Exam ILALPM

Date: Wednesday, November 8, 2023

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 7 questions numbered 1 through 7 with a total of 60 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:
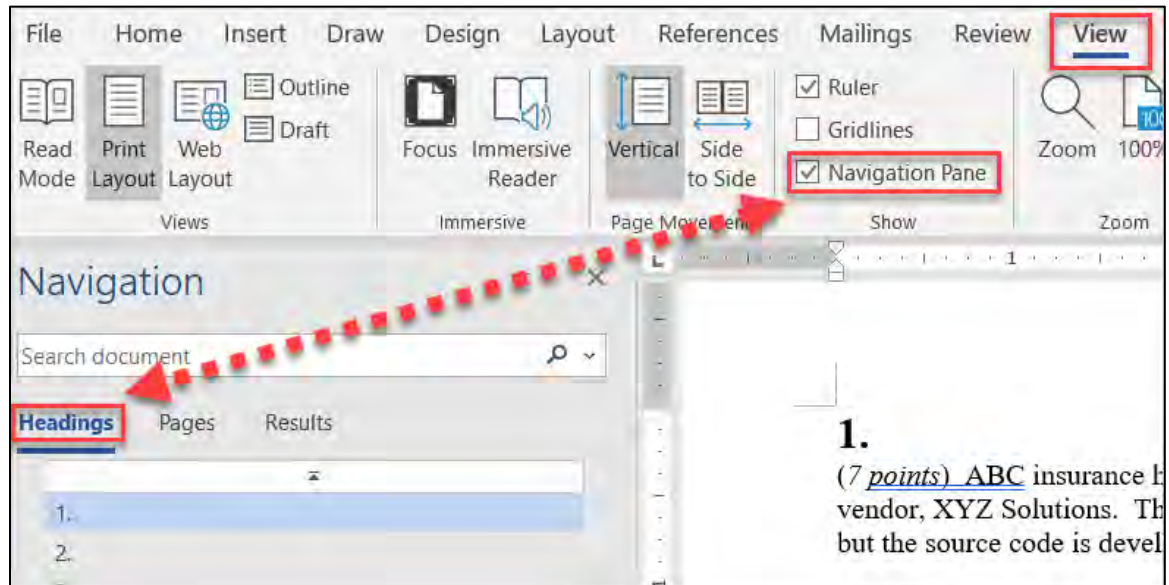
1.

(*10 points*)

(a)   (*2 points*) Describe considerations in the development of a mortality assumption for structured settlements with respect to the following:

(i)   Underwriting compared to an insured population

(ii)   Experience studies

(iii)   Mortality improvement

ANSWER:

(b)   (*6 points*) The following is a company's experience study for their in-force structured settlements:

Attained Age	Death Count	Count Exposed
0-19	5	5,000
20-49	250	75,000
50-79	1,000	80,000
80-99	400	3,000
100+	15	50
Total	**1,670**	**163,050**

You are given the following additional information:

Confidence Interval	Normal Distribution Z-value
85%	1.440
90%	1.645
95%	1.960

Expected value of the process variance = 42,000
Variance of the hypothetical means = 13

(i)   List one strength and one weakness of each of the Limited Fluctuation and the Greatest Accuracy methods for calculating credibility.

ANSWER:

1.   Continued

        (ii)   Calculate the credibility for each line within the highlighted box in the provided Excel spreadsheet using the Limited Fluctuation method with a 95% probability of a 5% margin of error. Show all work.

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

        (iii)   Calculate the credibility for each line within the highlighted box in the provided Excel spreadsheet using the Greatest Accuracy method, also known as the Bühlmann Credibility Formula. Show all work.

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

        (iv)   Recommend a credibility method for pricing structured settlements. Justify your response.

ANSWER:

(c)   (*2 points*) Evaluate how a predictive analytics approach could be beneficial for pricing structured settlements.

ANSWER:

2.

(*10 points*) You are given the following for AMO Life Insurance Company's Registered Index-Linked Annuity (RILA) product:

RILA Rate sheet:

Crediting Option	Term	Index	Crediting Structure	Cap	Floor	Buffer
RILA-A	1 Year	S&P 500	Cap with Buffer	15%		10%
RILA-B	1 Year	S&P 500	Cap with Floor	18%	10%	
RILA-C	3 Year	S&P 500	Cap with Buffer	40%		10%

(a)   (*2 points*) You are given:

S&P 500 Annual Index Returns	
Year	**Return**
1	-15%
2	35%
3	-5%

At the end of each term, the same crediting option is chosen for the following term and the same rates are available.

