SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

AFTERNOON SESSION

Date: Thursday, November 3, 2016
Time: 1:30 p.m. – 3:45 p.m.

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.

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 ILALFVC.

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

Tournez le cahier d'examen pour la version française.

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Exam ILALFVC Front Cover

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

7. (*13 points*) BIT Insurance Company uses stochastic projection models with seriatim policy records on its segregated fund portfolio. BIT has limited computer resources, and is investigating modeling options to meet its increasing modeling requirements.

(a) (*3 points*) Describe the following:

(i) The classic cell reduction approach to modeling.

(ii) The primary steps of the cluster modeling process.

(b) (*4 points*) Recommend a modeling option for BIT's segregated fund portfolio. Justify your answer.

(c) (*6 points*) BIT dynamically hedges their segregated fund guarantees. The appointed actuary has made the following statements regarding BIT's segregated fund portfolio:

A. For this product, we offer actively managed funds which have outperformed the market for the past three years. This reduces our basis risk. We should release 80% of the 50 million adjustment to the calculated reserve to reflect the reduced risk.

B. We do not hedge one of our minimum guarantee segregated fund products. This product is a material portion of our total segregated fund portfolio, and its fee revenue partially offsets guarantees from our other hedged products where the projected benefits are greater than projected fees. This natural offset reduces our overall segregated fund risk and, as a result, we should reduce our MfADs.

C. We recently started using put options to mitigate our previously unhedged volatility risk. We do not believe any changes to our valuation processes or assumptions are needed to reflect this hedging strategy enhancement.

7. Continued

For each of the above statements:

(i) Describe the underlying risk.

(ii) Critique the valuation methodology recommendations.

(iii) Propose changes to the valuation methodology where appropriate.

8. (*7 points*)

(a) (*4 points*) You are given seriatim policyholder data for three one-year term insurance policies.

Name of Insured	Net death benefit	Best Estimate q_x	q_x with MfAD	Reserve
Snap	10,000	0.004	0.005	100
Crackle	6,000	0.004	0.005	60
Pop	3,000	0.006	0.007	50

This product is not reinsured.

Calculate the MCCSR mortality component. Show all work.

(b) (*3 points*) Atlantic Life has three life insurance products with different mortality guarantee features. You are given:

Product	**Reinsurance status**	**Gross of Reinsurance Mortality Capital Component**		**Net of Reinsurance Mortality Capital Component**	
		Volatility	**Catastrophe**	**Volatility**	**Catastrophe**
10-year term	No reinsurance	2,000	500	2,000	500
Whole Life	Ceded with registered reinsurer	10,000	3,000	8,000	2,400
20-year renewable term	Ceded with unregistered reinsurer	5,000	2,000	1,500	600

(i) Calculate the total company MCCSR mortality component. Show all work.

(ii) The unregistered reinsurer of the 20-year renewable term product provides a 1,500 deposit to Atlantic Life for the remainder of the policy term. Assume there is no other required capital requirement under MCCSR.

Recalculate the total company MCCSR mortality component. Show all work.

9. (*7 points*) With respect to the CIA Educational Note "Future Income and Alternative Taxes":

(a) (*1 point*) Explain why future tax provisions are necessary.

(b) (*4 points*) You are given the following:

Calendar Year	**2016**	**2017**	**2018**	**2019**
Insurance contract liability ignoring future taxes	600	400	200	0
Maximum tax actuarial reserve	650	425	215	0
GAAP expenses	90	80	70	60
Tax expenses	70	60	50	40
Pre-tax investment income rate on GAAP basis	6%	6%	6%	6%
Pre-tax investment income rate on tax basis	4%	4%	4%	4%
GAAP assets	600	400	200	0
Tax assets	590	360	155	0
Tax rate	35%	35%	35%	35%

- Assume projected insurance contract liability cash flows include margins for adverse deviation.

Calculate the following as at the end of 2016:

(i) Discounted future tax provision

(ii) Future tax carve-out

Show all work.

(c) (*2 points*) There is a loss carry forward of 24 at the end of 2016 that is deemed not policy related. The company has other future taxable income such that the tax benefits can be realized equally over the next two years.

Calculate the revised net balance sheet position to reflect the loss carry forward. Show all work.

