SOCIETY OF ACTUARIES

Life Finance & Valuation – U.S.

Exam ILALFVU

MORNING SESSION

Date: Thursday, November 1, 2018
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. (*11 points*)

(a) (*3 points*) Critique the following statements pertaining to IFRS 17:

A. *IFRS 17 allows multinational insurance companies to use different accounting policies to measure similar insurance contracts issued in different jurisdictions.*

B. *IFRS 17 requires insurance companies to recognize financial options and guarantees embedded within insurance contracts only when such options and guarantees are in the money.*

C. *IFRS 17 allows companies to determine how insurance contracts are aggregated for measurement purposes as long as relevant disclosures are provided.*

D. *IFRS 17 requires insurance companies to recognize losses on onerous contracts immediately in profit or loss.*

E. *IFRS 17 applies to both reinsurance and insurance contracts, but does not apply to investment contracts with discretionary participation features, which will be covered by IFRS 9.*

F. *IFRS 17 requires a company to recognize a group of insurance contracts when the coverage starts.*

(b) (*3 points*) Contrast the treatment of term life insurance under IFRS 17 and U.S. GAAP for each of the following:

(i) Revenue

(ii) Discount rate

(iii) Treatment of risk

(iv) Mortality assumptions

(v) Acquisition costs

1. Continued

(c) (*5 points*) You are given the following information for a term life block:

Item	Year 1	Year 2
Premium	1000	500
Commission	100	50
Acquisition Expense	75	0
Maintenance Expense	25	25
Death Benefit	150	300
Investment Income	200	250

Item	Time 0	End of Year 1	End of Year 2
U.S. GAAP Expense Reserve	0	-150	-100
U.S. GAAP Benefit Reserve	0	500	700
Present Value of Cash Flows	-950	-300	-175
Risk Margin	80	60	30

Question 1 continued on the next page.

1. Continued

Assume:

- No taxes
- Other comprehensive income is zero
- Contractual service margin amortizes linearly over 3 years
- No deviations from baseline assumptions occur

(i) Construct an income statement under U.S. GAAP and IFRS 17 using the following format:

U. S. GAAP	Year 1	Year 2
(+) Revenue		
(–) Benefits and Expenses		
(=) Profit		

IFRS 17	Year 1	Year 2
(+) Insurance Revenue		
(–) Incurred Claims & Expenses		
(=) Insurance Service Result		
(+) Investment Income		
(=) Profit		

Show all work.

(ii) Construct a balance sheet under U.S. GAAP and IFRS 17 using the following format:

U. S. GAAP	Time 0	End of Year 1	End of Year 2
(+) Financial Assets			
(–) Insurance Contract Liabilities			
(=) Equity			

IFRS 17	Time 0	End of Year 1	End of Year 2
(+) Financial Assets			
(–) Insurance Contract Liabilities			
(=) Equity			

Show all work.

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2. (*6 points*) For RBC C-3 Phase I, the American Academy of Actuaries (AAA) provides the option of using either the 12- scenario set or the 50-scenario set produced from the AAA's interest rate scenario generator.

A cash flow testing model produces the following results from the 12-scenario set for DCA Life:

Present value of statutory surplus at the end of calendar year

Calendar Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Scenario 1	828	527	856	912	230	860	962	56	49	711
Scenario 2	24	254	446	703	881	976	586	567	100	814
Scenario 3	-290	-503	122	118	748	276	713	837	643	994
Scenario 4	539	360	858	771	286	900	13	293	890	610
Scenario 5	747	329	645	261	32	84	330	332	78	344
Scenario 6	627	926	177	166	182	633	850	525	456	348
Scenario 7	571	-417	757	759	694	739	650	269	502	336
Scenario 8	12	662	240	442	146	805	548	631	654	759
Scenario 9	657	496	910	400	118	783	99	745	-881	295
Scenario 10	136	220	875	294	844	370	519	480	971	938
Scenario 11	979	220	890	-793	328	532	911	900	582	666
Scenario 12	-538	833	148	270	117	953	299	74	520	527

(a) (*4 points*)

(i) Calculate the C-3 requirement based on the 12-scenario set. Show all work.

(ii) Describe how the calculation would be different if a 50-scenario set were used.

DCA also determines its internal capital adequacy using a multi-stakeholder approach. The following result shows the capital available to release:

Financial Variable (Risk Threshold)	**Year 1**	**Year 2**	**Year 3**	**Year 4**
RBC Ratio (at 200%)	1,237	854	(158)	113
S&P Capital Adequacy Ratio (downgrade)	979	(40)	61	187

DCA weights the objectives equally and considers a four-year time horizon without discount.

(b) (*2 points*) Calculate the additional capital amount DCA should hold, if any. Show all work.

3. (*11 points*) You are developing valuation methodologies for an Equity-Indexed Annuity (EIA) Index that credits interest on a two-year point-to-point basis using a proprietary index (Mars Index). This index has only four possible paths with equal probability.

	Mars Index		
Path	**Year 0**	**Year 1**	**Year 2**
1	1,000	1,200	1,300
2	1,000	1,200	1,100
3	1,000	800	900
4	1,000	800	700

Product features and assumptions for an EIA policy are:

Premium	50,000
Minimum Guarantee	90% of premium accumulated at 3% yearly
Minimum Interest Credits	0%
Interest credited is non-vested until the end of term	
Participation Rate	100% of Mars Index
Risk Free Rate	1%

Assume no decrements.

