SOCIETY OF ACTUARIES
Individual Life & Annuities Canada – Company/Sponsor Perspective

Exam CSP-IC

MORNING SESSION

Date: Friday, April 30, 2010
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 120 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 60 points).

   a) The morning session consists of 7 questions numbered 1 through 7.

   b) The afternoon session consists of 7 questions numbered 8 through 14.

   The points for each question are indicated at the beginning of the question. Questions 3, 5, and 12 pertain to the Case Study, which is enclosed inside the front cover of this exam booklet.

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 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 CSP-IC.

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.

CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

1. (*6 points*) You are given:

t (years)	Liability Cash Flows	v^t @ 5%
1	10	0.9524
2	15	0.9070
3	28	0.8638
4	32	0.8227
5	37	0.7835
6	40	0.7462
7	0	0.7107
8	0	0.6768
9	0	0.6446
10	50	0.6139
11	0	0.5847
12	0	0.5568

Available assets:
- 2 year non-callable bond with a modified duration of 1.87
- 10 year non-callable bond with a modified duration of 7.95

Assume:
- Interest rate is 5%.

(a) (*2 points*) Explain the benefits and limitations of the following two asset and liability matching approaches:

(i) Exact Cash Flow Matching

(ii) Immunization

(b) (*3 points*) Create the asset portfolio at time zero that will immunize the liability cash flows based on modified duration.

(c) (*1 point*) The duration mismatch tolerance for this block is +/- 1 year. Immediately after immunization, the 10th year liability cash flow changed to zero.

Determine whether the company will need to re-immunize the liability cash flows. Show all work.

2. (*10 points*) You are the Valuation Actuary at Temp Life Insurance Company, a U.S. subsidiary of a European company. Temp Life uses the Capital Asset Pricing Model (CAPM) to determine its cost of equity capital and explicitly reflects the costs of debt in determining its cost of capital.

You are reviewing the assumptions and results of the In-force Business Value (IBV) calculations at December 31, 2009, and you are given the following:

Beta (β)	1.2
Risk Free Rate	5.0%
Expected Total Market Rate of Return	12.0%
Embedded Value at January 1, 2009	20.0
New Business After Tax Book Profits for 2009	-3.0
Value of New Business at July 1, 2009	5.0

	Year			
	2009	**2010**	**2011**	**2012**
Required Capital at start of Year	100.0	120.0	130.0	140.0
Equity at start of Year	75.0	90.0	97.5	105.0
Debt at start of Year	25.0	30.0	32.5	35.0
After Tax Cost of Debt	7.0%	9.0%	8.0%	8.5%
After Tax Rate of Return	5.0%	6.5%	5.5%	6.0%
Total After Tax Book Profits	11.0	15.0	20.0	25.0

(a) (*3 points*) Explain the considerations involved in the setting of non-economic assumptions.

(b) (*5 points*)
    (i) Determine the difference between the Target IBV and the Actual IBV at December 31, 2009. Show all work.

    (ii) Propose possible reasons for differences between the Target IBV and Actual IBV.

(c) (*2 points*) The embedded value method is a special case of the economic capital framework, as described in the note 'The Economics of Insurance'.

Explain why the embedded value method is not based on economic principles.

3. (*8 points*) You are given the following information for a Single Premium Fixed Deferred Annuity block of business.

For 2008	Expected	Actual
Base Lapse Rate	5%	5%
Excess Lapse Rate	10%	3%
Account Value	5.0 billion	5.5 billion
Investment Income	50 million	10 million

Assume:
- Credited interest rates are annually reset.
- For 2007, expected assumptions matched actual.
- For 2008, the company experienced the same market and economic conditions as described in the case study.

(a) (*3 points*) Explain factors in the economic environment that may be causing the following actual to expected differences:

    (i)   Account value is higher than expected.

    (ii)   Actual investment income is lower than expected.

(b) (*3 points*) Identify the key considerations in creating an excess lapse function for asset liability matching.

(c) (*2 points*) Recommend any changes to future expected excess lapse assumptions. Justify your answer.

4. (*6 points*) SLH Life Insurance is a U.S. company. You are given the following information for SLH's asset portfolio at December 31, 2009.

