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

**Exam ILA LFMU**

**AFTERNOON SESSION**

**Date:** Thursday, October 31, 2013

**Time:** 1:30 p.m. – 3:45 p.m.

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**INSTRUCTIONS TO CANDIDATES**

**General Instructions**

1. This afternoon session consists of 5 questions numbered 7 through 11 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.
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 since 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 ILA LFMU.

**Written-Answer Instructions**

1. Write your candidate number at the top of each sheet. Your name must not appear.
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.** (11 points) You are a valuation actuary at a U.S. life insurance company that sells both traditional life insurance and universal life (UL) products. You are responsible for calculating U.S. statutory accounting principles (U.S. SAP) reserves and U.S. GAAP reserves for a block of flexible premium UL policies.
- (a) (2 points) Compare and contrast U.S. SAP and U.S. GAAP with respect to the following:
- Key audience
  - Primary emphasis
  - Financial statement focus
  - Types of valuation methodologies and assumptions used
- (b) (3 points) With respect to U.S. SAP
- (i) Explain why the traditional valuation methods are challenging to apply to flexible premium UL products.
- (ii) Your company calculates UL under the NAIC Universal Life Insurance Model Regulation. You are given the following information for a specific inforce flexible premium UL policy as of the valuation date:
- Guaranteed Maturity Fund = 29,815
  - Current Fund = 29,765
  - Present Value of Future Guaranteed Benefits = 55,718
  - Net Level Premium = 2,480
  - Present Value of a Life Annuity Due of 1 per year = 10.99
- Calculate the statutory net level reserve as of the valuation date. Show all work.
- (c) (2 points) Describe similarities and differences with the presentation of the income statement and the balance sheet under FAS 60 and FAS 97 for each of the following categories:
- Liabilities
  - Assets
  - Revenues
  - Benefits and other deductions

**7. Continued**

- (d) (2 points) Compare and contrast retrospective deferred acquisition cost (DAC) unlocking and prospective DAC unlocking, in the context of FAS 97.
- (e) (2 points) You are given the following information for a specific cohort of flexible premium UL policies:

<b>Duration</b>	<b>DAC Original Projection</b>	<b>DAC Retrospective Unlocking</b>	<b>DAC Prospective Unlocking</b>
9	20,672	24,806	20,258
10	20,114	15,086	9,052

Assume experience exactly follows expected assumptions for the first 9 policy years.

Calculate the following DAC effects for policy year 10:

- (i) Impact of retrospective unlocking
- (ii) Impact of annual events
- (iii) Impact of prospective unlocking

Show all work.

8. (8 points) You are given the following for a 5-year term life insurance policy:

Annual Premiums	900 (beginning of year)
Face Amount	10,000
Death Benefits	Paid at end of year
1 <sup>st</sup> Year Deferrable Expense	500
1 <sup>st</sup> Year Non-Deferrable Expense	200
Annual Maintenance Expense	60 (beginning of year)
Annual Overhead Expense	40 (beginning of year)
Interest Rate Assumption	6%

Best Estimate Mortality:

Year	Deaths per 1,000
1	30
2	40
3	50
4	100
5	120

Provisions for Adverse Deviation:

Mortality	Additional 10 deaths per 1,000 per year
Interest Rate	1% per year

- (a) (4 points) Calculate the following expected balances at the end of year 4:
- (i) U.S. GAAP Reserve
  - (ii) DAC Asset
- (b) (2 points) Describe how each expense component affects the profit emergence over the life of the policy, given that experience emerges as expected.
- (c) (2 points) In your calculation of the U.S. GAAP reserves and DAC asset, all of the following were ignored:
- (i) Lapse Rates
  - (ii) Inflation
  - (iii) Mortality Improvement
  - (iv) Commissions

Explain the appropriateness and implications of ignoring each of the above.

9. (5 points) A payout annuity product sold to older policyholders has the following characteristics:

- Single premium of 1000;
- Payments of 75 are made at the end of each policy year to the later of the policyholder's death or the cash value (CV) reaching zero;
- The CV is equal to the initial single premium less payments to policyholder, all accumulated at 4% annual interest rate;
- The Policyholder can surrender at anytime for 98% of CV.

You are given the following assumptions:

- Mortality rate = 10% per year;
  - Lapse rate = 10% per year;
  - Interest rate = 6% per year;
  - Deferrable acquisition expense is 5% of single premium.
- (a) (3 points) Identify the applicable U.S. GAAP accounting standard for this payout annuity product. Justify your answer
- (b) (2 points) Describe how the expected reserves and DAC balances in future periods for this particular policy are calculated under the standard identified in (a).

- 10.** (9 points) Your company sells Universal Life (UL) products with secondary guarantees, and is making preparations for the move to principle-based reserves as per the VM-20 guidelines.
- (a) (2 points) VM-20 requires two separate aggregate principle-based reserves as components of the final reserve. Outline the similarities and differences between these two calculations.
  - (b) (4 points) Prepare guidelines to assist the company in setting the assumptions required to produce these aggregate reserves under VM-20.
  - (c) (2 points) VM-20 also requires the calculation of a rules-based reserve as a component of the final reserve.
    - (i) Outline the similarities and differences between this calculation and the net level premium reserve calculation currently required under the U.S. statutory CRVM method.
    - (ii) Explain the justifications given for including a rules-based calculation in a principle-based framework.
  - (d) (1 point) Describe how the results from the two aggregate principle-based and one rules-based reserve runs are used to produce the final reserve under VM-20.

**11.** (7 points) You are the Appointed Actuary for a U.S. life insurance company. You are just wrapping up your annual asset adequacy analysis and are starting to prepare your actuarial opinion and supporting memorandum.

- (a) (1 point) List the liabilities covered by the opinion.
- (b) (1 point) Describe the paragraphs to be included in the opinion.
- (c) (5 points) The method you have chosen to perform asset adequacy analysis is cash flow testing. The following results (shown in millions) are from the cash flow testing model:

Scenario	Present Value of Ending Surplus	Present Value of Minimum Surplus Over Projection Period
1	-100	-100
2	100	0
3	200	-10
4	300	-20
5	-125	-125
6	-110	-115
7	-150	-150

Assume:

- The above scenarios are appropriate for determining asset adequacy for your company (analysis of additional scenarios is not necessary).
  - Surplus at the beginning of the projection period equals 0.
  - There are no additional reserves as of the prior opinion date.
- (i) Determine a reasonable additional reserve amount to satisfy asset adequacy requirements. Justify your answer.
- (ii) Explain what you would do if company management refuses to set up the additional reserve.

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**

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