(a) (*2 points)* Describe how FAS 133 and Derivatives Implementation Group Issues (DIG) are applicable to the GAAP accounting for this annuity.

(b) (*5 points)* Calculate the projected GAAP reserves at end of year 1 assuming the Mars Index path 2 occurs.

Show all work.

(c) (*4 points)* You are given:

- Death benefits equal the account value plus 50% of non-vested index-based credited interest.
- The Market Value Reserve Method (MVRM) from Actuarial Guideline XXXV is used to calculate the CARVM reserve.
- Valuation rate is 2%.

Calculate the projected death benefit at the end of the first year that would be used in the CARVM calculation that was performed at issue. Show all work.

4. (*11 points*) With regard to U.S. Statutory reporting for single premium deferred annuities (SPDA):

You are given the following information on an SPDA policy:

- A 45-year-old male deposits 10,000 into an annuity contract with 6% guaranteed interest for 3 years.
- Guaranteed minimum interest rate is 1%.
- Crediting rate after the guaranteed period will follow the new money rate, less a spread.
- Surrender charge is 5% in year 1 and grades linearly to 0% at the end of year 5.
- A bailout provision waives the surrender charge if the current credited interest rate falls more than 3% below the initial guaranteed credited rate.
- Contract expires after the 5th anniversary.
- Death benefit is the account value.

(a) (*2 points*) Evaluate the appropriateness of using Plan Type A rates for discounting the following benefits:

(i) Withdrawals

(ii) Expected death benefit payments

(b) (*4 points*) Calculate the CARVM Reserve at the end of year 3 for the above policy, ignoring non-elective benefits and assuming the valuation rate for elective benefits is 5%. Show all work.

(c) (*2 points*) Contrast how elective and non-elective benefits are incorporated into the CARVM Reserve calculation for this product.

(d) (*3 points*) Recommend two changes to the product features that would reduce the statutory reserve requirements without affecting the guaranteed account values.

Justify your response.

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5. (*10 points*) VCE Life just launched a no cash value term insurance product which is subject to VM-20 reserving standards.

(a) (*3 points*) You are given:

Projection Period (t)	**0**	**1**	**2**	**3**
Statement Value of Assets	100,000	50,000	(9,900)	(10,000)
One-year Treasury rate (beginning of the year)	N/A	2.0%	2.5%	3.0%
Net Premium Reserve	110,000			
Interest Maintenance Reserve	0			
Stochastic Reserve	100,000			

Calculate the final VM-20 reserve at time 0. Show all work.

(b) (*3 points*) You are given additional information about the term product:

In-force death benefit at beginning of the year	10,000,000
Projected reserve at end of the year	120,000
Plan mortality rate (q_x)	0.01
Plan lapse rate	5%

A single stochastic scenario is run with the following:

- Stochastic underwriting factor = 1.05
- Stochastic volatility factor = .99
- Catastrophic factor = 1.0
- Stochastic lapse factor = 1.1

Calculate a source of earnings variance over plan, assuming all deaths and lapses occur at the end of the year, for each of the following:

(i) Mortality

(ii) Lapses

Show all work.

5. Continued

(c) (*4 points*) VCE has been selling their term product for a few years and is looking to acquire one of two potential blocks:

- Block 1: A block of term policies similar to its current in-force with a projected return on equity of 9.5%.
- Block 2: A block of universal life policies with an equity indexed crediting rate with a projected return on equity of 10.5%.

(i) Explain three methods of determining a reasonable purchase price for both blocks of business.

(ii) Recommend which block should be purchased assuming VCE's cost of capital is 10%. Justify your answer.

(iii) Describe additional considerations relevant to the recommendation.

6. *(11 points)* TPE sells a Universal Life product and reports GAAP financials.

(a) (*4 points*) You are given:

Premium	1,100
Cost of insurance (COI)	325
Net investment income	125
Expense Charge	10
Total death benefits paid	70
Total surrender benefits paid	105
Policyholder account value (AV) released on death	10
Policyholder account value (AV) released on surrender	110
Interest credited to policyholder account	155
Increase in reserve	800
Deferred acquisition costs amortized	35
Commission	25
Operating expenses	90
Tax rate	35%

Construct a SFAS 97 and a hypothetical SFAS 60 income statement.

(b) (*7 points*) You are given:

Year	AV at end of the year	Total Death Benefits	Excess Death Benefits	COIs	Deferrals	Interest Margins	Other Assessments
1	969	2,581	2,580	2,058	1000	5	1,470
2	1,888	0	0	1,518		10	1,425
3	2,750	1,116	1,114	1,021		14	1,395

Assume:

- Crediting rate is 0%
- The policy coverage period is three years
- Initial testing indicated that a SOP 03-1 reserve is required

(i) (*5 points*) Calculate the DAC balance at end of year two. Show all work.

(ii) (*2 points*) Determine which approach to handling negative EGP would result in the lowest DAC balance at year two. Justify your response.

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

USE THIS PAGE FOR YOUR SCRATCH WORK

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