SOCIETY OF ACTUARIES

Life Financial Management – U.S.

Exam ILALFMU

Date: Tuesday, November 5, 2024

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 9 questions numbered 1 through 9 with a total of 80 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.

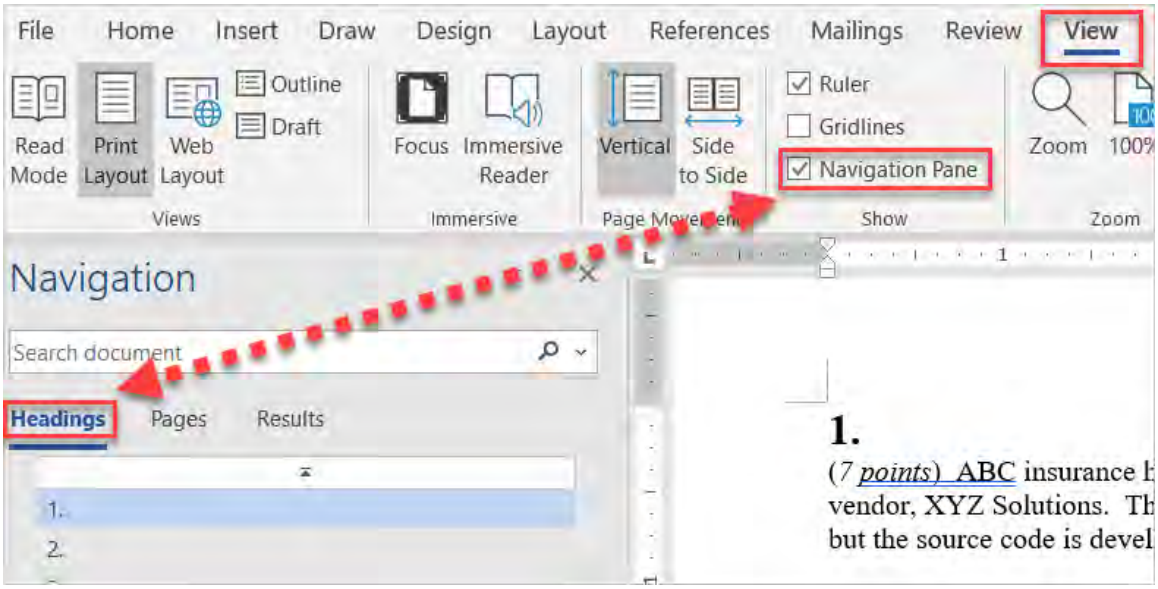
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename. To maintain anonymity, please refrain from using your name and instead use your candidate number.

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.

(*10 points*) For a block of life contingent payout annuities with a 2 year term-certain period, you are given:

- 100 policies were issued in the same year.
- Each policy has an initial premium of 10,000 with a fixed annual annuity benefit of 2,000.
- Commission is 5% of premium and no other expenses.
- The locked-in discount rate is 4.5%.
- Policies in force are used as the DAC amortization basis.
- Annuity benefit payment is used as the deferred profit liability (DPL) amortization basis.
- Benefit payment occurs at the end of the year based on survivorship at the beginning of the year.

(a) (*6 points*) You are given:

Policy year	**Survivors (beginning of year, based on assumed mortality)**
0	100
1	90
2	80
3	70
4	60
5	50
6	40
7	30
8	20
9	10
10	0

Calculate the following at the end of Year 1, assuming the current discount rate is the same as the locked-in discount rate:

1. Continued

(i) Benefit reserves

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

(ii) DAC

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

(iii) DPL

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

(b) (*2 points*) Based on actual experience, a revised in-force projection, and market conditions, you are given:

- The current discount rate is 6%.

Policy year	**Survivors (beginning of year, based on actual and assumed mortality)**
0	100
1	95
2	85
3	75
4	65
5	55
6	45
7	35
8	25
9	15
10	0

(i) Calculate the DPL balance at the end of year 3.

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

(ii) Calculate the Accumulated Other Comprehensive Income (AOCI) at the end of year 3.

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

1. Continued

(c) (*2 points*) Critique the following statement with regards to a payout annuity contract under the LDTI standards:

A. The reason that DPL needs to be calculated for this block of payout annuities due to their classification as investment contracts.

