SOCIETY OF ACTUARIES
Life Finance & Valuation – U.S.

Exam ILALFVU

AFTERNOON SESSION

Date: Thursday, November 2, 2017
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 4 questions numbered 7 through 10 for a total of 40 points. 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.

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Exam ILALFVU Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 7

7. (*6 points*) Your company purchased a 5-year bond at issue on January 1, 2015, held within an Available For Sale (AFS) portfolio. The bond has a par value of 1,000 and an 8% coupon rate payable semi-annually. You are given the following information as of June 30, 2017:

Amortized Cost of Bond	1,045.77
Balance of Bond Valuation Adjustment Account	21.95

(a) (*3 points*) Calculate the GAAP interest income earned in the second half of 2017. Show all work.

(b) (*2 points*) At the end of 2017, the fair value of the bond dropped to 900 due to rising interest rates, and your company has no intent to sell the bond prior to maturity.

(i) Calculate the impact on the GAAP financial statements. Show all work.

(ii) Explain how the impact will be reported on the GAAP financial statements.

(c) (*1 point*) Assume the company purchased an interest rate swap to hedge the impact of fluctuating fair values of the bond.

Explain how the impact will be reported on the GAAP financial statements.

8. (*13 points*)

You are given the following for a variable deferred annuity:

Assumed premium	7,000 at the beginning of each of the first three years
Loads per policy	30 annually in the middle of each year
M&E charge	Calculated as a percentage of account values and collected in the middle of each year. Charges projected to be 500 in the first year, 1000 in the second year and 1500 in the third year.
Surrender charges	None
Commission	5% of premium in first 3 years, 0% thereafter
Deferrable commission	100% of commission
Deferrable acquisition expenses	125 at beginning of the first year
Best estimate maintenance expense assumption	25 annually in the middle of each year
Discount rate	7%
Best estimate mortality assumption	None
Best estimate lapse assumption	100% at end of third year

(a) (*5 points*) Calculate GAAP pre-tax income in year 1. Show all work.

(b) (*4 points*) Describe the additional assumptions and types of calculations required to calculate GAAP pre-tax income if the policy contains Guaranteed Minimum Death Benefit (GMDB) and Guaranteed Minimum Accumulation Benefit (GMAB) riders.

(c) (*4 Points*) Describe the impacts to the DAC calculation, compared with the initial expectations, for each of the following situations:

(i) The equity markets decrease significantly at the end of the first year.

(ii) The actual premiums collected in the second year exceed the expected amount.

(iii) After one year, the future maintenance expense assumption is increased.

9. (*9 points*)

(a) (*4 points*) TWA Life Insurance Company uses Principle-Based Reserving (PBR) for its Universal Life with Secondary Guarantee (ULSG) block of business.

You are given the following information (amounts in millions):

	2018 cash flows	**PV of future cash flows at December 31, 2018**
Premium	5.0	60
Cost of Insurance (COI)	1.2	10
Expense Charge	0.5	4
Investment Income	1.5	22
Death Benefit	1.0	45
Commission	4.0	9
Acquisition Expense	2.0	8
Maintenance Expense	1.5	12
Credited Interest	0.8	30
Federal Income Taxes	0.2	13

- Policy loans are not modeled
- Discount rate is 4%
- No reinsurance
- Cash flows occur at beginning of the year

(i) (*3 points*) Calculate the deterministic reserve, as of December 31, 2017, using the present value of cash flows approach. Show all work.

(ii) (*1 point*) Describe an alternative method for establishing the deterministic reserve.

9. Continued

(b) (*3 points*) You are given the following for a PBR valuation on a different block of ULSG policies as of December 31, 2017:

Starting Asset in Model	198
Net Premium Reserve	100
Cash Surrender Value	102
COI to the Next Paid-To Date in 2018	23
Deterministic Reserve	124

Average Stochastic Reserve for every 10 scenarios ranked from worst to best:

1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
230	215	200	195	190	182	180	175	165	164

(i) Calculate the December 31, 2017 reserve under PBR. Show all work.

(ii) Assess whether or not the starting asset is appropriate for this model. Justify your answer.

(c) (*2 points*) TWA is developing a derivative investment program including a Clearly Defined Hedging Strategy (CDHS).

Describe the components of a qualified CDHS under PBR.

10. (*12 points*)

(a) (*2 points*)

(i) Explain the purpose of Risk-Based Capital (RBC).

(ii) Explain why principle-based RBC (such as C-3 Phase I and C-3 Phase II) is necessary.

(b) (*4 points*) You are an actuary for TOB Life and are responsible for calculating RBC.

(i) You are given the following details about the model to be used for RBC C-3 Phase I:

- It is the same cash flow model that was used for year-end Asset Adequacy Analysis cash flow testing.
- It uses scenarios from Asset Adequacy Analysis.
- The model lapse assumption is the cash flow testing assumption plus a margin for conservatism.
- The products that will be modeled are: single premium whole life, annual premium whole life, and single premium deferred annuities. Universal life (UL) and flexible premium annuities will not be modeled.

Critique this model relative to RBC C-3 Phase I requirements.

(ii) The model produced the following results for the alternative 12 scenarios, ranked in order from largest to smallest capital need:

Scenario	1	2	3	4	5	6	7	8	9	10	11	12
Capital needed (in millions)	25	15	12	10	7	5	5	0	0	0	0	0

Determine the C-3 Phase I requirement. Show all work.

10. Continued

(iii) You are given the following results from the C-3 Phase II model for TOB Life's variable annuity with guaranteed living benefits product.

	Millions
CTE(75) of required capital	30
CTE(90) of required capital	40
CTE(99) of required capital	55
Starting assets	25
Statutory reserve	60

Determine the C-3 Phase II requirement. Show all work.

(c) (*3 points*) TOB Life, a publicly-traded insurer, calculates three capital measures: RBC ratio, Standard and Poor's Capital Adequacy Ratio (S&P CAR), and Economic Capital. Your colleague makes the following statements:

A. "*A reduction in our S&P CAR is okay so long as our RBC ratio doesn't decrease. Since the RBC ratio is the measure regulators look at, it is the item that has the most consequences."*

B. *"As long as we have as much capital as possible to cover our existing business, all of our stakeholders will be satisfied."*

C. *"The following chart compares our company to our closest competitor, BAX Life:*

	RBC ratio	S&P CAR	Economic Capital
TOB Life	350%	150%	100 million
BAX Life	350%	150%	60 million

Obviously TOB Life is better prepared to cover its risks."

Critique each statement.

Question 10 continued on next page.

10. Continued

(d) (*3 points*)

(i) You are given the following data for TOB's whole life block:

	Millions
Premium	70
Benefits	40
Expenses	10
Investment income	25
Increase in statutory reserve	15
Increase in GAAP reserve	25
Tax	10
Increase in required capital	12
After-tax investment income on assets backing required capital	4

Calculate the distributable earnings. Show all work.

(ii) To calculate future distributable earnings, you project the whole life block over 30 years. Explain why the distributable earnings calculation may need to be adjusted.

(iii) Propose one technique for adjusting the distributable earnings calculation.

****END OF EXAMINATION****
Afternoon Session

USE THIS PAGE FOR YOUR SCRATCH WORK

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