(i)   Determine which RILA crediting option will have the highest cumulative return at the end of 3 years. Show all work.

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

(ii)   Determine which RILA crediting option will have the lowest cumulative return at the end of 3 years. Show all work.

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

2. Continued

(b)   (*4 points*) You are given the following pricing data for a Fixed Indexed Annuity (FIA):

- FIA crediting option has no cap but has a participation rate
- S&P 500 index level at time of pricing: 4,000
- Option costs (as a percentage of notional amount):

Strike Price	Put Cost	Call Cost
3,400	2.7%	19.3%
3,600	3.4%	16.4%
3,800	4.6%	12.5%
4,000	5.9%	9.0%
4,200	7.7%	6.4%
4,400	9.7%	4.0%
4,600	12.1%	2.0%

Calculate the participation rate of the FIA crediting options that will result in the static hedging cost being equal to the RILA-A crediting option. Show all work.

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

(c)   (*4 points*) For each of the two ways for calculating the interim value of a RILA contract:

(i)   Assess whether the interim value would increase, decrease, or remain unchanged due to an increase in equity index volatility.

ANSWER:

(ii)   Explain which way each of the following would prefer:
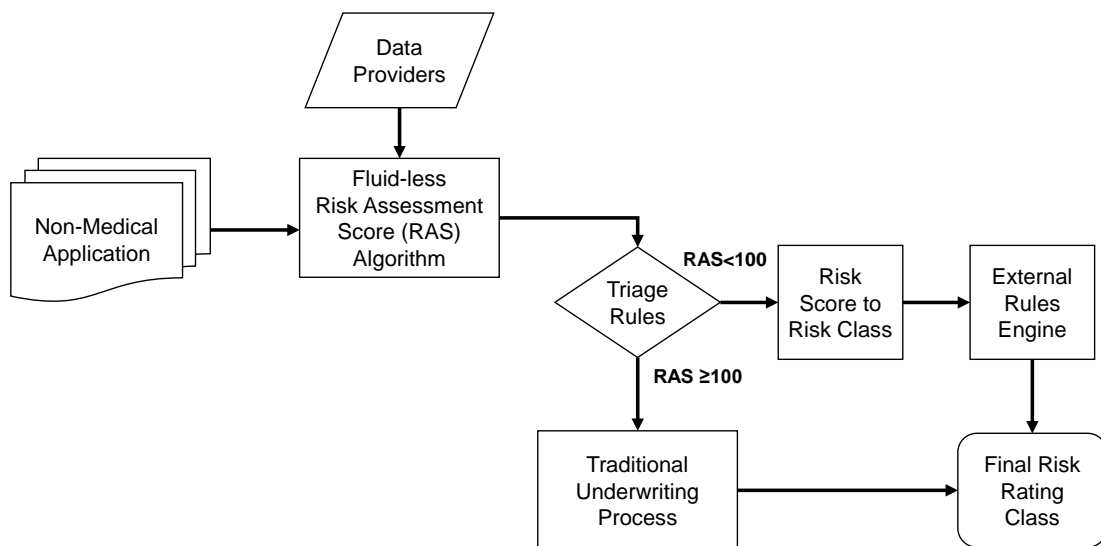
- Shareholders
- Advisors

Justify your response.

ANSWER:

3.

(*8 points*)

(a)   (*1 point*) Describe considerations for use of data that is subject to FCRA (Fair Credit Reporting Act).

> ANSWER:

DEF Life sells whole life. You are given the following information with respect to the end-to-end accelerated underwriting process for purchasing DEF Life's whole life insurance product.

- Data providers offer information for prescription history, motor vehicle records, electronic medical records, public data for background check and criminal history, income and employment history, and credit score on applicants.
- The nonmedical application includes a question on tobacco use status.
- The nonmedical application includes questions regarding family history and risky avocations. The responses to these questions feed into the external rules engine.
- The traditional underwriting process uses underwriters to assess final risk classification.
- The traditional underwriting process uses paramedical examination and collecting fluids including blood, urine, and saliva tests.
- If the RAS equals or exceeds 300, then the case automatically is declined for coverage.

