SOCIETY OF ACTUARIES

Pricing and Introduction to Valuation and Risk Management

Exam ILA 101

Date: Tuesday, November 18, 2025

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 7 questions numbered 1 through 7 with a total of 50 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 unique candidate number in the filename. To maintain anonymity, please refrain from using your name and use your candidate number instead.

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

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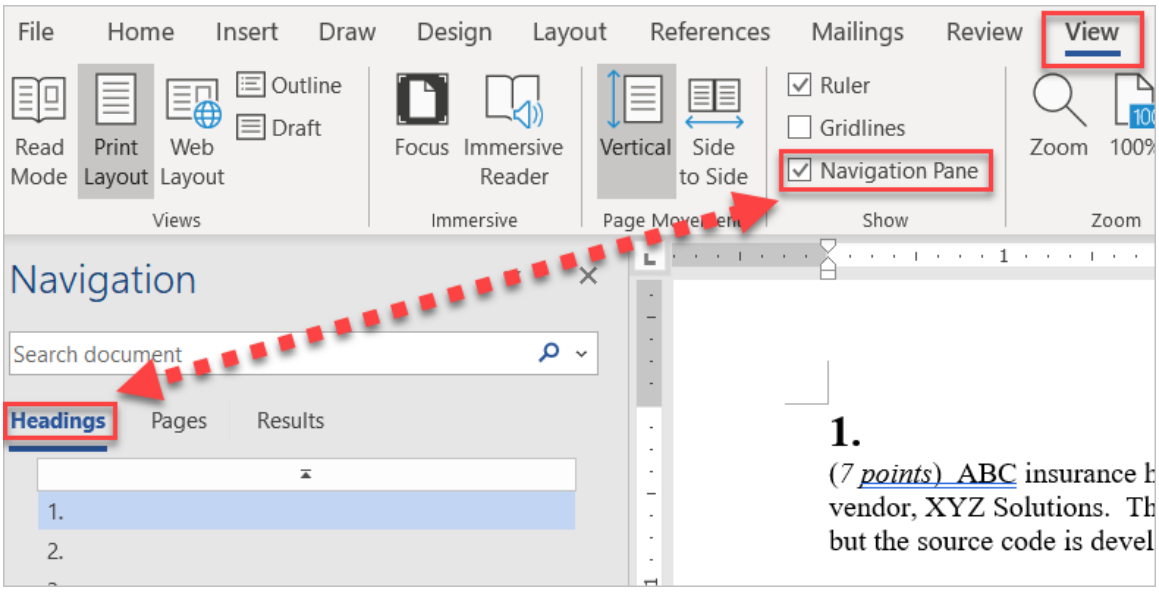
Navigation Instructions

Open the Navigation Pane to jump to questions.

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



1.

(*7 points*) You are repricing a term life insurance product and are analyzing projected profitability.

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

(i) (*1 point*) *The projected ROE for joint products will be equivalent in all future durations when priced using either the joint equal age method or the equivalent same age method.*

ANSWER:

(ii) (*0.5 points*) *Substandard policies will have lower profitability than standard lives due to increased mortality costs.*

ANSWER:

(iii) (*0.5 points*) *Each component of Market Consistent Embedded Value is significantly impacted by an update to the conversion option assumptions.*

ANSWER:

The product has a conversion option. You are given the following information:

- There are 1,000 new issues.
- All policies have a 5% decrement rate per year.
- All policies have the same issue age.
- All original policies are issued with a death benefit of 100,000.
- The conversion option charge in all durations is 40.
- The face amount of the policy does not change at conversion.

1. Continued

End of policy year	% of eligible inforce converting
1	0%
2	0%
3	0%
4	0%
5	7%
6	7%
7	6%
8	6%
9	5%
10	5%

(b) (*3 points*) Calculate the total expected cost of the conversion option through policy year 10.

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

(c) (*2 points*) You are concerned about the high costs to the company of term conversion elections.

(i) (*0.5 points*) Describe three philosophical approaches to charging for this conversion option.

ANSWER:

(ii) (*1 point*) Recommend one of the approaches to decrease the likelihood of future term conversions. Justify your answer.

ANSWER:

(iii) (*0.5 points*) Describe how a term conversion option would impact the product's IRR if it was priced competitively.

ANSWER:

2.

(*7 points*) Your company is pricing a fixed deferred annuity with the following features:

- 10-year accumulation phase with flexible premiums allowed for all 10 years
- A surrender charge applies for all withdrawals during the first 5 years
- A minimum interest rate guarantee of 3% per year

(a) (*2 points*) Explain how each of the product changes below would impact the withdrawal assumptions.

(i) (*0.5 points*) Flexible premium payments are allowed for the first 2 years only.

ANSWER:

(ii) (*0.5 points*) The surrender charge period is extended from 5 years to 10 years.

