SOCIETY OF ACTUARIES

Life Finance & Valuation – U.S.

Exam ILALFVU

MORNING SESSION

Date: Thursday, May 2, 2019
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).

   a) The morning session consists of 6 questions numbered 1 through 6.

   b) The afternoon session consists of 4 questions numbered 7 through 10.

   The points for each question are indicated at the beginning of the question.

2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.

3. 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 on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.

2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.

3. The answer should be confined to the question as set.

4. When you are asked to calculate, show all your work including any applicable formulas.

5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam ILALFVU.

6. Be sure your essay answer envelope is signed because if it is not, your examination will not be graded.

Canadian version of this exam is recognized by the Canadian Institute of Actuaries.

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Exam ILALFVU Front Cover

****BEGINNING OF EXAMINATION****
Morning Session

1. (*7 points*) Critique the following statements regarding IFRS 17:

A. IFRS 17 affects the same population of contracts as IFRS 4: insurance contracts issued, reinsurance contracts held, and investment contracts with discretionary participation features issued.

B. All assumptions used to calculate fulfillment cash flows and the contractual service margin (CSM) are current assumptions. The cash flows and assumptions are updated at each reporting date, using current estimates.

C. There is no special treatment for contracts with a variable fee (compared to all other IFRS 17 applicable contracts) in recognizing fulfillment cash flows, changes due to discount rates and other financial variable changes.

D. In the event of non-economic assumption updates, changes that relate to current or past insurance coverage are recognized in profit or loss; changes that relate to future coverage are recognized by adjusting the CSM.

E. IFRS 17 helps to eliminate the economic mismatches between insurance contract liabilities and assets by using a discount rate based on the characteristics of the liability.

F. Under IFRS 17, a company can group contracts within a portfolio into: 1) those contracts that are onerous at initial recognition and 2) those contracts that are not onerous at initial recognition. In addition, a group of contracts cannot include contracts issued more than one year apart.

G. Under IFRS 17, a company can: 1) include an explicit, current risk adjustment in the measurement of insurance contracts; 2) use risk adjustment for some contract types but not for others; 3) use an implicit risk margin or allowance.

2. (*10 points*) ABC is a public life insurance company subject to the financial reporting requirements of Section 404 of the Sarbanes-Oxley Act (SOX 404).

(a) (*2 points*) Describe the four key risk areas impacting the processes for determining actuarial amounts in the financial statements.

(b) (*4 points*) Critique the statements below from the Chief Financial Officer of ABC with regard to best practices for adherence to SOX 404:

A. Internal controls have no obvious benefit.

B. Only processes that directly support the compilation of GAAP reserves and DAC should be included in the company's internal controls, and there is no reason to include other processes at all.

C. Once the compilation task is peer reviewed, I will attest, and no further action will be necessary.

D. Our actuary will respond to auditor queries only pertaining to the appropriateness of the method of compilation.

2. Continued

(c) (*4 points*) You are given the following values on ABC's annual statements for two blocks of business:

Term Life	**2016**	**2017**	**2018**
Beginning Face Amount Inforce	51,143	52,643	Not Available
Ending Face Amount Inforce	52,643	Not Available	Not Available
Beginning Reserve	2,407	2,478	2,551
Ending Reserve	2,478	2,551	2,489
Valuation Net Premium	1,115	1,148	1,265
Tabular Interest	100	103	108
Reserve release by death	93	94	88
Reserve release by other terminations	62	63	56

Life Annuities (Payout Annuities)	**2016**	**2017**	**2018**
Beginning Reserve	512	479	437
Ending Reserve	479	437	426
Premiums	0	0	0
Tabular Interest	24.75	22.75	21.50
Reserves Released by Death	13	13	14
Payments to Annuitants	58	64	30

Evaluate the reasonableness of ABC's reported change in statutory reserves for the two blocks. Justify your answer with an appropriate formula ratio test. Show all work.

3. (*10 points*)

(a) (*4 points*) Critique the following statements:

A. The cash transfer at inception of a partially modified coinsurance treaty equals the sum of the initial allowance and the modified coinsurance adjustment.

B. It is not possible for a ceding company to take credit for reinsurance ceded to a reinsurer who does not meet the criteria defined in the Credit for Reinsurance Model Regulation.

C. Some states in the U.S. have a "mirror image" reserve requirement that does not allow the ceding company to reduce its reserves by an amount greater than the reserves the reinsurer holds.

D. Under ASOP 52, Principle-Based Reserves for Life Products under the NAIC Valuation Manual, the reserve credit for yearly renewable term reinsurance is equal to $(½)c_x$ which is calculated using a prescribed valuation table and interest rate.

(b) (*2 points*) You are given the following for a stop loss reinsurance contract:

Maximum retention	150,000 per life
Expected claims	6,500,000
Attachment point	105% of expected claims
Limits	95% of all covered claims in excess of the attachment point amount, up to a total maximum of 1,000,000

Calculate the amount the reinsurer would pay under each of the following scenarios:

(i) Covered claims = 6,000,000

(ii) Covered claims = 7,000,000

(iii) Covered claims = 8,000,000

Show all work.

