SOCIETY OF ACTUARIES

Valuation & Advanced Product & Risk Management. – U.S

Exam ILA 201 U

Date: Wednesday, November 19, 2025

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 6 questions numbered 1 through 6 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.

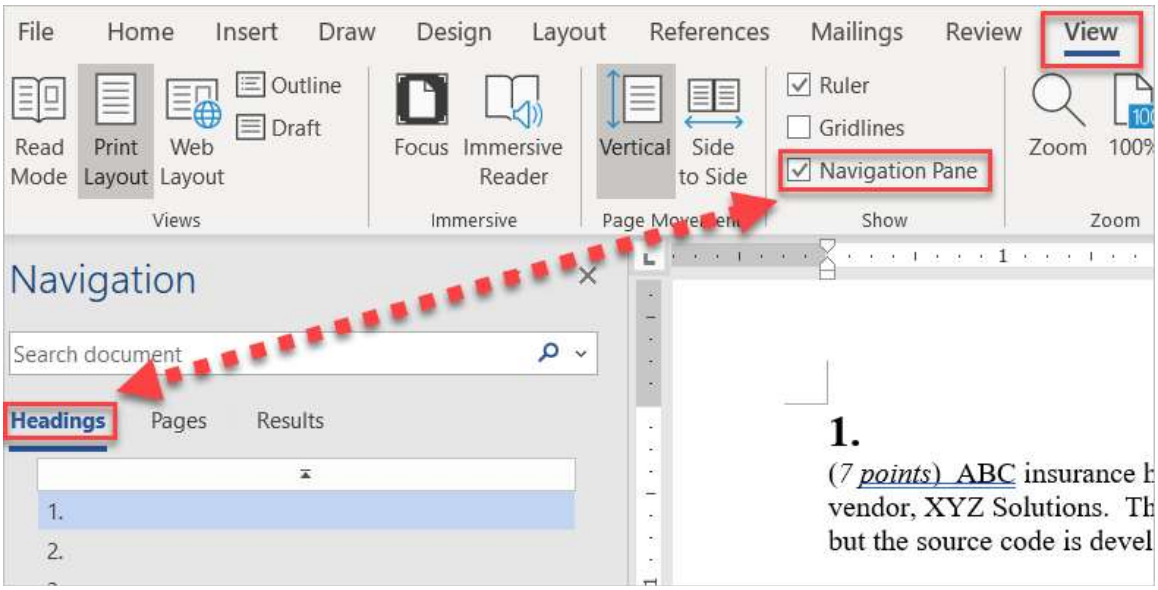
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename. To maintain anonymity, please refrain from using your name and instead use your candidate number.

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.

(*5 points*) You are given the following information about Company XYZ in the United States:

- Sells universal life insurance with secondary guarantee (ULSG) and variable annuity with GLWB products.
- Is considering an offshore reinsurance coinsurance treaty for the variable annuity business.
- Has a yearly renewable term (YRT) reinsurance treaty in place for the ULSG business.
- Holds 60% of its portfolio in fixed assets and the other 40% in equity.
- Guarantees the contingent asset payments for its affiliate, DEF.

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

(i) (*1 point*) *Entering into the offshore reinsurance transaction for the variable annuity business will lower XYZ's total adjusted capital (TAC). The off-balance sheet items are not applied to the Company Action Level amount.*

ANSWER:

(ii) (*1 point*) *XYZ uses book value of bonds for both risk-based capital (RBC) and rating agency capital. If there is a decrease in interest rates, then there will not be an impact to the available capital on either the RBC or rating agency capital framework.*

ANSWER:

(iii) (*1 point*) *The Company Action Level amount for ULSG business will be lower because the face amount used in the C-2 calculation is lower as a result of the YRT reinsurance.*

ANSWER:

1. Continued

(b) (*1 point*) Calculate the BCAR assessment based off the following:

AM Best BCAR Capital	**Amount**
Available Capital	2000
Net Required Capital @ 95% Confidence Level	1000
Net Required Capital @ 99% Confidence Level	1750
Net Required Capital @ 99.5% Confidence Level	1800
Net Required Capital @ 99.6% Confidence Level	1950
Net Required Capital @ 99.8% Confidence Level	1990

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

(c) (*1 point*) Describe how each capital model utilizes diversification among the risks.