ANSWER:

(iii) (*0.5 points*) The minimum interest rate guarantee is reduced to 2% per year.

ANSWER:

(iv) (*0.5 points*) A penalty-free withdrawal provision is introduced.

ANSWER:

(b) (*2 points*) Recommend two product feature changes that could improve the product's premium persistency. Justify your answer.

ANSWER:

2. Continued

The company decides to launch a new variable annuity product with a guaranteed minimum withdrawal benefit (GMWB) rider. You are reviewing the following proposed pricing assumptions:

Assumption	**Current fixed annuity assumptions**	**Proposed variable annuity assumptions**
Annual maintenance expense	50	50
First year marketing expense	500,000	1,000,000
Mortality	Publicly available insured mortality table, adjusted for current experience	Equal to the current fixed annuity product assumption

(c) (*3 points*) For each of the three assumptions:

(i) (*1.5 points*) Describe potential reasons you would approve the proposed pricing assumptions.

ANSWER:

(ii) (*1.5 points*) Describe potential reasons you would reject the proposed pricing assumptions.

ANSWER:

3.

(*6 points*) Your company is developing a fixed indexed annuity and is considering two different designs.

(a) (*2 points*) Calculate the fund values at the end of the fifth year for the following designs given the information in Excel.

(i) (*1 point*) 5% cap, 0% floor

(ii) (*1 point*) 75% participation rate, 0% floor

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

(b) (*3 points*) Critique the following statements:

(i) (*1 point*) *Option-based static hedging is a logical choice for hedging a variety of fixed indexed annuity designs due to its cost-effectiveness and simplicity.*

ANSWER:

(ii) (*1 point*) *Fixed indexed annuities and registered index-linked annuities are nearly identical from both the contract holder perspective and the insurance company perspective.*

ANSWER:

(iii) (*1 point*) *The primary source of earnings for fixed annuities, fixed indexed annuities, and variable annuities is investment income.*

ANSWER:

Management wants to minimize earnings volatility stemming from equity market volatility while maintaining competitive products.

(c) (*1 point*) Recommend a form of hedging for the fixed indexed annuity that aligns with management's interests.

ANSWER:

4.

(*7 points*)

(a) (*3 points*) Evaluate the tax status of distributions from the contract in each of the following situations. Assume that each policy complies with the requirements of Internal Revenue Code §7702 – Definition of Life Insurance.

(i) (*1 point*) A whole life policy has a guaranteed fixed premium structure. The policy's annual premium is equal to the 7-pay annual premium. The payer decides to pay monthly premiums and the total of the monthly premiums over the year is 2% higher than the annual premium.

ANSWER:

(ii) (*1 point*) A whole life policy has a level death benefit of 100,000. The annual premium paid is 800 and the 7-pay annual premium is 1,100. The death benefit was decreased at the end of the 3rd policy year, which reduces the 7-pay annual premium to 550.

ANSWER:

(iii) (*1 point*) A small final expense whole life policy has a level death benefit of 5,000 and an annual level premium of 400 payable for 10 years. The 7-pay annual premium was computed as 350 based on the prevailing commissioner's mortality and interest rate. The policy owner does not have any other life insurance policies.

ANSWER:

For substandard lives on a universal life product, the pricing mortality is 200% of the prevailing industry select table. The guaranteed mortality charges are 400% of the prevailing commissioner's ultimate mortality table. The company uses the guaranteed mortality charges when computing guideline and 7-pay annual premiums.

(b) (*1 point*) Evaluate this product with respect to compliance with Internal Revenue Code §7702 – Definition of Life Insurance.

ANSWER:

4. Continued

Information for a whole life policy with a face amount of 50,000 is provided below.

Attained Age	CVAT Net Single Premiums for a 1,000 Whole Life Policy	Cash Value Per 1,000 of Death Benefit	Guaranteed Surrender Charge per 1,000 of Death Benefit	Present value of the expected premiums for Rider 1	Present value of the expected premiums for Rider 2	Present value of the expected premiums for Rider 3
68	513	510	20	55	13	70
69	528	536	15	25	7	45
70	544	540	10	0	0	25

The policy and any applicable riders are intended to qualify as life insurance using the cash value accumulation test (CVAT). The deemed maturity age for cash value accumulation net single premiums is 121. You are evaluating the following riders:

- Rider 1: Hospital indemnity benefit rider that pays 500 per day for qualifying confinements in a hospital or care facility that terminates at age 70
- Rider 2: 50,000 accidental death benefit rider that terminates at age 70
- Rider 3: 50,000 spouse term life insurance rider that terminates at spouse's age 100

The riders do not change the cash surrender value of the whole life policy.

(c) (*3 points*) Assess whether each of the following passes the cash value accumulation test. Show your work.