3. Continued

(c) (*4 points*) You are given the following information for a coinsurance treaty covering short duration contracts:

Single year's exposure	
Ceded annual premiums	5,000,000
Expected loss ratio of reinsured business	65%
Expected loss ratio distribution of reinsured business (assume the loss ratio is the midpoint of the range)	
Loss ratio range	**Probability**
40-50%	5%
50-60%	10%
60-70%	70%
70-80%	10%
80-90%	5%
Expected loss payment run-off pattern	
Year 1	90%
Year 2	10%
Year 3	0%

Assume:

- Expense allowance is 30% of ceded premium.
- Discount rate is 4.5%.
- A significant loss to the reinsurer is 10% or more of ceded premium.
- 10% is a reasonable probability of the reinsurer realizing a significant loss.
- Premiums and expenses are paid at the beginning of the year.
- Claims are paid at the end of the year.

Assess if the treaty meets the requirements for reinsurance accounting per SFAS 113. Show all work.

4. (*12 points*)

(a) (*2 points*) Describe the drivers of profitability for each of the following product types according to Source of Earnings Analysis:

(i) Term insurance with level premium products

(ii) Unit-linked savings products

(iii) Payout annuity products

(b) (*3 points*) Compare the following profitability metrics. Consider areas of use, advantages and assumptions.

(i) Actuarial Appraisal Value (AAV)

(ii) Embedded Value (EV)

(iii) Operating (or profit) margin

(c) (*3 points*) You run a projection on a block of business assuming the entire block lapses in year 5:

	Projection Year					
	0	**1**	**2**	**3**	**4**	**5+**
After Tax Book Profit		100	90	95	103	0
Required Capital	50	48	46	44	42	0
Free Surplus	10	9	11	7	5	0

The model uses equity cost of capital as the risk discount rate, and the inputs below:

10 Year Treasury	2.90%
CAPM Beta for your company	1.3
Market Risk Premium over 10 Year Treasury	5%
After-tax Investment Return Rate	3.5%

Calculate the EV that should be produced by the model. Show all work.

4. Continued

(d) (*4 points*) Critique each of the following statements related to EV methodology:

A. Since assets backing reserves include debt securities, the company should consider factoring in the cost of debt into the risk discount rate.

B. Assumptions that are considered sensitive should have a Provision for Adverse Deviation (PAD) in EV calculations.

C. Market Consistent Embedded Value (MCEV) would be a significant improvement over EV since it is easier to track changes over time, and it is easier to compare across companies.

D. Policyholder behavior should not be modeled when calculating the Time Value of Financial Options and Guarantees (TVFOG) because it cannot be accurately forecasted.

5. (*9 points*)

(a) (*3 points*) Describe the differences in determining the reinsurance reserve credits under rules-based methods and VM-20 methods.

(b) (*6 points*) You are given the following projection results from the VM-20 deterministic reserve model for a 5-year term life insurance product:

Year	**1**	**2**	**3**	**4**	**5**
Gross premiums	800	700	600	500	400
Net investment income	20	23	25	30	35
Death benefits	100	300	480	700	1000
Commissions and expenses	10	9	8	7	6
Federal income taxes	10	8	7	6	5
Reinsurance premiums	400	350	300	250	200
Reinsurance death benefit recoveries	25	75	120	175	250

	End of Year 2
Pre-tax interest maintenance reserve (PIMR)	112
Asset valuation reserve (AVR)	432
Net premium reserve pre-reinsurance	800
Net premium reserve post-reinsurance	700

Assume:

- The deterministic interest rate is 4%.
- The deterministic reserve is calculated using the present value of cash flows approach.
- All cash flows occur at the beginning of the year.
- The product passes the stochastic exclusion test.

Calculate the reinsurance reserve credit as of the end of year 2. Show all work.

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6. (*12 points*) You are given the following information about a variable annuity policy with a 3 year Guaranteed Minimum Death Benefit (GMDB):

- Discount rate is 4%
- Surrender rate is constant at 1%
- Mortality rate is constant at 1%
- Maintenance expense is 50 per year

Year	**1**	**2**	**3**	**4+**
Surrender Charge as % of Account Value	2%	2%	2%	0%
Mortality and Expense Fee (M&E) as % of Account Value	1.2%	1.2%	1.2%	0%
Projected Account Value	315,000	310,000	305,000	N/A
GMDB	320,000	320,000	320,000	0

(a) (*6 points*) Calculate the SOP 03-1 liability at the end of year 1. Show all work.

(b) (*2 points*) Describe concerns a company might have related to FASB's targeted improvements for GMDB GAAP calculations.

6. Continued

(c) (*4 points*) You are given the following results from an Actuarial Guideline XLIII (AG 43) calculation:

Overall results for the company			
	Sub-Grouping A	Sub-Grouping B	Sub-Grouping C
Conditional Tail Expectation Amount	150,000,000	100,000,000	200,000,000
Standard Scenario Amount	145,000,000	103,000,000	197,000,000

Sample results for two policies from Sub-Grouping A		
	Policy 1	**Policy 2**
Allocated value of approved hedges	600	200
Basic Adjusted Reserve	248,000	199,100
Basic Reserve	250,200	200,100
Cash Surrender Value	250,000	200,000
Greatest present value of the negative of the Accumulated Net Revenue	3,000	1,000

Calculate the statutory reserve for policy 1 and policy 2. Show all work.

****END OF EXAMINATION****
Morning Session

USE THIS PAGE FOR YOUR SCRATCH WORK