premium Scale	Lifetime IRR	GAAP ROI at Issue
A	20%	11%
B	18%	14%
C	15%	12%

- (a) (2 points) Recommend the most suitable premium scale for the term product using the given lifetime IRR and GAAP ROI. Justify your response.

ANSWER:

- (b) (2 points) Explain possible reasons for the difference in values between lifetime IRR and GAAP ROI, even when experience emerges as expected.

ANSWER:

2. Continued

The term product also allows the policyholders to convert to a whole life policy without additional underwriting. Conversion can only be exercised within the first 10 policy years. Your team is reviewing the cost of term conversions. You are given the following:

Annual Lapse Rate (policy years 1-10)	2.5%
Conversion Mortality Multiple	1.1
Discount Rate	3%

Duration	q_x
1	0.038
2	0.044
3	0.051
4	0.059
5	0.068
6	0.078
7	0.090
8	0.104
9	0.120
10	0.138

(c) (4 points)

- (i) (3 points) Calculate the term conversion premium rate per thousand of face amount at issue using the given assumptions.

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

- (ii) (1 point) Explain what concerns could exist about the cost of term conversions.

ANSWER:

2. Continued

It has now been 15 years since the inception of the product. The block is closed, and you are performing analysis on the post-level term profitability of the product.

(d) (3 points)

(i) (1 point) Explain what concerns could exist about post-level term profitability.

ANSWER:

(ii) (2 points) Recommend a possible solution to address concerns about post-level term profitability. Justify your answer.

ANSWER:

3.

(11 points) KAG Life is evaluating whether to add a 20-year guaranteed level premium term rider and a chronic illness acceleration rider to their universal life with secondary guarantees (ULSG) product.

ULSG product features and assumptions:

- Issue ages: 18-85
- Mortality set at 100% of recent credible company ULSG experience with six underwriting classes, including substandard
- Lapse rates set at 4% in the first year, grading to an ultimate rate of 2% over five years
- Fully underwritten with face amount offerings of 50,000 to 500,000
- Secondary guarantee uses a shadow account design
- Base ULSG contract is expected to have low account values in the first ten policy years and zero account value thereafter

Proposed 20-year guaranteed level premium term rider design and assumptions:

- Issue ages: 18-60
- Pricing assumptions for mortality and lapse set equal to the base ULSG plan
- The available rider face amount will be up to nine times the base policy face amount, with an aggregate death benefit limit of 3,000,000
- Premiums equal to the premiums of a stand-alone level premium term insurance product
- The term rider charge deducted from the base product account value will be level for twenty years, followed by annually increasing rider charges

Proposed chronic illness acceleration rider design and assumptions:

- Uses the same underwriting, issue ages and application as the base ULSG plan
- Pricing assumptions for mortality and lapse set equal to the base ULSG plan
- Allows the policyholder to accelerate up to 100% of their base ULSG plan face amount or 1 million (whichever is less), when they are unable to perform two or more activities of daily living (ADLs), without assistance from another person as diagnosed by a medical professional
- Cost of rider is funded through additional premium
- Management is considering reinsuring the proposed chronic illness rider

3. Continued

(a) (4 points) With respect to the proposed 20-year guaranteed level premium term rider:

(i) Critique the proposed design and assumptions.

ANSWER:

(ii) Recommend design changes to minimize risk.

ANSWER:

(b) (4 points) With respect to the proposed chronic illness acceleration rider:

(i) Critique the design and risk control considerations.

ANSWER:

(ii) Recommend design changes to minimize risk.

ANSWER:

3. Continued

Current experience studies show that persistency has been better than expected on the ULSG product which is impacting the profitability as measured using both IRR and profit margin.

(c) (3 points) Recommend changes to the ULSG product design and pricing in consideration of the following:

(i) Updated lapse experience

ANSWER:

(ii) The two new riders

ANSWER:

(iii) Competitive considerations

ANSWER:

4.