Asset Class	Annual Statement Value (millions)	RBC C-1 Factor (before adjustment)	Number of Securities	Number of Issuers
Government Bonds	1,000	0.000	10	5
Medium Quality Bonds	700	0.046	90	90
Commercial Mortgages in good standing	600	0.026	n/a	n/a

Issuers	Bond Size Factor
First 50	2.500
Next 50	1.300
Next 300	1.000

Assume:
- SLH Life experienced actual mortgage defaults 20% higher than the life insurance industry over the past eight quarters
- The ten largest asset holdings are Medium Quality Bonds, totaling 200 million

(a) (*4 points*) Calculate the C-1 component of the RBC for SLH Life at December 31, 2009. Show all work.

(b) (*2 points*) Explain the approaches that could be used to model the following asset risks under an Economic Capital Framework:

(i) Equity risk

(ii) Liquidity risk

(iii) Credit risk

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5. (*15 points*) You are given the following:

- Fair value measurements calculated according to SFAS 157
- A 3 year term insurance contract with a level face amount of 500,000
- Level annual premiums of 250 are payable at the beginning of each policy year
- Commissions and other deferrable acquisition costs included in the price are equal to 90% of first year premium
- Non-performance risk (credit spread) of the insurer is 0.50%
- Future spot rates are equal to current forward spot rates
- All assets are invested in 3 year zero coupon bonds yielding LIBOR plus 0.50%
- Risk premium is held constant and there is no change in the issuer's credit standing during the 3 year term insurance contract
- Deaths occur at the end of the policy year
- Withdrawals are applied following the mortality decrement

Policy Year	LIBOR Spot Rates	Mortality Rates / 1000	Withdrawal Rates
1	2.50%	0.30	10.0%
2	3.00%	0.32	5.0%
3	3.72%	0.35	0.0%

(a)   (*1 point*) Explain the method used in determining the risk premium at equilibrium for this 3 year term life insurance policy.

(b)   (*4 points*) Calculate the following for policy year 1, using a risk premium of 6.00%:

- Fair value liability (end of year 1)
- Single premium for the Funding Agreement-Backed Issuance Program (FANIP)
- Economic asset

Show all work.

5. **Continued**

(c)   (*4 points*) Assume the risk premium remains unchanged at 6.00%.

Determine the change in the fair value liability at the end of year 1 for each of the following scenarios:

(i)   An epidemic causes 2 additional deaths per 1,000 in policy year 2 only

(ii)   Lapses in policy year 2 increase to 10%

(iii)   The credit spread of the insurer widens to 2.00%

(iv)   The LIBOR spot rates are reduced by 0.5% at all durations

Show all work.

(d)   (*2 points*) Determine the appropriate categorization of the liability for this policy with respect to the fair value hierarchy of valuation inputs described on page 25 of the case study. Justify your answer.

(e)   (*4 points*) You are given the risk factors identified in Item 1A of the case study (pages 18 – 40).

Identify five applicable market related factors that might indicate a change in the appropriate risk premium used in the determination of the fair value of the insurance contract.

6. (*8 points*) DGC Life is evaluating market value margins for fair value of insurance liabilities.

    (a)   (*5 points*) You are given the following information for a 3 year term life product:

- 1000 policyholders, all the same age
- Death benefit is 100,000 per policy
- Mortality rates each period are independent and normally distributed with a mean of 3% and a standard deviation of 0.5%
- 99.5% percentile is 2.576 standard deviations.
- Risk-free yield curve is level at 4% per year.
- The capital base for an ultimate risk exposure horizon is 1.83 million at the 99.5% percentile.

        (i)   Calculate market value margin (MVM) using:

- the ultimate risk horizon basis
- the one-year risk horizon basis with a 99.5% percentile.

        Show all work.

        (ii)   Explain reasons for any difference between the ultimate risk horizon basis and the one-year risk horizon basis.

    (b)   (*3 points*) Compare the merits of the following methods for determining MVM:

        (i)   Percentile method

        (ii)   Cost of capital method.

7. (*7 points*) You are responsible for the pricing of a new Universal Life (UL) product with Yearly Renewable Term (YRT) cost of insurance charges and are considering the use of reinsurance.

    (a)   (*3 points*) Compare YRT reinsurance and coinsurance with respect to:

        (i)   Types of risk transferred

        (ii)   Retention method

        (iii)   Premiums and Allowances.

    (b)   (*2 points*) Explain the pros and cons of using coinsurance for the UL product.

    (c)   (*2 points*) Assess the impact of reinsurance on each component of MCCSR under a coinsurance agreement with a registered reinsurer.

** END OF EXAMINATION **
Morning Session