3. **Continued**

You are given the following information with respect to four applicants for the whole life insurance product:

Applicant	Risk Assessment Scores (RAS)	Days To Underwrite	Adverse Underwriting Decision Disclosure For Applicant
A	75	1	-
B	110	55	Hypertension
C	50	1	Participate in risky avocations
D	305	1	RAS Algorithm

For all applicants:
- answered no tobacco use on application
- no criminal history and clean driving record for the last 5 years.

The risk classes include:
- best nonsmoker (NS)
- second best NS
- standard NS
- standard smoker

The best nonsmoker risk class was assigned to applicant A.

You are reviewing the company's underwriting results.

(b)   (*5 points*) For each of the applicants B, C and D:

(i)   (*2 points*) Determine the applicant's risk class. Justify your answers.

ANSWER:

(ii)   (*2 points*) Critique the appropriateness of the underwriting decision disclosures.

ANSWER:

(iii)   (*1 point*) Describe how predictive analytics can improve the mortality assumptions for this block of whole life business using end-to-end accelerated underwriting process.

ANSWER:

3. **Continued**

(c)   (*2 points*) Recommend additional analyses and data elements from external providers that can be used to reduce mortality anti-selection in DEF Life's accelerated underwriting program.

> ANSWER:

4.

(*8 points*) XYZ Insurance is developing a new term life product. You are given the following pricing assumptions and projections:

End of year	2022	2023	2024	2025	2026
Statutory Reserve	0	350	700	650	0
GAAP Benefit Reserve	0	250	500	700	0
Tax Reserve	0	325	650	603	0
Earnings Reserve	0	100	375	600	0

	2023	2024	2025	2026
Premium Income	400	390	380	350
Investment Income	15	68	86	85
Investment Income on Required Capital	10	25	20	35
Benefits	100	125	200	995
Expenses	175	0.5	0.5	0.5
DAC Amortization	-150	25	25	100
PermDiff*	0	0	0	0
Tax Rate	21%	21%	21%	21%

* Permanent difference between solvency earnings and taxable earnings

(a)   (*1.5 points*) Calculate the pre-tax stockholder earnings for each year 2023 through 2026. Show all work.

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

(b)   (*1.5 points*) Calculate the taxes payable on solvency earnings for each year 2023 through 2026, assuming no DAC tax. Show all work.

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

(c)   (*1 point*) Calculate the Deferred Tax Liability for years 2024 and 2025. Show all work.

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

4.   Continued

You are given the following graph detailing the current statutory cash flow and reserve pattern of XYZ's term product without reinsurance.
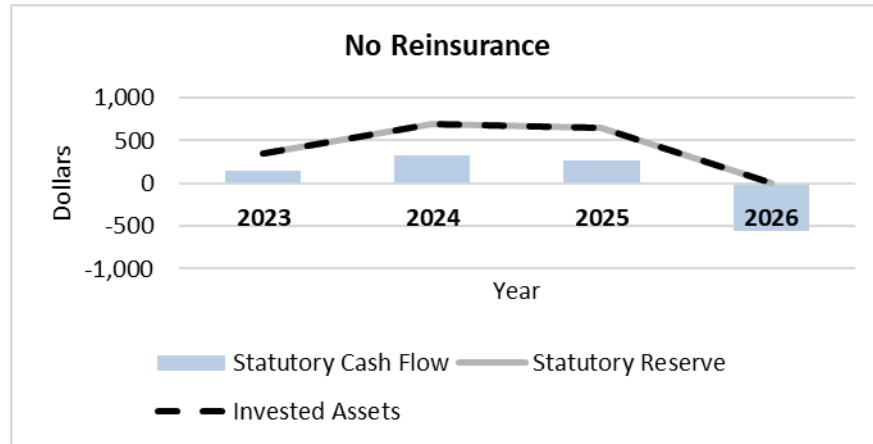
XYZ Insurance is considering three reinsurance treaty options with the following terms:

- Initial expense allowance equal to 125
- 50% quota share
- Mod Co interest rate equal to the asset earned rate, where applicable

4. **Continued**

You are given three graphs illustrating XYZ's statutory cash flow and reserve pattern under the three reinsurance treaty options.