(10 points) QXZ Life primarily sells products in the affluent market through an exclusive agent and agency manager system.

- (a) (2 points) Propose design elements for a term product to be sold in the direct to consumer channel.

ANSWER:

- (b) (4 points) Critique the following statements:

A. *The products offered in the direct to consumer channel should accept alternative forms of payment such as credit card.*

ANSWER:

B. *In designing the end-to-end process for purchasing life insurance, there is no need to consider agent involvement since this is a direct to consumer sale.*

ANSWER:

C. *The new direct sales channel currently accounts for a small portion of the market so only a small portion of resources should be allocated to the development of this direct to consumer product.*

ANSWER:

D. *Conversion options and other complex product options should be clearly described during the online sales process.*

ANSWER:

4. Continued

QXZ Life believes that a simplified underwriting method should be utilized to be successful in a direct to consumer channel. To support this method, QXZ is building a fluid-less risk score prediction model.

- (c) (4 points) Recommend four appropriate data elements that this predictive model should use. Justify your answer.

ANSWER:

5.

(10 points) HLC Life sells a 5-year level premium term product and backs the insurance liabilities with a portfolio of fixed income assets.

(a) (2 points) Compare and contrast the following strategies to manage the asset portfolio backing the liabilities:

- Immunization
- Cash flow matching
- Derivatives enabled

ANSWER:

The company's expected liabilities as of 12/31/2021 are as follows:

Calendar Year	Liabilities (EOY)
2022	1,100
2023	400
2024	300
2025	200
2026	200

The following assets are available for purchase:

- 2-year zero coupon bond with a yield-to-maturity of 7%
- 4-year zero coupon bond with a yield-to-maturity of 10%

The current yield curve is:

Maturity	Spot Rate
1 year	2.7%
2 years	3.1%
3 years	3.3%
4 years	3.5%
5 years	3.8%

(b) (3 points) Calculate the amount of cash HLC Life should invest in each of the available assets to implement an immunization strategy.

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

5. Continued

One year later on 12/31/2022, there was no change to the expected liabilities and the yield curve had a level shift down.

- (c) (2 points) Assess the impact to the proposed immunization strategy.

ANSWER:

- (d) (3 points) Critique each of the following statements made by the CEO:

- A. *In order to manage interest rate risk, our company needs to duration match the liabilities with a portfolio of fixed income assets at time 0, with no further action until all the liabilities are paid out, with no liquidity considerations.*

ANSWER:

- B. *By using fixed income assets to back the liabilities, interest rate risk is the only risk we will need to consider.*

ANSWER:

- C. *Our company should have a portfolio risk indicator when implementing an immunization strategy. This will allow us to compare different asset portfolio options.*

ANSWER:

6.

(8 points) XYZ Life is a life and annuity insurer that has never reinsured any business. Their current business plan includes the following objectives:

- Stop new sales of fixed annuities because of falling interest rates
- Switch from selling universal life with a lifetime secondary guarantee to participating whole life
- Increase available capital for future growth

(a) (3 points) Describe three types of strategic or customized reinsurance solutions which could help XYZ Life achieve its business plan objectives.

ANSWER:

(b) (2 points) Assess how XYZ Life may need to update its corporate governance to prepare for issuing participating whole life policies.

ANSWER:

6. Continued

(c) (3 points) Critique each of the following product design proposals for the new participating whole life product:

A. *To help promote the launch of the product, XYZ Life's illustration software will reflect a special one-time dividend paid out of retained earnings from its non-participating term business.*

ANSWER:

B. *The cost to migrate to a new policy administration system will be borne by newly issued policies by embedding it in acquisition expenses.*

ANSWER:

C. *Because of low fixed income yields, the investment strategy includes a greater amount of equities than other asset classes; realized gains are paid to the policyholders through the investment component of the dividend scale, once the stock is sold.*

ANSWER:

7.