10. (*8 points*)

(a) (*4 points*) The following statements have been made regarding the changes IFRS 4 Phase II will have on reserves and net income recognition:

A. Changes in the present value of expected cash flows related to future service should be recognized in earnings when the change becomes known.

B. Insurance contract revenue and expense should be presented in the statement of comprehensive income with revenue recognized as earned including investment components.

C. An entity should choose to present the effect of changes in discount rates in profit and loss or in Other Comprehensive Income (OCI) as its accounting policy. The same accounting policy should be applied to all similar insurance contracts that are backed with similar investments.

D. A contract which is deemed to be onerous at time of issuance will be deemed to be onerous throughout the term of the contract.

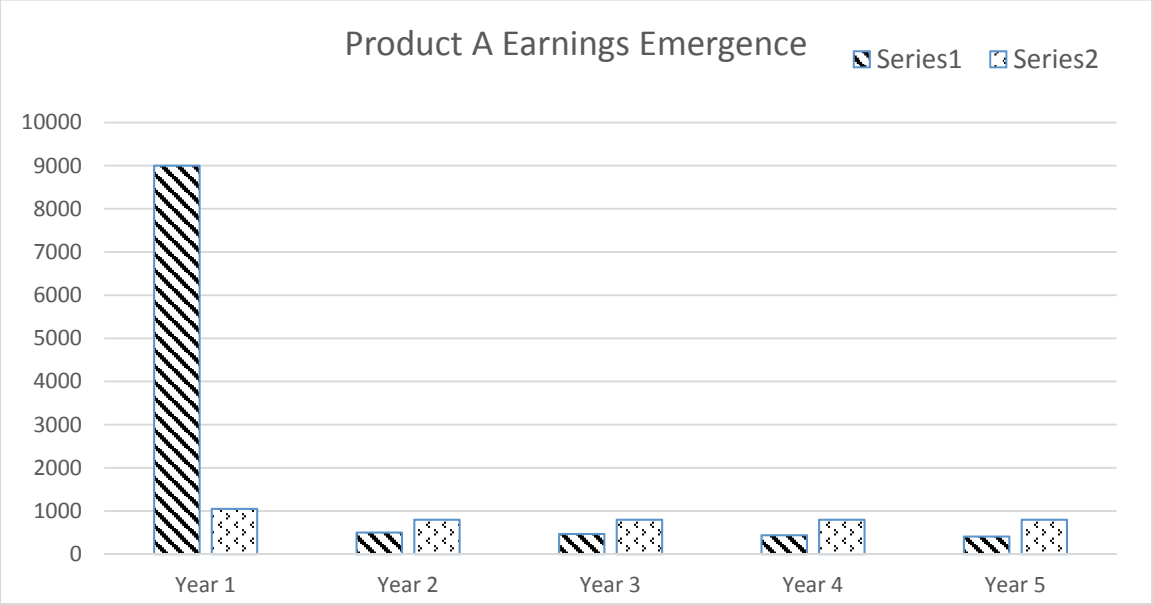
Critique each of the above statements and recommend changes where appropriate.

10. Continued

(b) (*4 points*) The valuation actuary produced the following graphs of the earnings emergence using both CALM and IFRS for the first 5 years for the following two products that are both priced to generate the same return on investment (ROI):

- A 10-year term life insurance product with annual renewable premiums in the post-level term period, lapses of 15% in year 1 grading down to 7% at the end of the level term period, with shock lapses of 85% in Year 10 and 40% in Year 11.

- A deferred annuity product that includes a surrender charge for the first six years, a surrender assumption of 5% per annum during the surrender charge period followed by high surrenders of 20% when the surrender charge expires with an ultimate surrender rate of 10% thereafter.



