

Exam ILALFMU

Date: Tuesday, November 8, 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.

1.

(8 points) You are given the following:

Values in the period:		
	GAAP Basis	Actual Results
Beginning of Period Reserve per policy	100	100
Gross Premium per policy	325	325
Net Premium per policy	300	300
Mortality Rate	0.0020	0.0030
Investment Interest Rate on Reserves	4.00%	4.25%
Lapse Rate	2%	0%
Maintenance Expense per Policy	15	8

Assume:

- Beginning of Period Policies in Force: 5,000
- Policy Death Benefit per policy: 100,000
- All premium is collected at the beginning of period.
- All deaths and lapses occur at end of period.
- There are no surrender benefits.
- Expenses are paid at the beginning of the period for policies in-force at the beginning of period.

- (a) (2 points) Construct an Analysis in Change in Reserves for the GAAP expectation and actual results.

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

- (b) (1 point) Explain how the Analysis in Change in Reserves from part (a) would change if the reserve was calculated using a present value of cash flows approach without margins, such as under ASU 2018-12.

ANSWER:

1. Continued

- (c) (4 points) Construct a Source of Earnings analysis for the GAAP expectation and actual results.

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

- (d) (1 point) Explain the main drivers of differences between the expected and actual results.

ANSWER:

2.

(7 points) ABC Life Insurance, a large multinational corporation, has a U.S. based subsidiary reporting the following reserves for a block of term life product portfolio issued between 2010 and 2014 (in millions):

NAIC Statutory Reserve	60
Deficiency Reserve included in Statutory Reserve	38
Asset Adequacy Reserve for this block	0

(a) (2 points) ABC Life is evaluating the use of an off-shore affiliate captive for reinsuring this portfolio.

(i) Evaluate the advantages and disadvantages of this approach.

ANSWER:

(ii) Describe two potential captive structures.

ANSWER:

(b) (2 points) Explain each of the following regulations in relation to the use of captives or foreign affiliates by ABC's U.S. subsidiary:

(i) Actuarial Guideline XLVIII (AG-48)

ANSWER:

(ii) Principle Based Reserves (VM-20)

ANSWER:

2. Continued

(c) (3 points) Critique the use of captive insurance companies in the following circumstances:

A. *A reinsurance company has acquired a block of term life insurance written in 2007. It has done this by accepting the business using 100% coinsurance.*

ANSWER:

B. *A large life insurance company is writing its newest product of term life insurance.*

ANSWER:

C. *A carrier has a large block of Universal Life (UL) policies that was written in 2016.*

ANSWER:

3.

(10 points)

- (a) (2 points) Compare the pre-PBR Standard Valuation Law to the Principles Based Reserve (PBR) for statutory reserves of life insurance policies with respect to the following:

- (i) Valuation Methodology/Calculation

ANSWER:

- (ii) Assumptions

ANSWER:

3. Continued

(b) (4 points) Describe how each piece of the following information about XYZ Life should be used in setting assumptions under VM-20:

(i) XYZ has been selling 10-year Level Term and Whole Life insurance for 20 years.

ANSWER:

(ii) Historically, sales have been limited to ages 18-50, but have been expanded to include ages 51-65 in the last 3 years.

ANSWER:

(iii) XYZ expects increased deaths from COVID-19 for the next 3 years.

ANSWER:

(iv) XYZ has implemented new underwriting guidelines that it expects to result in future mortality improvement.

ANSWER:

(v) XYZ does not have the capability to model mortality stochastically.

ANSWER:

3. Continued

- (c) (4 points) Evaluate the following e-mail for compliance with the NAIC Life Insurance Illustration Model Regulation:

To: Illustration Actuary
From: Pricing Actuary
Subject: Illustration Sign-off for Upcoming Whole Life Product

My team has verified that for all illustrated points in time after the twentieth policy anniversary, the accumulated value of all policy cash flows equals or exceeds the policy cash surrender value (there are no other illustrated benefit amounts for this product). This is true under both experience assumptions and a modified persistency rate assumption. The modified persistency assumption uses experience persistency for the first 15 years and 100% persistency thereafter.

Below is a numeric summary of a sample illustration for a male, age 35, non-smoker.