ANSWER:

B. When a payout annuity liability is established upon the derecognition of a market risk benefit for a guaranteed minimum withdrawal benefit, the DPL should be calculated based on the amount of accumulated attributed fees collected that exceeds the liability for future policy benefits.

ANSWER:

2.

(*12 points*)

(a) (*4 points*) CLT is planning to sell a new level premium whole life product while minimizing the first-year surplus strain on a US GAAP basis, and is considering the following marketing options:

Option 1: Hire a marketing agency to sell the policies and collect 100% commission on first year premium. There is no additional cost.

Option 2: Use the internal sales team to sell the policies. The annual fixed salary for the sales team is 1,200,000, and they will receive commission of 5% of premium every year the policy is inforce.

(i) Calculate the first-year expenses associated with the sale of the policies for each option. Assume total first year premium collected will be 5,000,000. Show all work.

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

(ii) Determine the deferrable acquisition costs for each option during the first year.

ANSWER:

(iii) Recommend which option optimizes CLT's performance during the first year, assuming all other elements are constant. Justify your response.

ANSWER:

2. Continued

(b) (*4 points*) You are given the following information on CLT's invested assets:

Asset	Effective yield	Classification	Years to maturity	Balance sheet value (millions)
X	5%	Available for sale	10	50
Y	2%	Held to maturity	5	160
Z	7%	Trading	7	10

Critique each of the following statements with respect to US GAAP:

A. *The recent volatility is expected to have negative impact in the short term, but may revert back in the future. CLT should sell and exit all positions in Asset X, so it doesn't affect net income.*

ANSWER:

B. *Asset Y was purchased when market yields were at 2%. The market is currently yielding 7%. There is no downside to rebalancing CLT's portfolio and liquidating half of its position in Y to higher yielding assets.*

ANSWER:

C. *Asset Z pays coupons denominated in a foreign currency, which are immediately converted to USD with the exchange rate on the coupon date. CLT has accumulated other comprehensive income (AOCI) from miscellaneous activities. CLT can use their AOCI to offset the negative currency exchange impacts in the previous two quarters.*

ANSWER:

2. Continued

(c) (*4 points*) You are given the following information from the pricing model used to develop a whole life product:

Best estimate assumptions	PV @3.5%	PV @4%	PV @5%
Premium	10,000,000	9,000,000	8,000,000
Death benefits	7,000,000	6,500,000	6,000,000
Surrender benefits	1,500,000	1,480,000	1,460,000
Commissions	750,000	675,000	600,000
Claim expense	70,000	65,000	60,000
All other expenses	175,000	162,500	150,000

Prudent estimate assumptions	PV @3.5%	PV @4%	PV @5%
Premium	9,500,000	8,550,000	7,600,000
Death benefits	7,350,000	6,825,000	6,300,000
Surrender benefits	1,550,000	1,500,000	1,475,000
Commissions	715,000	650,000	600,000
Claim expense	73,500	68,250	63,000
All other expenses	175,000	162,500	150,000

- The net asset earned rate is 5%
- The upper-medium quality fixed income yield is 4%
- The statutory valuation interest rate is 3.5%

Calculate the following at issue:

(i) Net premium ratio used to calculate the US GAAP liability for future policy benefits

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

(ii) Deterministic reserves under VM-20

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

3.

(*8 points*)

(a) (*4 points*) Critique each of the following statements for a fixed rate deferred annuity under CARVM:

A. *Integrated benefit streams can only end in annuitization and full withdrawal.*

ANSWER:

B. *Elective benefits should only assume 0% or 100% incidence rates.*

ANSWER:

C. *The same valuation interest rate should be used for elective and non-elective benefits.*

ANSWER:

D. *Regardless of either an issue year basis or a change-in-fund basis, the valuation interest rates will remain constant throughout the life of the contract.*

ANSWER:

3. Continued

(b) (*4 points*) Calculate the CARVM reserve at issue for a fixed rate deferred annuity with the following assumptions:

Single premium	100,000
Current credited interest rate (all years)	8%
Guaranteed credited interest rate (years 1-4)	6%
Guaranteed credited interest rate (years 5+)	3%
Valuation interest rate	4.5%

Surrender Charge:

Year	% of Account Value
1	7
2	6
3	5
4	4
5	3
6	2
7	1
8	0

There are no deaths, partial withdrawals, or annuitizations.