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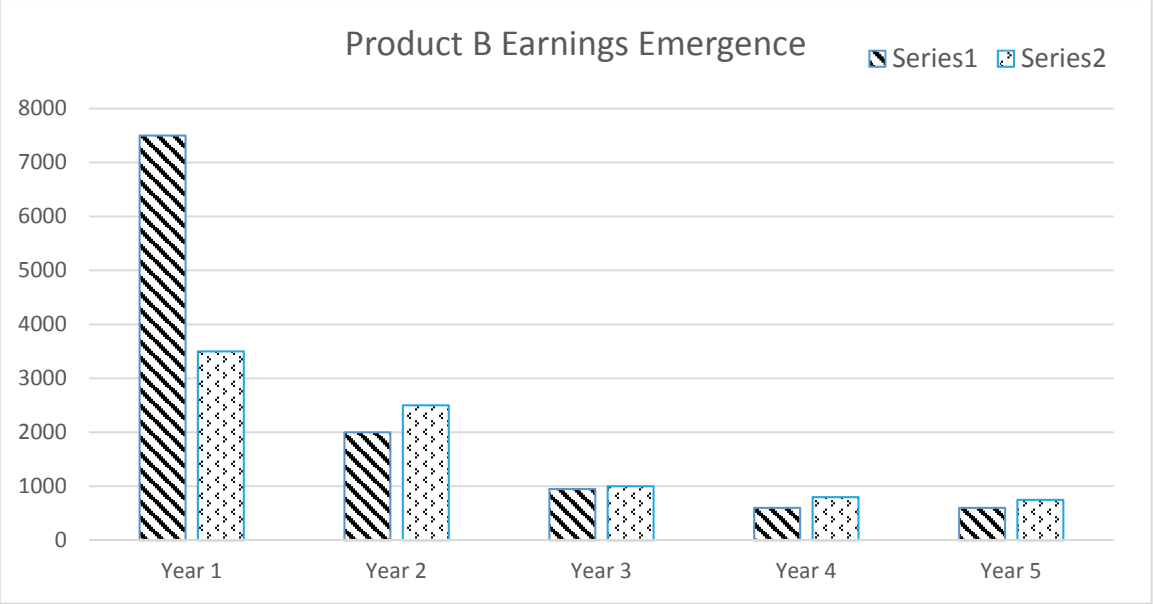
10. Continued



Identify which product graph and earnings emergence bar series corresponds to each of the following:

(i) 10-year term life under IFRS

(ii) 10-year term life under CALM

(iii) Deferred annuity under IFRS

(iv) Deferred annuity under CALM

Justify your answers.

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11. (*5 points*) XYZ Life only sells a whole life insurance product and a Single Premium Deferred Annuity (SPDA) product.

The company is performing its annual review of its mortality margins for adverse deviation (MfADs).

You are given the following whole life reserve scenario testing:

	Mortality Improvements			Mortality MfAD	CALM Reserve with Mortality Improvements	
Test	**Prescribed Annual Mortality Improvement**	**Years of Improvement**	**Other Considerations**		**Without MfAD**	**With MfAD**
1	2% flat	20 years	Smoker Distinct; By Gender; Attained Age	$15/e_x$	950	1,050
2	Varies by Age	20 years	Smoker Distinct; Unisex Rates; Attained Age	$15/e_x$	1,050	1,150
3	1.5% flat	25 years	Non Smoker Distinct; Unisex Rates; Attained Age	$10/e_x$	1,000	1,075
4	Varies by Age	Select & Ultimate Period	Smoker Distinct; By Gender; Issue Age	$15/e_x$	1,100	1,200
5	2% flat	20 years	Non Smoker Distinct; Unisex Rates; Attained Age	$5/e_x$	975	1,025
6	2% flat	30 years	Non Smoker Distinct; Unisex Rates; Attained Age	$15/e_x$	925	1,025
7	Varies by Age	25 years	Non Smoker Distinct; Unisex Rates; Attained Age	$3.75/e_x$	1,075	1,100
8	Varies by Age	All Future Years	Non Smoker Distinct; Unisex Rates; Issue Age	$15/e_x$	1,050	1,150
9	2% flat	Select & Ultimate Period	Smoker Distinct; By Gender; Attained Age	$3.75/e_x$	1,025	1,050
10	Varies by Age	To Age 84	Non Smoker Distinct; Unisex Rates; Attained Age	$3.75/e_x$	1,060	1,085

11. Continued

You are also given:

- Number of whole life policies in force: 5,000,000
- Number of annuities in force: 500,000
- Average number of annual death claims: 5,000

The recommendation is to set the CALM reserve based on Test # 4 and to include the annuitant mortality to reduce conservatism.

Critique the recommendation.

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

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