Age	Policy Year	Cash Surrender Value
35	0	\$1,000
40	5	\$2,500
45	10	\$9,000
55	20	\$25,000
70	35	\$50,000

ANSWER:

4.

(11 points)

(a) *(3 points)* Assess whether the following benefit features meet the definition of Market Risk Benefits (MRB) under ASC 944 MRB Fair Value Guidance:

(i) Interest crediting rate on the account value based on performance of an equity index within an annuity

ANSWER:

(ii) Guaranteed lifetime withdrawal benefit on a fixed-indexed annuity

ANSWER:

(iii) Minimum guaranteed periodic payments on a variable immediate payout annuity, where payments will vary based on the investment performance of a related separate account fund

ANSWER:

(iv) A secondary guarantee on a universal life contract, where the death benefit remains in force even if the account balance is insufficient to pay the cost of insurance assuming minimum funding requirements are met

ANSWER:

4. Continued

(b) (3 points) Critique the following statements regarding MRBs:

A. *An MRB shall be measured at fair value. Total attributed fees used to calculate the fair value of the MRB can be negative. The unit of account for the attributed fee determination for an MRB can be calculated for a group of contracts with similar product types and issuance period.*

ANSWER:

B. *An MRB can be evaluated using either a non-option or option-based valuation approach. If an option-based approach is adopted, the terms of the MRB can be adjusted to result in the MRB being equal to zero at inception.*

ANSWER:

C. *If a contract contains multiple MRBs, those MRBs shall be bundled together as a single compound MRB in the fair value determination.*

ANSWER:

4. Continued

(c) (3 points) You are given the following information about a variable annuity contract with a GMAB and GMDB rider:

- Fees of 1.5% of the account value will be deducted from the account balance each year.
- The present value of the benefits to be paid in excess of the account balance using fair value assumptions:

	GMAB only	GMDB only	GMAB and GMDB
At inception	4,000	1,000	4,500
Year 4	5,000	2,000	6,000

- The present value of fees collected from the account using fair value assumptions:

	PV of fees collected from the account
At inception	15,000
Year 4	10,000

Calculate the following under the non-option method:

- (i) Annual percentage of the account value that will be attributed to the host as fee revenue

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

- (ii) The value of the MRB at year 4

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

Show all work.

4. Continued

(d) (2 points) You are given the following at issue:

- A contract holder deposits 50,000 in an index annuity with GMDB rider that provides the contract holder's death benefit be credited at 6% interest compounded annually.
- The fair value of benefit for the GMDB rider to be paid in excess of the account balance is 2,000.
- The fair value of the embedded derivative for index crediting is 8,000.

Describe the calculation needed for each of the following at a future valuation date under the option method:

(i) MRB

ANSWER:

(ii) Embedded derivative

ANSWER:

(iii) Host

ANSWER:

5.

(11 points)

(a) (3 points) Critique the following statements with regard to ASU 2018-12:

A. *ASU 2018-12 updates the existing guidance to include a provision for adverse deviation for cash flow assumptions, which need to be reviewed on an annual basis.*

ANSWER:

B. *Under ASU 2018-12, contracts are grouped in cohorts to measure the liability. These cohorts can include contracts from different issue years.*

ANSWER:

C. *Terminal dividend liability is accrued at a constant rate based on the present value of the basis used for the amortization of DAC, which is a straight-line basis for individual contracts.*

ANSWER:

D. *Market risk benefits are measured at fair value. The change in fair value is recognized in other comprehensive income (OCI).*

ANSWER:

5. Continued

- (b) (4 points) Company VLF currently sells fixed indexed annuities (FIA) with a GMWB, which is valued as an embedded derivative under FAS133. Under ASU 2018-12, VLF has concluded that FIA indexed credits and GMWBs are considered market risk benefits because they were previously valued as an embedded derivative, and because they have “other than nominal” capital market risk.

- (i) Critique VLF’s conclusion.

ANSWER:

- (ii) Describe “other than nominal” capital market risk that is relevant to VLF’s FIA product.

ANSWER:

- (c) (2 points) Describe the new disclosures with respect to ASU 2018-12 for the following:

- (i) liability for policyholder’s account balances and additional liability

ANSWER:

- (ii) market risk benefits

ANSWER:

- (d) (2 points) List the disaggregation principles that insurers will need to apply to the new required disclosure under ASU 2018-12.

