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

Exam CSP-IC

MORNING SESSION

Date: Friday, May 9, 2008
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 8 questions numbered 1 through 8.

   b) The afternoon session consists of 9 questions numbered 9 through 17.

   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 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.

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475 N. Martingale Road
Schaumburg, IL 60173-2226

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****BEGINNING OF EXAMINATION****
INDIVIDUAL LIFE & ANNUITIES CANADA
COMPANY SPONSOR PERSPECTIVE
Morning Session

1. *(6 points)*

(a) *(1 point)* Identify the two fundamental premises for asset-liability management.

(b) *(2 points)* The fundamental premises are subject to four significant qualifications

(i) Statutory and GAAP measures have economic value
(ii) Risk is costly
(iii) Managing interest rate exposure is not enough
(iv) Asset liability management is not just asset management.

Explain the significance of each qualification.

(c) *(3 points)*

(i) Describe the key considerations when examining the economic value of any insurance company as it pertains to 'Asset-Liability Management for a Going Concern'.
(ii) Propose ways to protect the insurer's shareholder value from interest rate risk.

2. *(12 points)* ABC, a US life insurance company is planning to introduce a new 3-year term insurance product, Executive Term.

Projections for Executive Term

	12/31/2008	12/31/2009	12/31/2010
Face amount	8000	6800	5500
Statutory reserves	1500	900	0
GAAP benefit reserve	600	200	0
Premiums	2000	1200	900
Commissions	600	350	200
Benefits paid	300	700	1100
Unamortized GAAP deferred acquisition costs	1200	550	400
GAAP earnings	170	220	70

Assume:

- Statutory required capital is equal to 10% of the statutory reserves
- Statutory required surplus is equal to statutory required capital
- Investment income on year end statutory reserves and required capital are both 8% annually
- Cost of capital is 12% annually
- No income tax

(a) (*2 points*) Explain how capital budgeting techniques can be used in strategic planning and list the potential limitations of these techniques.

(b) *(6 points)*

(i) Calculate the actuarial appraisal value of Executive Term at 12/31/2008. Show all work.

(ii) Determine whether ABC should invest in the product. Show all work.

2. Continued

(c) (*4 points*) A reinsurer proposes the following YRT terms for ceding Executive Term:

- YRT using the pro rata method, retention rate is equal to 20% of the net amount at risk
- Initial terminal reserve is zero
- YRT reinsurance premium rate equal to 0.10 per 1000 of ceded amount
- First year reinsurance allowance is equal to 15% of first year ceded premium
- Unearned portion of a one year term insurance benefit is equal to 60% of the YRT reinsurance premium
- Ceded premium and reinsurance allowance are paid at the beginning of the year
- All other reinsurance transactions are at the end of the year

Compare the cash flow strain, before required capital consideration, at 1/1/2008 with and without the proposed YRT arrangement. Show all work.

3. *(10 points)* XYZ Life Insurance Company is building an Economic Capital model.

(a) Describe the major uses of Economic Capital in the insurance industry.

(b) Describe choices XYZ Life needs to consider with regard to the types of models, techniques and parameters pertaining to Economic Capital.

(c) Compare the types of risks that should be considered in Economic Capital calculations for the following products:

(i) Ten-year Term Life

(ii) Equity Indexed Annuity

(d) You are provided with the following scenario results:

Scenario	Present Value of Future Profits
1	1250
2	−45
3	120
4	1400
5	1350
6	−500
7	−600
8	1200
9	1300
10	1600

(i) Calculate the Economic Capital using a Tail-Value at Risk approach with a risk tolerance of 20%. Show all work.

(ii) Calculate the Economic Capital under a 10% confidence level using a Value at Risk approach. Show all work.

4. *(8 points)* You are given the following financial information for a two year term insurance product:

	Year 1	Year 2	Year 3
Premiums	2000	2250	0
Claims or Death Benefits	500	650	800
Operating Expenses	550	600	550
Policy Reserve at year end	1500	1600	0
Tax Reserve	1400	1525	0
DAC	200	250	0
Required GAAP Surplus	600	750	0
Risk Capital	1200	1125	0

Assume:

- risk-free annual rate 5.0%
- risk capital cost rate 2.5%
- spread due to default option and liquidity 0.5%
- tax rate 40%
- no investment income is earned

(a) *(5 points)* Calculate the after-tax economic profit for Year 2.

(b) *(3 points)* Determine the GAAP basis free cash-flow for Year 2.

Show all work.

5. *(4 points)*

(a) Compare and contrast various methods of determining modeled credited interest rates and any implications on policyholder behavior.

(b) XYZ Life Insurance Company stochastically models interest rates using the successive ratios method for an asset liability model. The yield curve is defined by the 90-day and 15-year rates.

You are given:

- 90-day rate 4.50%
- 15-year rate 6.00%
- degree of correlation of changes between 90-day and 15-year rate 60%
- volatility factor 20%
- the following normally distributed, randomly generated numbers with means of zero and standard deviations of one:

Time	Z1	Z2
1	0.482	1.829
2	–0.709	0.902

Calculate the 90-day and 15-year rates for the next two time periods. Show all work.