(i) (*0.5 points*) Fitch

ANSWER:

(ii) (*0.5 points*) US RBC

ANSWER:

2.

(*11 points*)

(a) (*3 points*) Critique the following statements with respect to VM-21:

(i) (*2 points*) *The VM-21 stochastic reserve is calculated based on the results derived from an analysis of asset and liability cashflows produced by the application of a stochastic cashflow model. Equity returns and interest rate scenarios are generated stochastically while other assumptions reflect company specific best estimates. The goal of the stochastic reserve is to quantify the amount of statutory reserves needed to meet contractual obligations at the 50th percentile.*

ANSWER:

(ii) (*1 point*) *VM-21 allows for the costs and benefits of a clearly defined hedging strategy to be accounted for in the cashflow projections. These costs and benefits of a clearly defined hedging strategy are included in all components of the stochastic reserve.*

ANSWER:

You are given the following about a variable annuity block of business:

- All deposits from this block are allocated to a separate account invested in an S&P 500 index fund.
- All decrements and transfers are assumed to occur at the end of a policy year.
- All asset related cash flows affecting the general account are accounted for in the "Total Revenue" line item provided in the excel file.
- S&P 500 returns, net asset earned rates (NAERs), and 1-year US Treasury rates for the applicable scenario referenced in parts (b) and (c) are provided in the Excel file.

2. Continued

(b) (*5 points*) Calculate the following items over the 12-year projection:

(i) (*1 point*) Pre-tax profits

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

(ii) (*2 points*) General account assets

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

(iii) (*2 points*) Separate account assets

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

(c) (*3 points*) Calculate the following VM-21 values over the 12-year projection:

(i) (*2 points*) PV of accumulated deficiencies

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

(ii) (*1 point*) Scenario reserve (as of valuation date only)

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

3.

(*9 points*)

(a) (*6 points*) You are given the following information for a 10-pay whole life policy:

- Issue age is 43.
- Level annual premiums, paid at the beginning of each policy year for ten years.
- Death benefit is 100,000 and paid at the end of the policy year.
- Statutory valuation rate is 3.5%.

t	Attained Age	$1000q_{(43)+t}$	$1000A_{(43)+t}$	$\ddot{a}_{(43)+t}$	$\ddot{a}_{(43)+t:[20-t]}$	$\ddot{a}_{(43)+t:[10-t]}$
0	43	1.04	244.0167	22.3555	14.5251	8.5667
1	44	1.05	251.7792	22.1260	14.0131	7.8397
2	45	1.07	259.8143	21.8883	13.4827	7.0865
3	46	1.11	268.1246	21.6426	12.9334	6.3063
4	47	1.17	276.7062	21.3888	12.3648	5.4981

Calculate the CRVM basic reserve at the end of policy year 3. Show all work.

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

(b) (*1 point*) Given the following information for a level pay whole life policy where the next policy anniversary is 6 months after the valuation date:

- Premiums are paid annually at the beginning of the policy year.
- Mid-terminal CRVM reserves are held.
- Annual Gross Premium = 600
- Annual Net Premium = 500

Calculate the following. Show all work.

(i) (*0.5 points*) Deferred premium asset

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

(ii) (*0.5 points*) Unearned net premium liability

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

3. Continued

(c) (*2 points*) Critique the following statements related to a new participating whole life product.

(i) (*0.5 points*) *Dividends do not need to be considered when calculating the reserves.*

ANSWER:

(ii) (*0.5 points*) *The reduced paid-up insurance amount at time t is the amount of insurance that can be purchased with the cash surrender value using maximum nonforfeiture interest rate and mortality table in effect at time t.*

ANSWER:

(iii) (*0.5 points*) *Under VM-20, deterministic reserve is required, but stochastic reserve does not need to be calculated if the stochastic exclusion ratio test is passed.*

ANSWER:

(iv) (*0.5 points*) *For the VM-20 stochastic exclusion ratio test, the deterministic reserve is calculated for each of the 16 prescribed scenarios, using the same assumptions as for the deterministic reserve except that the following are scenario specific: interest rates, equity return assumptions, and net asset earned rates used to discount cash flows.*

ANSWER:

4.