ANSWER:

6.

(9 points) AIF Life is a global insurance group that operates in both the United States and European countries. MJE Life is a US-based subsidiary of AIF that primarily sells Single Premium Deferred Annuity (SPDA) to mid-income households. You are given the following information:

- The SPDA does not have surrender charges
- MJE has an overall asset duration of 10.5 and liability duration of 9.5
- The Authorized Control Level RBC for MJE is 2.0

	AIF	MJE	Total of All Other Subsidiaries of AIF (Non-US)
Total Available Capital	20.0	5.0	15.0
Minimum Regulatory Capital	6.0	2.0	3.0

(a) (6 points) Critique the following statements in the context of RBC:

- A. *AIF is not subject to the C-0 requirement if all its subsidiaries are non-insurance entities. If AIF has a life insurance subsidiary, then the C-0 factors of such subsidiary is equal to 30% to 100% of the book value of the subsidiary as reported in the statutory annual statement.*

ANSWER:

- B. *For MJE, the RBC interest rate risk factor for the SPDA reserve is determined under the medium category and is required to be increased by 50% due to an asset-liability mismatch. MJE can submit a qualified opinion based on a C-3 significance test to avoid the increase.*

ANSWER:

- C. *MJE must perform a trend test. If its RBC ratio falls below the Regulatory Action Level, the commissioner of the state of domicile is required to take actions necessary to protect the best interest of the policyholders and creditors.*

ANSWER:

6. Continued

D. *The C-4 business risk capital for MJE will be 0 because AIF Life will allocate C-4 at Total Company level.*

ANSWER:

E. *The C-2 insurance risk capital for SPDA is typically a percentage of premium and since these are only single premium products, C-2 risk capital is required in the first policy year.*

ANSWER:

(b) (2 points) Calculate the Group Capital Ratio for AIF. Show all work.

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

(c) (1 point) Describe two considerations related to a capital adequacy assessment of an insurer that operates under more than one regulatory regime per ASOP 55 – Capital Adequacy Assessment.

ANSWER:

7.

(9 points) Company DEF plans to fully adopt ASU 2018-12 by the end of the current year.

(a) (4 points) Critique each of the following approaches.

A. *For long-duration contracts, DAC is amortized on a straight-line basis over the expected term of the related contracts. DAC is not subject to impairment testing. However, the premium deficiency test for long duration insurance contracts will need to include the DAC balance.*

ANSWER:

B. *The test for profits followed by losses may be performed on a grouped contract basis, at grouped contract inception, and is not revisited. When an additional liability is required, it is determined based on a benefit ratio that does not exceed 100%.*

ANSWER:

C. *Future cash flows used to estimate the liability for future policy benefits for limited-payment contracts must be discounted using an upper medium grade 10-year fixed-income instrument yield. The discount rate is required to be updated annually, with the effect of the discount rate changes on the liability recognized in accumulated other comprehensive income (AOCI).*

ANSWER:

D. *The ceding company may receive a ceding allowance from the reinsurer. The ceding allowance DAC offset must be limited to the amount that represents recovery of acquisition costs deferred by the ceding company. Any excess should be recognized in income at the time of the reinsurance transaction.*

ANSWER:

7. Continued

You are also given the following information for a group of life insurance policies sold by Company DEF in a month:

	<u>First Year Cashflow</u>	<u>Risk-adjusted PV at issue</u>
Premium	28,000	249,000
Commission	28,000	28,000
Premium tax	560	4,980
Policy underwriting expense	8,000	8,000
Policy service expense	1,000	18,550
Policy benefits	1,030	187,000

Assume risk-adjusted PV are calculated using current assumption at issue.

These policies are in the same GAAP cohort / IFRS 17 group.

- (b) (1 point) Calculate GAAP DAC capitalization at issue.

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

- (c) (2 points) Calculate the amount of contractual service margin at issue for this group under IFRS 17.

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

- (d) (0.5 points) Determine if this group of contracts is onerous per IFRS 17. Justify your answer.

ANSWER:

- (e) (1.5 points) Describe how reinsurance contracts held should be accounted under IFRS 17.