Treaty Option A

Treaty Option B
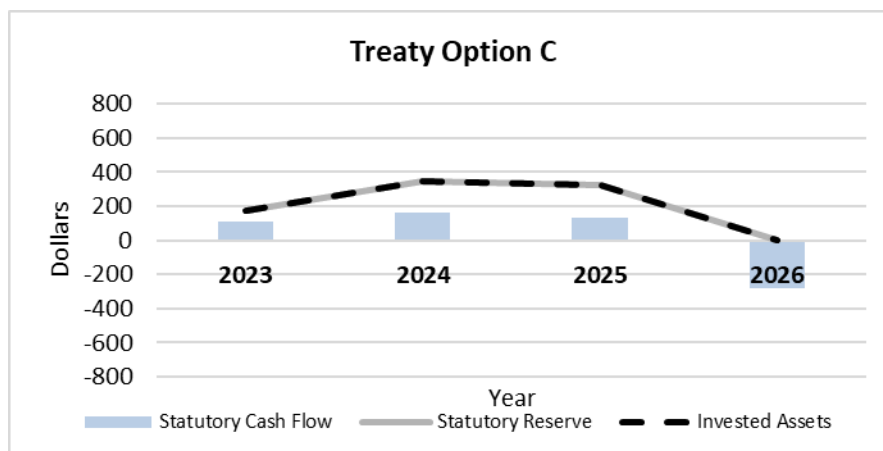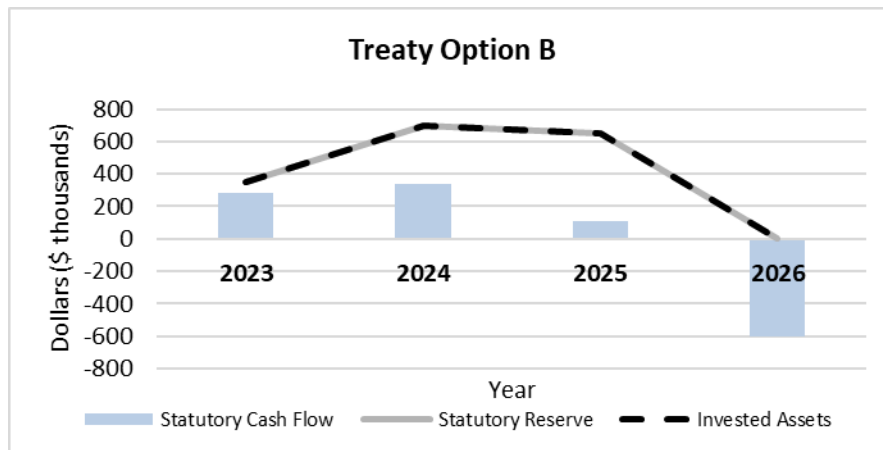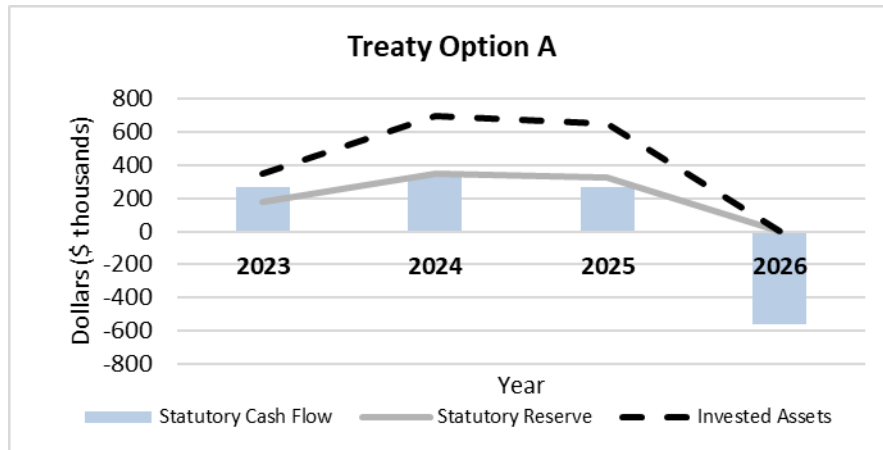
Treaty Option C

4. **Continued**

(d)   (*3 points*) Identify which of the following reinsurance methods corresponds to each treaty option above. Justify your response.

   (i)   Coinsurance

ANSWER:

   (ii)   Funds Withheld Coinsurance

ANSWER:

   (iii)   Modified Coinsurance

ANSWER:

(e)   (*1 point*) Recommend one of the above three reinsurance methods for XYZ Insurance. Justify your response.