(11 points) AWL Life would like to improve its capital position through a reinsurance transaction of a certain block of business. The block of business generates gains over the long term and incurs little upfront costs. AWL Life has an existing agency force selling similar products and intends to recapture this block of business at a future date.

AWL Life identified ONA Re as a reinsurance partner and a contract is currently under negotiation. Both parties are open to explore different reinsurance methods, however, both parties also possess specific post-transaction capital requirements.

You are given:

- Investment income and interest are paid at the beginning of the year
- No claims or surrenders during the year
- There are no income taxes

Assumptions for the Block of Business	
Face amount	5,000
Premium tax	2.5%
Direct premium per thousand	0.95
Commissions	80%
Terminal reserve	250
Reserve at time 0	100
Reserve at time 1	850
Proposed Reinsurance Transaction Assumptions	
Yearly Renewable Term retention	10%
Yearly Renewable Term mean reserve per thousand	0.14
Modified Coinsurance interest rate	5%
Modified Coinsurance expense allowance	90%
Modified Coinsurance premium per thousand	0.80
AWL Life	
Initial surplus	1,500
Investment return	17%
Underwriting expenses	300
Maintenance costs	50
ONA Re	
Initial surplus	3,000
Investment return	20%
Underwriting expenses	270
Maintenance costs	10

7. Continued

- (a) (2 point) Propose an appropriate type of reinsurance for AWL Life. Justify your answer.

ANSWER:

- (b) (7 points) For the proposed reinsurance transaction.
- (i) (3 points) Calculate the premium per thousand on a Yearly Renewable Term basis, if AWL Life expects to increase total capital by at least 20%. Show all work, using the financial statements in Excel.

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

- (ii) (4 points) Calculate the ceding percentage on a Modified Coinsurance basis if ONA Re is unwilling to accept a reduction in capital of more than 20%. Show all work, using the financial statements in Excel.

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

- (c) (2 points) Critique the following statement:

The block of business contains flexible premium universal life products. After examining the significant risks of the business, ONA Re agreed to provide surplus relief to AWL Life for the next year. Under the surplus relief treaty, all underlying assets backing the liabilities will be transferred from AWL Life to ONA Re, and the appropriate amount of reserve credit will be provided to AWL Life.

ANSWER:

8.

(10 points) MSQ Insurance Company sells only annuity products. It offers a Variable Annuity with a Guaranteed Living Withdrawal Benefit (VA with a GLWB). The withdrawal benefit base in year t (WBB_t) is a lookback ratchet design equal to the greater of the account value in year t (AV_t) and the prior year withdrawal benefit base (WBB_{t-1}). The initial benefit base is equal to the premium. Withdrawals are only allowed at the end of each policy year. The table below has additional product information for a sample policy.

Initial Premium	100,000
Administration Charge (ϕ^{adm}) – charged continuously	0.5%
Guarantee Charge (ϕ^{guar}) – charged continuously	1.2%
Annual Withdrawal Percentage (x_{WL})	5.0%

- (a) (2 points) Calculate the permitted withdrawal benefit in each year for a policyholder, assuming the benefit is elected in year 1 for each of the following two scenarios' market returns on the variable subaccount.

Year	Scenario 1	Scenario 2
1	0%	6%
2	-3%	9%
3	6%	-5%
4	9%	0%
5	-5%	-3%

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

- (b) (4 points) Evaluate how each of the following product changes would impact the volatility of the product cash flows and hedging of the product. Assume the same initial annual withdrawal percentage.

- (i) Removal of the ratchet feature.

ANSWER:

- (ii) The addition of a remaining withdrawal benefit base ratchet.

ANSWER:

8. Continued

- (c) (2 points) Compare how a rising interest rate environment would impact this VA with a GLWB versus a fixed deferred annuity without a GLWB.

ANSWER:

- (d) (2 points) Evaluate the impact to MSQ's risk exposure of adding a new term life insurance product to MSQ's current product portfolio.

ANSWER:

9.