(*8 points*) ZJL Life is a mid-sized insurance company with only a variable annuity block of business. ZJL Life's current RBC ratio is at 300% and would like to maintain it at this level.

(a) (*1 point*) Describe the purpose of risk-based capital for the life insurance industry.

ANSWER:

(b) (*2 points*) Recommend one of the following provided portfolios for ZJL Life. Justify your response.

				Asset Allocation		
Type of asset	**RBC factor**	**Expected annual return**		**Current Portfolio**	**Portfolio A**	**Portfolio B**
Class 1 Bonds	0.004	3%		10%	5%	5%
Class 3 Bonds	0.046	4%		20%	10%	10%
Class 5 Bonds	0.230	5%		10%	5%	5%
Residential Mortgage	0.001	5%		5%	5%	5%
Class 1 Common Stock	0.004	5%		15%	20%	10%
Class 3 Common Stock	0.046	7%		20%	30%	30%
Class 5 Common Stock	0.230	10%		20%	25%	35%

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

(c) (*3 points*) Critique the following statements

A. ZJL Life is exempt from performing any cash flow testing for C-3 RBC because the C-3 significance test ratio is less than 40%.

ANSWER:

4. Continued

B. ZJL Life's Additional Asset Requirement should be calculated using a deterministic best estimate scenario of the underlying equity returns.

ANSWER:

C. Due to the confidentiality of ORSA reporting, ORSA is only required to be filed with the regulator when an insurer's RBC ratio falls below the regulatory threshold.

ANSWER:

(d) (*2 points*) Compare key components of the ORSA report and risk-based capital.

ANSWER:

5.

(*9 points*) You are given the following for a variable annuity contract with a GMDB rider:

- Net asset earned rate (NAER) = 5.50%
- Own credit adjustment (OCA) = 0.25%
- Risk-free rate = 3.50%
- Rider fee = 1.50%
- GMDB benefit base roll up = 5.00%

For simplicity:

- NAER, OCA and Risk-free rate are assumed constant over the life of the contracts.
- Projected values are as of the end of the year.
- Assume all contracts mature in 10 years.
- 3 scenarios are sufficient to cover the range of market conditions.
- Ignore reinsurance and derivatives.

(a) (*4 points*) You are given the projections at issue for 3 scenarios in Excel.

Calculate the Market Risk Benefit (MRB) liability at issue. Show all work.

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

(b) (*2 points*) You are given an updated projection reflecting the actual 10% market growth during year 1 in Excel.

Calculate the MRB liability at the end of Year 1. Show all work.

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

(c) (*1 point*) Analyze qualitatively the impact on the attributed fee ratio if the GMDB roll-up rate were 6% instead of 5%.

ANSWER:

5. Continued

(d) (*2 points*) Analyze the following qualitatively if the OCA were to increase:

(i) (*1 point*) The impact on MRB liability

ANSWER:

(ii) (*1 point*) The impact on net income

ANSWER:

6.

(*8 points*) Company GEG has an inforce block of variable products with guaranteed benefits:

- Rate of return on invested assets backing surplus, pre-tax = 6.25%
- Tax rate = 20%
- Risk free rate = 3.50%
- S&P 500 total return = 7.50%
- Risk of Company GEG's stock relative to that of S&P 500 = 110%
- There are only two sources of capital: debt and equity
  - 40% of capital is funded by debt
  - Cost of debt, pre-tax = 8.00%
- Capital projection:

Time (t)	0	1	2	3	4	5
Surplus	1,000	1,200	1,400	1,550	1,580	1,650
Required Capital	360	345	320	310	295	280

- Mean of PV of distributable earnings for a set of stochastic scenarios = 140
- PV of distributable earnings for a single deterministic scenario = 135
- Value of future new business = 30

(a) (*2 points*) Calculate the risk discount rate (RDR). Show all work.

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

(b) (*4 points*) Calculate the following metrics, using the RDR from part (a).

(i) (*1.5 points*) Present Value of post-tax Statutory Book Profits

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

(ii) (*1.5 points*) Value of Cost of Capital

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

(iii) (*1 point*) Inforce Business Value

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

6. Continued

(c) (*2 points*) Assume the current book value of assets equals the realizable market value.

Calculate the Embedded Value at time 0. Show all work.

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

*****END OF EXAMINATION*****