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

# Exam ILALFVU

## AFTERNOON SESSION

**Date:** Thursday, April 27, 2017

**Time:** 1:30 p.m. – 3:45 p.m.

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### 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.





**\*\*BEGINNING OF EXAMINATION\*\***

**Afternoon Session**  
***Beginning with Question 7***

**7.** (9 points)

(a) (4 points)

- (i) Describe the three conditions required for an embedded derivative to be bifurcated from the host contract and accounted for as a derivative under SFAS 133.
- (ii) Identify any embedded derivatives and determine if bifurcation is required for each of the following products:
- Variable payout annuity with a period certain and guaranteed minimum payments
  - Market-value adjusted (MVA) annuity
  - Equity indexed annuity (EIA)

(b) (5 points) You are given the following information for a 1 year point-to-point equity indexed annuity subject to FAS 133:

- Deposit: 100,000
- Initial guaranteed value: 100,000
- Index: S&P 500
- Participation: 100%
- Cap: 4%
- Guaranteed minimum rate: 0%
- Surrender charge: 0%

Assume:

- Surrender rate at the end of year 2: 100%
- Discount rate: 2%

	Deposit Date	End of Year 1	End of Year 2
S&P 500 Index	1000	1050	1100

- (i) (3 points) Calculate the excess benefits.
- (ii) (1 point) Calculate the value of the embedded derivative at issue.
- (iii) (1 point) Calculate the value of the host contract at issue.

Show all work.

**8.** (12 points) DBM Life is pricing a new variable universal life (VUL) product with an extended no-lapse guarantee (NLG) and a long term care (LTC) rider.

- (a) (3 points) Propose a detailed method to determine whether this new product requires additional reserves under SOP 03-1.
- (b) (2 points) Compare and contrast the types of assumptions used in the DAC and SOP 03-1 calculations.
- (c) (4 points) You are given:

Year	End of Year Account Value	Deferrals	Estimated Gross Profits (EGPs)	Mean Benefits	Mean Assessments
1	52,342	7,500	4,252	1,342	5,594
2	106,316	0	3,992	1,484	5,476
3	161,214	0	3,734	1,566	5,298
4	217,110	0	3,528	1,626	5,154
5	276,912	0	3,380	1,662	5,042
6	0	0	3,316	1,696	5,012
PV		7,500	18,085	7,744	26,406

- EGP's are calculated before SOP 03-1 reserves are considered
- GAAP credited rate = 6.5%
- The product was determined to require SOP 03-1 reserves
- PV of revised EGP's (after SOP 03-1 reserves are considered) = 17,991
- All policies terminate at the end of year 6

Calculate the revised DAC balance at the end of year 1.

Show your work.

- (d) (3 points) The product development team would like to add a first year premium load to the product to cover ongoing policy expenses.

Describe the implications this change could have on the SOP 03-1 reserves.

**9.** (8 points)

- (a) (5 points) Critique each of the following statements about the Principle-Based Reserves (PBR) framework:
- A. *Except for term and universal life products, all other products would use the current statutory reserve method as the Net Premium Reserve (NPR).*
  - B. *NPR will never be less than the cash surrender value.*
  - C. *The prescribed interest rates for determining present values for the NPR and for the current reserve method use the same basis.*
  - D. *For policies that are reinsured, the ceding company and the assuming company must use the same assumptions.*
  - E. *A company can use its own mortality experience when setting mortality assumptions, but the method for determining the mortality margin is prescribed.*
  - F. *Based on credibility and exposure of company experience, mortality improvement factors can be applied until the period when company mortality grades to the industry mortality table.*
  - G. *When setting expense assumptions, information technology development costs and other capital expenditures must be recognized in the current year.*
  - H. *Expense efficiencies resulting from an acquisition cannot be recognized.*
  - I. *Both the deterministic reserve and stochastic reserve are determined in aggregate. Net premium reserve is determined on a seriatim basis.*
  - J. *When determining the stochastic reserve, discount the negative of the projected statement value of the general account using the one year US Treasury interest rates for each projection year.*
- (b) (1 point) Describe the risks the deterministic and stochastic exclusion tests are meant to identify under the PBR framework.

## 9. Continued

- (c) (2 points) Under the current rules based statutory method, BNA Life Insurance Company performs C-3 Phase 1 testing as part of its annual risk-based capital (RBC) testing. The result is a low RBC ratio that suggests BNA may be weakly capitalized.

The Chief Actuary states "*This is not a major concern because we will soon be moving to a principle-based approach; the current statutory method is formulaic but under the new PBR method, we will be allowed to more accurately reflect our own risks and prove we are not poorly capitalized.*"

Critique this statement.

**10.** (11 points)

(a) (2 points)

- (i) Summarize how risk categories are used to determine whether reserve credit is allowed under statutory regulations.
- (ii) Contrast the risk transfer requirements between U.S. GAAP FAS 113 and statutory regulations.

(b) (6 points) The following terms appear in a proposed reinsurance treaty between ABC Life and XYZ Re:

- A. *On a coinsurance basis, ABC Life will cede 75% of future whole life and universal life sales with XYZ Re.*
- B. *XYZ Re will pay renewal expense allowances sufficient to cover all renewal commissions and premium taxes on the reinsured portion of the business.*
- C. *If sales of new business fall below 3 million in direct premium in the first 2 years of the agreement, ABC Life will pay XYZ Re an additional 1.5% load on the reinsurance premium for existing ceded business.*
- D. *In return for an extremely generous first year expense allowance, ABC Life guarantees the performance of the ceded block for 5 years.*
- E. *Settlements between ABC Life and XYZ Re will occur quarterly to help reduce administrative expenses.*
- F. *Any disputes arising between ABC Life and XYZ Re will be resolved with preference to industry custom and practice rather than strict legal interpretation of the treaty.*

Evaluate each term relative to the NAIC Life and Health Reinsurance Agreement Model Regulation, specifically when an asset may be established or a liability reduced for a reinsurance transaction.



## 10. Continued

- (c) (3 points) You are given the following statutory information about the assets backing the reserves for business ceded under a modified coinsurance (mod-co) arrangement:

(in millions)	2014	2015
Capital gains	10	5
Capital losses	20	1
Cash and invested assets	99	99
Investment income due and accrued	30	30
Borrowed money	10	10
Net investment income	1	2

Calculate an appropriate mod-co interest rate for 2015. Show all work.

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**