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

4.

(*8 points*) Company A is performing margin analysis on their 20-year term life product under VM-20.

(a) (*2 points*) Determine if the policy passes the Stochastic Exclusion Test given the following information. Show all work.

Scenario	**Gross Premium Reserve**
01- Pop Up, High Equity	280
02- Pop Up, Low Equity	280
03- Pop Down, High Equity	470
04- Pop Down, Low Equity	470
05- Up/Down, High Equity	315
06- Up/Down, Low Equity	315
07- Down/Up, High Equity	330
08- Down/Up, Low Equity	330
09- Baseline Scenario	325
10- Inverted Yield Curves	320
11- Volatile Equity Returns	322
12- Deterministic for Valuation	344
13- Delayed Pop Up, High Equity	280
14- Delayed Pop Up, Low Equity	280
15- Delayed Pop Down, High Equity	355
16- Delayed Pop Down, Low Equity	355

PV(Benefits) for Scenario 09 = 2,500

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

(b) (*3 points*) Company B and Company C both decide to sell a 20-year term life product. Company C offers a lower premium than Company B. Both companies have implemented the VM-20 reserving methodology. You are given:

- Mortality Credibility (Limited Fluctuation Method)

Company B	95%
Company C	50%

4. Continued

Explain which component of VM-20 reserves will likely dominate for each company.

(i) Company B

ANSWER:

(ii) Company C

ANSWER:

(c) (*3 points*) For an indexed universal life insurance contract, you were given the following information:

Indexed Fund

Initial Premium	150,000
Expense charge	9%
Minimum guaranteed interest rate	3.5%
Participation Rate	80%
Participation period	1 year

Call Option Terms

Index	S&P 500
Volatility	13%
Dividend rate	2.5%
Risk free rate	5%
Option cost (per contract)	50
Number of option contracts	50

Statutory valuation interest rate: 4%

Determine the credited interest rate for the indexed universal life insurance contract by using the Implied Guaranteed Rate Method (IGRM). Show all work.

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

5.

(*9 points*) AXE Life is a publicly traded insurance company that offers multiple life and annuity products.

(a) (*6 points*) AXE is analyzing the experience of its ULSG block during the pandemic. You are given:

Planned Margins	
Mortality Margin	1,000
Surrender Margin	350
Expense Margin	1,000
Interest Margin	500

Experience	
AV released on Death	4,900
AV released on Surrender	1,350
COI Charges	1,200
Death Benefit	5,000
Expense charges	1,800
Interest Credited	1,200
Investment Income	2,500
Maintenance Expenses	1,800
Surrender Benefit	1,000

- The planned profit margin is 0.
- All COIs are used to fund mortality.
- All expense loads are used to fund expenses.

(i) Calculate the actual margins for this product. Show all work.

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

(ii) Assess whether the experience is more favorable than expectation.

ANSWER:

(iii) Describe the mortality impact the pandemic had on this block.

ANSWER:

5. Continued

(iv) Describe the impact lapse experience had on this block.

ANSWER:

(v) Describe the biggest driver of profit for this block.

ANSWER:

(vi) Describe the impact expense experience had on this block.

ANSWER:

(b) (*3 points*) You are given the following balance sheet information:

US GAAP	
Total Liability	5000
Common Stock	1
Additional Paid in Capital	399
Common Stock held in Treasury	-250
AOCI	300
Retained Earnings	1000
Shares outstanding (millions)	100

US STAT	
Statutory Policy Reserves	5200
Interest Maintenance Reserve	50
Target RBC	500

All GAAP assets are admitted statutory assets.

(i) Calculate the GAAP stockholder's equity. Show all work.

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

(ii) Calculate the maximum dividend per share AXE Life could pay while meeting its RBC targets. Show all work.

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

6.