ANSWER:

8.

(11 points)

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

A. *A block of business containing universal life with secondary guarantee policies, which were issued in 2020 and 2021, is subject to VM-20.*

ANSWER:

B. *If a group of term life contracts passes the deterministic exclusion test for VM-20, the minimum reserve is the aggregate net premium reserve.*

ANSWER:

C. *To qualify as a clearly defined hedging strategy, the strategy must specify the risks being hedged and instruments used for hedging.*

ANSWER:

D. *If a group of universal life with secondary guarantee policies has a clearly defined hedging strategy, it is subject to the stochastic exclusion test for VM-20.*

ANSWER:

E. *Disintermediation risk, annuitization risk, and reinsurer default risk should be reflected in the VM-21 reserve calculation.*

ANSWER:

F. *If the VM-21 total reserve equals the standard scenario amount, there is no need to allocate the results to the contract level.*

ANSWER:

8. Continued

- (b) (4 points) Identify whether each of the following would increase or decrease due to a change of the 7702 insurance interest rate from 2.0% to 3.0% for a Universal Life contract in a future year:

- (i) Seven-pay Premium

ANSWER:

- (ii) Guideline Level Premium

ANSWER:

- (iii) Guideline Single Premium

ANSWER:

- (iv) CVAT Corridor Factor

ANSWER:

Justify your response.

- (c) (1 point) Whole life policies were issued at the guaranteed interest rate of 5% in 2021.

Explain how the changes of the minimum interest rates for CVAT will impact the cash value.

ANSWER:

9.

(11 points)

(a) (5 points) Critique each of the following statements with respect to annuities in payment status:

A. *A contract whose life contingent payments is 20% of the present value of all payments anticipated under the contract is not considered to have a nominal mortality risk and thus, can be valued as an investment contract.*

ANSWER:

B. *Some companies can group contracts with similar characteristics together when classifying policies for accounting purposes and can change such classification when circumstances change during the contract's lifetime.*

ANSWER:

C. *The concept of loss recognition applies to investment contracts under SFAS97.*

ANSWER:

D. *Once the DAC asset for an investment contract has been written off, the deferral of future losses can be avoided by increasing the benefit reserve.*

ANSWER:

E. *The concept of locked-in assumptions is applicable to investment contracts.*

ANSWER:

F. *Margins for adverse deviations should be included in setting assumptions for investment contracts.*

ANSWER:

9. Continued

(b) (6 points) You are given the following data for a 5-Year certain annuity contract:

- Premium paid at beginning of policy year 1: 1,400
- Acquisition expenses incurred at beginning of policy year 1: 75
- Policy benefits paid at the end of each policy year 1 to 5: 300
- Maintenance expenses incurred at the end of each policy year 1 to 5: 15
- Investment rate of return in all policy years: 6.50%

With respect to the Constant Yield Method:

(i) (2 points) Calculate the discounted interest rate needed to determine the net policy reserves. (Hint: Use IRR function in Excel to determine this interest rate.)

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

(ii) (1 point) Calculate the GAAP net policy reserves for the end of each policy year 1 through 5.

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

(iii) (3 points) Determine the GAAP profit for each policy year 1 through 5, assuming actual realized experience match the assumed assumptions.

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

Show all work.

10.

(13 points)

(a) (10 points) You are given:

- a block of 10-year level-premium, level death benefit term insurance policies
- issued to males aged 55
- All cash flows are assumed to occur at the beginning of each year.
- Valuation assumptions correspond to minimum valuation standards as allowed by the Standard Valuation Law.
- Experience data and assumptions are provided in the spreadsheet.

With respect to the calculations provided in the spreadsheet:

(i) (8 points) Revise the calculations, where necessary, to assure the accurate calculation of pre-PBR CRVM and deficiency reserves.

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

(ii) (2 points) Assume the above policies are issued on January 1, 2022. Calculate the Deterministic Reserve as of December 31, 2022 using the Prospective Method.

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

(b) (3 points) Describe 3 model validation techniques as outlined by ASOP 52 - *Principle-Based Reserves for Life Products under the NAIC Valuation Manual on PBR for Life Products*.

ANSWER:

****END OF EXAMINATION****