ANSWER:

5.
(*7 points*)

(a)   (*3 points*) GHI Life is entering into a coinsurance treaty with FSD Re and negotiating premiums for banded policies as follows:

Band	Face Amount	Expense allowance (% of premium)	Ceded Face Amount	Gross premium per 1,000
1	1 million or less	10%	100,000,000	15
2	Over 1 million	12%	250,000,000	10

You are given the following options to determine reinsurance premium and allowance:

- **Option 1**: reinsurance premium is based on the gross premium rate charged the policyholder, using 11% of premium as the expense allowances for all policies.
- **Option 2**: reinsurance premium is based on the gross premium rate charged to the policyholder, with different expense allowances for each band.
- **Option 3**: reinsurance premium and expense allowances are based on the policy with the highest face amount.

(i)   Describe one advantage to GHI Life for using each of the options.

ANSWER:

(ii)   Identify which option will yield the highest ceded premium net of allowances. Show all work.

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

5. Continued

(b)   (*4 points*) GHI Life is evaluating a reinsurance treaty at 80% quota share with BBB Re on its new business at issue. You are given the following information about the reinsured business, before reinsurance:

Policy Year	Gross premium	Investment income (5%)	Total Claims	End of year Reserves
2				2,000
3	6,000	100	600	6,000

- Investment income(t) = reserve(t-1) * earned rate
- BBB Re proposed a modified coinsurance structure, with the modco rate set to its investment earned rate at 4%.
- BBB Re will pay an experience refund equal to half of its pre-tax statutory income to GHI Life

Assume:
- Reinsurance treaty was effective at policy issue
- No expenses

(i)   Calculate the pre-tax statutory income for BBB Re in policy year 3, before the experience refund. Show all work.

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

(ii)   Calculate the pre-tax statutory income for GHI Life in policy year 3, including the experience refund. Show all work.

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

(iii)   Recommend whether coinsurance or modified coinsurance is more beneficial to GHI Life, assuming BBB Re has also offered a coinsurance quote with the same 80% quota share. Justify your response.

ANSWER:

6.

(*8 points*) UXS is a publicly traded company that operates in multiple regulatory regimes, with half of its business written in the U.S.

(a)   (*2 points*)

   (i)   Define embedded value.

   ┌───┐
   │ ANSWER: │
   │   │
   └───┘

   (ii)   List one reason why embedded value is not based on economic principles.

   ┌───┐
   │ ANSWER: │
   │   │
   └───┘

(b)   (*2 points*) UXS has a block of term to 100 business that was sold 15 years ago. Lapses have been lower than assumed at pricing, and profitability has been below expectations.

   Critique the following statements:

   A.   *Given the poor performance of the business, UXS proposes exiting the business using indemnity reinsurance with 100% quota share.*

   ┌───┐
   │ ANSWER: │
   │   │
   └───┘

   B.   *UXS should invest in programs that increase customer satisfaction, which will improve policy persistency and profitability. Higher than expected lapses will prevent UXS from recouping expenses, which ultimately hurts the profitability of the block.*

   ┌───┐
   │ ANSWER: │
   │   │
   └───┘

6. Continued

(c) (*4 points*) For its U.S. business, the product team has proposed three potential products.

	A	B	C
Profit Metrics	**Term**	**Whole Life**	**Annuity**
IRR on distributable earnings	13%	9%	14%
Profit Margin	8%	9%	8%
PV (of distributable earnings) @ 8%	10,000,000	4,000,000	28,000,000

UXS senior management has the following objectives:

- The required return on capital is 14%.
- Using the CAPM, the hurdle rate is 8%.
- Decisions should be made based on long term value impact.

(i) (*3 points*) Evaluate each of the three profit metrics in terms of their appropriateness for comparing the profitability across all three products.

ANSWER:

(ii) (*1 point*) Recommend a product that best aligns with UXS senior management's objectives. Justify your answer.

ANSWER:

7.

(*9 points*) ABC Life sells term life insurance products and would like to expand its business by introducing a new universal life (UL) product.

(a)   (*5 points*) Explain how each of the following sections of a term pricing report will change for UL:

(i)   Mortality

ANSWER:

(ii)   Lapses and policyholder behavior

ANSWER:

(iii)   Expenses

ANSWER:

(iv)   Options and Guarantees

ANSWER:

(v)   Compensation

ANSWER:

(b)   (*2 points*) Explain two ways rising interest rates could influence the pricing of the UL product.

ANSWER:

7. Continued

(c)   (*2 points*) In order to address policyholders' concerns about high inflation, ABC is interested in expanding its business into the annuities market.

Recommend an annuity product for ABC Life. Justify your answer.

> ANSWER:

END OF EXAMINATION