(*9 points*) You work for GUA Life Insurance Company and are looking to develop new whole life and universal life products. Your manager has asked you to look at the potential tax implications to policyholders between using the Cash Value Accumulation Test (CVAT) and the Guideline Premium Test (GPT) under Internal Revenue Code (IRC) 7702

(a) (*4 points*) You are given the following information about a universal life policy issued to a policyholder aged 45:

- The death benefit is level in all years.
- The policy is subject to Internal Revenue Code section 7702 interest rates as determined by the Consolidated Appropriations Act of 2020.
- The policy includes a minimum interest guaranteed rate of 4.0%.
- The policy was issued during 2022 and the minimum nonforfeiture interest rate was 3.75% for a long duration contract.
- The policy includes charges for cost of insurance, annual policy fees, per unit charges, and percent of premium expense charge in all policy years.
- The policy has two riders: a term life insurance benefit on the primary insured's spouse, and a term life insurance benefit on a business partner who is not related to the policyholder.
- You are given the values about the policy:

	PV@ 3.75%	PV@ 4.00%
Present value of death benefits	288	260
Present value of cost of insurance	250	225
Present value of annual policy fees, per unit charges, and premium expense charges	105	95
Present value of charges for the term rider on the primary insured's spouse	108	98
Present value of charges for the term rider on the business partner	1,250	1,130

Calculate the CVAT Net Single Premium at issue for the policy. Justify your answer.

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

6. Continued

(b) (*3 points*) Your manager has asked you to look at using GPT instead of CVAT.

(i) Explain the differences between CVAT and GPT.

ANSWER:

(ii) You are given for a policy:

- it qualifies as a life insurance contract under IRC 7702.
- it does not have any loans.
- the face amount remains the same.

Describe the circumstances that permit the premium paid to exceed the GPT.

ANSWER:

(c) (*2 points*) Your company wants to issue a high face amount, single premium universal life contract.

Describe how this contract will be classified under IRC 7702.

ANSWER:

7.

(*8 points*)

(a) (*3 points*) You are reviewing the capital position of CJA Life.

Critique the following statements:

(i) *CJA Life adopts an active market investment strategy. The use of a fair value risk assessment for the economic capital modeling is not appropriate for CJA Life.*

ANSWER:

(ii) *All stakeholders of CJA will want CJA to hold as much capital as possible to remain solvent.*

ANSWER:

(iii) *Group capital calculations for US banks and non-US insurers are calculated in accordance with the same principles as a US-based life insurer.*

ANSWER:

7. Continued

(b) (*3 points*) You are given the following statements from CJA Life's three main stakeholders:

Stakeholder 1: *We care about policyholder security and our aim is to meet our obligations under all circumstances. The best way to combat this is to hold no less than the minimum regulatory capital requirement which will meet our policyholder and regulator needs.*

Stakeholder 2: *The regulatory requirements for CJA Life appear to be quite onerous and capital intensive. The key is optimizing capital efficiently for CJA Life to achieve record high returns. Any more is a waste of capital.*

Stakeholder 3: *We need to go above and beyond our minimum requirements. Reducing the risk of insolvency is key to our future success. CJA Life needs to strengthen their credit rating to attract new business.*

You are also given:

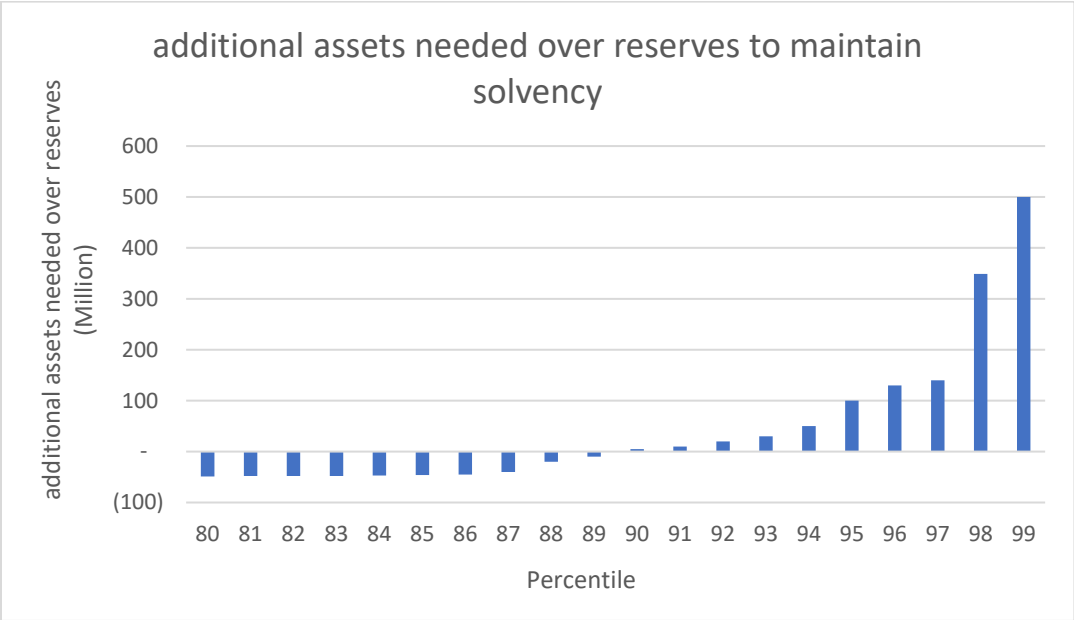
Option	Description	Capital Level
A	99.5th VAR of future obligations	200
B	400% RBC Level	750
C	Required capital by AM Best to maintain A+ Rating	500