(11 points) RPS Life is a life insurance company with assets backing long-term liabilities and a low risk tolerance. RPS Life currently possesses 200 million of assets under management.

- (a) (1 point) List two criteria that can be effective when specifying an asset class as part of a strategic asset allocation.

ANSWER:

- (b) (2 points) Propose an asset allocation method for each of the following scenarios. Justify your answer.

- (i) RPS Life believes international equities will outperform domestic equities in the next few months.

ANSWER:

- (ii) RPS Life's primary investment objective is to generate stable returns to meet claims obligations in the long term. It is not interested in risky assets, instead, it favors corporate bonds or stocks of large cap companies.

ANSWER:

The investment manager is examining the following three potential asset allocations. The risk aversion factor is 0.5. The investment manager has a maximum loss threshold of 5 million.

Asset Allocation	Expected Return	Standard Deviation of Return
A	15%	20%
B	15%	25%
C	3%	1%

- (c) (2 points) Identify the asset allocation with the highest risk-adjusted expected return while satisfying Roy's Safety-First criterion. Justify your answer.

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

9. Continued

(d) (6 points) Critique the following statements:

- A. *Credit Default Swaps have an upfront payment that is always paid by the protection buyer to the seller. The premium leg paid by the buyer is constant and calculated as the coupon rate multiplied by the notional amount, and then multiplied by the fractional year.*

ANSWER:

- B. *It can be beneficial for RPS Life to purchase direct ownership in commercial real estate buildings instead of REITs.*

ANSWER:

- C. *From 1990-2004, the NCREIF Index had a standard deviation of 3.4%, while S&P 500 had a 14.7% standard deviation, and the Lehman Aggregate Bond Index had 3.9%. Therefore, direct real estate investments are the least volatile, comparing to equities and bonds.*

ANSWER:

- D. *Interest rate swaps are low risk investment vehicles and do not expose the firm to additional risks. All securities and commercial banks can be swap dealers.*

ANSWER:

- E. *Credit Default Swaps are terminated upon a credit event and are not payable on soft credit events.*

ANSWER:

- F. *In a credit event, the protection leg must payout a cash amount equal to par minus the recovery price, determined by an auction.*

ANSWER:

10.

(11 points) You are the lead pricing actuary at your company.

The existing Universal Life (UL) product utilizes a new money interest crediting method. Management is considering a new UL product that will utilize a portfolio crediting method instead.

(a) (4 points)

- (i) Compare and contrast the new money crediting method versus the portfolio crediting method.

ANSWER:

- (ii) Analyze the impact of interest rate anti-selection on UL product pricing and profitability.

ANSWER:

10. Continued

You are reviewing and proposing changes to the non-guaranteed elements (NGEs) of the existing UL product.

(b) (4 points)

(i) (1 point) List four considerations when recommending a revision to NGE scales.

ANSWER:

(ii) (3 points) Critique each of the following statements excerpted from your company's NGE framework:

A. *NGE scales on in-force policies should be reviewed no less frequently than every 3 years.*

ANSWER:

B. *Policy class assignments for in-force policies should be redetermined during each NGE review cycle.*

ANSWER:

C. *Any changes to the defined profitability metrics for the purpose of evaluating NGEs are discouraged.*

ANSWER:

10. Continued

Your coworker presented the following table summarizing their calculations in determining revised NGE scales for this product. Assume that the impacts to net profits from each NGE update are independent and do not require consideration of other NGEs.

Valuation Year	1	2	3	4	5	NPV at 5%
Net Profits (Original Pricing)	13	16	16	15	13	63
Net Profits with Revised Expense Charges	14	16	17	14	13	64
Net Profits with Revised COI Charges	20	22	26	28	35	112
Net Profits with Revised Crediting Rate	10	15	25	15	8	63

- (c) (3 points) Evaluate compliance with ASOP 2: Non-guaranteed Charges or Benefits for Life Insurance Policies and Annuity Contracts, with respect to your coworker's analysis.

ANSWER:

****END OF EXAMINATION****