(i) (*1 point*) Whole life policy with rider 1

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

(ii) (*1 point*) Whole life policy with rider 2

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

(iii) (*1 point*) Whole life policy with rider 3

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

5.

(*7 points*) You are given the following information on a block of whole life business. The whole life policies provide cash values and allow for policy loans.

Premium	7 per 1000
Annual Policy Fee	35,000
Premium Tax	2.5%
Maintenance Expense	25,000
Earned Rate	5%
Commissions	Year 1: 50% Year 2: 10% Year 3+: 0%
Surplus at End of Year 1	150
Face Amount in force at End of Year 1	600 million

You are also given the following projections for the first 3 policy years (in thousands):

End of Year	Reserve	Death Claims	Surrender Claims
1	2,000	200	10
2	7,000	250	150
3	7,500	225	200

You are also given the following information related to any reinsurance agreement:

Ceded Policy Fee	0
Ceded Premium Tax	0
Expense Allowance	Year 1: 90% Year 2+: 5%

(a) (*3 points*) Calculate the second-year gain from operations under a 75% quota share coinsurance agreement.

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

(b) (*3 points*) Calculate the second-year gain from operations under a mod-co agreement using a mod-co interest rate of 4%.

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

(c) (*1 point*) Recommend whether the company should use coinsurance or mod-co for reinsuring the whole life block. Justify your response.

ANSWER:

6.

(*8 points*) Your company is setting their strategic asset allocation (SAA) within their asset liability management (ALM) framework. The initial investment objectives include:

Target yield	4.5%
Duration mismatch tolerance	0 years

The following corporate bonds are available for purchase:

	Annual Coupon Rate	**Coupon Frequency**	**Term to Maturity (years)**	**Yield to Maturity**	**Maturity Value**	**Credit Rating**
Bond X	4%	Semi-Annual	5	3.2%	1,000	A
Bond Y	7%	Semi-Annual	10	4.6%	1,000	AA

You are also given:

- The annual reinvestment rate is 5%
- The current overall liability duration is 7.3 years

(a) (*1 point*) Describe two types of credit risk related to corporate bonds.

ANSWER:

(b) (*3 points*) Construct a duration matched bond portfolio.

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

The company wants to minimize economic surplus and decides to change the duration mismatch tolerance to 0.3 years and the asset allocation to include BBB rated corporate bonds.

(c) (*2 points*) Describe how the changes would impact the SAA.

ANSWER:

(d) (*2 points*) Explain two ways that effective ALM can reduce regulatory capital requirements.

ANSWER:

7.

(*8 points*) You are given the following assumptions for a 10-year term policy:

- Premiums are level and paid at the beginning of each policy year.
- The death benefit of 50,000 is assumed to be paid at the end of the policy year.
- After 10 years the policy expires with no maturity benefit.
- There is no cash surrender value.
- The statutory valuation rate is 4%.

t	**1,000 q_{x+t}**	**1,000 $A^{1}_{x+t:\overline{10-t}|}$**	$\ddot{a}_{x+t:\overline{10-t}|}$
0	1.00	11.5607	8.5641
1	1.05	10.9764	7.8367
2	1.13	10.3213	7.0834
3	1.21	9.5634	6.3034
4	1.30	8.6986	5.4957

where:

- t = duration
- x = issue age
- 1,000 q_{x+t} = Mortality rate per 1,000 for attained age x + t
- 1,000 $A^{1}_{x+t:\overline{10-t}|}$ = Actuarial present value of a term life level death benefit of 1,000 for attained age (x + t) with a term of (10 - t) years
- $\ddot{a}_{x+t:\overline{10-t}|}$ = Actuarial present value of a life annuity due for attained age (x + t), payable for (10 - t) years

(a) (*4 points*)

(i) (*2 points*) Calculate the reserve at the end of policy year 2 using the Net Level Premium (NLP) reserve method.

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

(ii) (*2 points*) Calculate the reserve at the end of policy year 2 using the Full Preliminary Term (FPT) reserve method.

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

7. Continued

(b) (*4 points*) Critique the following statements from a PBR Actuarial Report for term insurance business under VM-20.

A. *Since the group of term policies passes both the Deterministic and Stochastic Exclusion Tests, only the Net Premium Reserve is calculated.*

ANSWER:

B. *Company mortality data is 100% credible, so no margins are included in company mortality assumptions until after the sufficient data period in the deterministic reserve projection.*

ANSWER:

C. *The expense assumptions used are fully allocated and include all federal income taxes.*

ANSWER:

D. *For the deterministic reserve, the present value of cash flows was calculated using the path of 1-year US treasury rates from the prescribed scenario multiplied by 1.05 as the discount rate.*

ANSWER:

E. *The reinsurance credit for coinsurance was calculated as one half of the one-year mean reserve for an annual increasing term policy using the prescribed valuation mortality.*

ANSWER:

****END OF EXAMINATION****