Identify the option from the table above that would be preferred by each stakeholder based on their statements. Justify your answers.

ANSWER:

7. Continued

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



- Current RBC is set at 200 million.
- The company's risk objective is to maintain solvency with 98% confidence.

Critique the following statements based on the given information:

ABC should hold capital at the economic level. Given RBC is redundant compared to economic capital, we can release RBC while still meeting our risk target of maintaining solvency with 98% confidence.

ANSWER:

8.

(*7 points*)

(a) (*1 point*) Describe three methods used to value an insurance company.

ANSWER:

(b) (*3 points*) ABC Life is acquiring XYZ Life. XYZ has the following financial information:

Capital and surplus	50,000,000
Asset valuation reserve	2,500,000
Interest maintenance reserve (undiscounted)	1,500,000
Interest maintenance reserve (discounted)	1,000,000
Book value of assets	100,000,000
Market value of assets	90,000,000
Value of inforce business	75,000,000
Value of future business	40,000,000
Intrinsic value of brand name	20,000,000

Calculate the following:

(i) Adjusted Book Value

(ii) Embedded Value

(iii) Actuarial Appraisal Value

(iv) Total Company Value

Show all work.

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

(c) (*3 points*) Explain the impact of the following items on the purchase price of XYZ:

(i) The level of confidence in the underlying assumptions used to calculate the value of inforce and value of future business.

ANSWER:

8. Continued

(ii) The degree of urgency associated with the sale of XYZ.

ANSWER:

(iii) Rising interest rate environment.

ANSWER:

(iv) Concerns that XYZ's target market is becoming saturated or oversold.

ANSWER:

9.

(*9 points*) Critique the following statements:

A. *Canadian life insurance companies should set their capital level equal to the minimum capital requirements set forth in OSFI's regulatory framework.*

ANSWER:

B. *ORSA in the US is very prescriptive and is a good replacement for the regulatory financial examinations conducted by the state regulators on their domiciled insurance companies.*

ANSWER:

C. *The two levels of capital requirements under Solvency II are the Solvency Capital Requirement and Minimum Capital Requirement.*

ANSWER:

D. *When the liability mix changes from a majority of term products to a majority of payout annuity products, the insurance risk capital will be higher under the US and Canada jurisdictions.*

ANSWER:

E. *All of Risk Based Capital (RBC), Life Insurer Capital Adequacy Test (LICAT), Solvency II and Bermuda Insurance Solvency (BIS) frameworks use a combination of model-based and factor-based approaches. RBC and LICAT are primarily factor-based, while Solvency II and BIS are primarily model based.*

ANSWER:

9. Continued

F. *All of RBC, LICAT, Solvency II and BIS are calculated on a net of reinsurance basis. For companies ceding business to reinsurers under YRT and coinsurance, amounts of both the assets and liabilities are excluded from the capital calculations.*

ANSWER:

G. *RBC, LICAT, Solvency II and BIS all consider liability/insurance risks, asset/investment risks, and operational risks.*

ANSWER:

H. *Under BIS, the Economic Balance Sheet liability is equal to the best estimate liability using the fair value approach.*

ANSWER:

I. *For RBC, both C-3 Phase I and C-3 Phase II need to be calculated using a stochastic approach for variable annuities.*

ANSWER:

J. *Bermuda companies are required to calculate a Target Capital Level (TCL) and a Minimum Margin for Solvency (MSM). The definition of available capital is based on the Economic Balance Sheet for both TCL and MSM.*

ANSWER:

END OF EXAMINATION