6. *(4 points)*

(a) Describe the common tests of claim reserve adequacy.

(b) You are given:

Cash Claims Paid by Year of Incurral

Total Cash Paid by End of Calendar Year	2003	2004	2005	2006	2007
2003	10				
2004	12	7			
2005	6	10	5		
2006	3	5	10	6	
2007	2	4	6	10	5

Calculate the minimum level of claim reserves which needed to be held in the table below to ensure claim reserve adequacy.

Calendar Year	2004	2005	2006	2007
2004	?			
2005	?	?		
2006	?	?	?	
2007	?	?	?	?

Show all work.

7. *(10 points)*

(a) *(3 points)* Compare the advantages and disadvantages to ABC Life Insurance Company of the following forms of reinsurance:

(i) YRT
(ii) Modified Coinsurance

(b) *(7 points)* You are given the following for a Whole Life policy from ABC Life issued in 2009:

Face Amount	500,000
Premium Rate per 1000	10
Commission Rate	20% of premium
Maintenance Expenses	50 per policy
Reserve at December 31, 2009	3000
Reserve at December 31, 2010	3400

ABC Life enters a modified coinsurance reinsurance arrangement with XYZ Re starting January 1, 2009.

You are given:

Quota Share	60%
Expense Allowance	10% of reinsurance premium
XYZ Re's Maintenance Expenses	25 per cession
Net Investment Income Rate (for both companies)	10% per annum
ABC Life's Surplus at December 31, 2009	500
XYZ Re's Surplus at December 31, 2009	1000
Mod-co interest rate	10% per annum

Assume:

- Policy and reinsurance premiums are paid annually in advance
- Policy fees, claims, surrenders, dividends and taxes are 0 in all years
- Expenses are incurred on policy anniversaries
- Investment Income is earned on beginning of year assets only
- No embedded derivative reporting issues

Construct the 2010 income statement and balance sheet for both ABC Life and XYZ Re. Show all work.

8. *(6 points)*

(a) *(2 points)* A US life insurer's target surplus goal is 3 times the minimum Risk Based Capital (RBC) amount and current surplus has fallen to 1.25 times the minimum RBC amount.

Recommend actions to improve the life insurer's surplus position.

(b) *(1 point)* You are given the following C-3 factors:

Low Risk	0.77%
Medium Risk	1.54%
High Risk	3.08%

A life insurer's product mix includes two annuity products:

Products	Surrender Charge	Considerations in 000's	Reserves in 000's
LeveragedSelect	0%	10,000	9,800
CorpSelect	10%	5,000	4,800

Both products allow withdrawals at book value.

Determine the risk classification and calculate the C-3 component of the RBC for each product. Show all work.

(c) *(3 points)* Compare the RBC C-3 Phase I approach to the C-3 Phase II approach.

****END OF EXAMINATION****
MORNING SESSION

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

Exam CSP-IC

AFTERNOON SESSION

Date: Friday, May 9, 2008
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

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****BEGINNING OF EXAMINATION****
INDIVIDUAL LIFE & ANNUITIES CANADA
COMPANY SPONSOR PERSPECTIVE
Afternoon Session

9. *(6 points)* Five years ago ABC Life Insurance Company started marketing variable annuities with living and death benefit guarantees. Even though the annuities are profitable, management is concerned about the high variability in cash flows and whether the reserve assumptions used are appropriate.

a) *(4 points)* Describe key valuation assumptions of guaranteed benefits related to policyholder behavior and explain how policyholder behavior can affect them.

b) *(2 points)* Describe potential costs to the company associated with highly variable cash flows.

10. *(3 points)* Identify and describe the categories of financial instruments as outlined by Section 3855 and for each category include the requirements for initial measurement, subsequent measurement and gain and loss recognition.

11. *(6 points)*

(a) Contrast the requirements under Canadian GAAP for Flexible Premium Universal Life and term insurance with respect to:

(i) margins for adverse deviation
(ii) non-economic assumptions

(b)

(i) List the qualifications OSFI considers necessary to become the appointed actuary.
(ii) Describe the reports and the related actions required of the appointed actuary.

12. *(4 points)* Compare the valuation modeling approach for product features of universal life insurance to that of segregated fund products with respect to:

(i) Fund transfer
(ii) Future deposits or premiums
(iii) Contract guarantees

13. *(6 points)*

(a) *(2 points)* Explain the methodology and phase-in of the revised MCCSR mortality risk component starting at year-end 2005.

(b) *(4 points)* You are given the following information for a book of similar individual life insurance policies at December 31, 2008:

- All policies are Whole Life, level face amount policies with guaranteed premium rates
- Total Face Amount is 10 billion
- Total Statutory Reserve is 900 million
- Projected death claims for 2009 are 75 million
- Variance of the projected death claims for 2009 is 49 million
- Macaulay Duration of the projected death claims for 2009 is 7
- No policyholder deposits
- No reinsurance
- No AD&D benefits

Calculate the MCCSR mortality risk component at December 31, 2008. Show all work.

14. *(7 points)*

(a) Explain the following four components used for OSFI's Source of Earnings Disclosure for life insurance companies:

(i) Expected profit on In-force business
(ii) Impact of New Business
(iii) Experience Gains & Losses
(iv) Other

(b) Identify possible impacts to the OSFI's Source of Earnings Disclosure in the reporting period following the implementation of Section 3855.

15. *(14 points)* ABC Life Insurance Company is evaluating a proposal to acquire all of the stock of XYZ Life Insurance Company. You are given the following information:

- An actuarial appraisal has been prepared on XYZ Life, and the embedded value of the inforce business has been calculated using a range of discount rates.
- XYZ Life issues primarily basic term products and backs the liabilities with well-matched high grade corporate bonds.

(a) (*6 points*) Explain the potential shortcomings of value creations from the financial economics perspective for:

(i) An actuarial appraisal of the value of XYZ Life's inforce business.
(ii) Use of the Capital Asset Pricing Model (CAPM) to determine an appropriate discount rate for the actuarial appraisal.

(b) (*8 points*) You are given the following:

- The investment to launch a new product is 112 million
- The present value of the net cash flows at the time of the product launch is estimated to be either 180 million or 60 million
- A "twin security" has been identified whose price is 20 and whose value is estimated to be either 36 or 12
- The risk-free rate is 8%

(i) Explain the advantages of using Contingent Claims Analysis (CCA) over traditional Discounted Cash Flow techniques.
(ii) Explain the benefits of using CCA in evaluating a new product launch.
(iii) Calculate the option value assigned to launching this new product using CCA. Show all work.

16. *(6 points)* XYZ Life is developing a dual-life status flexible premium joint and last Survivor Universal Life insurance product (Survivor UL).

(a) *(4 points)* The following steps outline a procedure to determine minimum UL reserves:

Step	Procedure
1	The amount of policy liabilities for a scenario equals the amount of supporting assets which the actuary deems as a reasonable allocation. In forecasting the cash flow, the actuary should take into account all policyholder expectations, and make provision for any adverse deviations that the insurer may experience.
2	The policy liabilities in respect of a relevant policy comprise all of that policy's cash flow after the date of issue of a relevant policy. Policy liabilities consist of claim liabilities including all benefit and expense cash flows.
3	If applicable regulation requires policy liabilities to be valued without taking account of the time value of money, then the actuary should report a value for the policy liabilities in accordance with accepted actuarial practice, and report this amount with reservation on account of the regulation.
4	The actuary's best estimate of mortality should include the effect of any anti-selection. The low margin for adverse deviation is an addition of 3.75 to the mortality rate per 1000. The high margin for adverse deviation is an addition of 10 to the mortality rate per 1000.
5	The margins for adverse deviation for withdrawals are an addition of between 5% and 25% of the best estimate withdrawal rates.

Revise, add or delete information to make each step consistent with the Canadian Asset Liability Method (CALM).

(b) *(2 points)* Outline the approach under deterministic CALM for scenario testing and setting Margins for Adverse Deviations (MfADs) for interest rate risk.

17. *(8 points)* You are given the following information for five non-participating Whole Life insurance policies:

- All policies were issued by a Canadian Life Insurance Company to Canadian residents
- All policy loans were taken prior to 2006 with no dispositions occurring in 2006 or 2007
- Moving average interest rate for the 60 months on Government of Canada bonds is 5%

As of December 31, 2006							
Policy Number	Issue Date	Gross Statutory Reserve	Ceded Statutory Reserve	Gross 1.5 FPT Reserve	Ceded 1.5 FPT Reserve	Cash Surrender Value	Outstanding Policy Loan Amount
1	Jan 1,1993	72,000	58,000	80,000	66,000	11,000	0
2	Jan 1,1994	33,000	43,000	28,000	23,000	13,500	3,500
3	Jan 1,1995	43,000	40,000	46,000	42,000	9,500	0
4	Jan 1,1996	37,000	41,000	41,000	39,000	7,500	0
5	Jan 1,1997	85,000	74,000	79,000	73,000	26,000	5,000

As of December 31, 2007							
Policy Number	Issue Date	Gross Statutory Reserve	Ceded Statutory Reserve	Gross 1.5 FPT Reserve	Ceded 1.5 FPT Reserve	Cash Surrender Value	Outstanding Policy Loan Amount
1	Jan 1,1993	75,000	60,000	84,000	69,000	12,000	0
2	Jan 1,1994	36,000	45,000	30,000	24,000	15,000	4,000
3	Jan 1,1995	45,000	41,000	49,000	44,000	10,000	0
4	Jan 1,1996	40,000	43,000	44,000	41,000	8,000	0
5	Jan 1,1997	90,000	78,000	82,000	75,000	28,000	6,000

a) *(4 points)* Calculate the total reserve to be included in the taxable income of the Life Insurance Company at December 31, 2007. Show all work.

b) *(3 points)* Calculate the Investment Income Tax due as of December 31, 2007. Show all work.

c) *(1 point)* Describe the changes to tax reserves proposed by the Department of Finance on December 28, 2006 to deal with the effect of accounting changes under CICA Handbook Section 3855.

****END OF EXAMINATION****
AFTERNOON SESSION