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

Exam CSP-IC

MORNING SESSION

Date: Friday, May 3, 2013
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.

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.

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Exam CSP-IC Front Cover

****BEGINNING OF EXAMINATION****
Morning Session

1. (*9 points*)

(a) (*2 points*) Describe the advantages and disadvantages of the following methods of calculating the fair value of liabilities:

(i) Direct method

(ii) Indirect method

You are given the following for a 1-year insurance contract to be used in parts (b) and (c):

Benefit payment at end of year 1	5,000
Probability of claim	20%
Expected asset cash flow at end of year 1	1,200
Risk-free rate of return	10%
Risk premium	9%
Expected excess return of investment portfolio over risk-free interest rate	3%
Tax rate	0%

(b) (*4 points*) Calculate the required profit that enables the firm to earn its cost of capital assuming expenses of 15 at the end of year 1. Show all work.

(c) (*3 points*) Calculate the quantity Z used in the certainty equivalent approach assuming no expenses and using the approaches defined in "Fair Value of Liabilities, the Financial Economic Perspective." Show all work.

2. (*7 points*) Mod Life, a U.S. life insurance company, is developing two new life insurance products with inflation protection:

Product	Death Benefit	Cash Value
A	Reflects increases in inflation	Does not reflect increases in inflation
B	Reflects increases in inflation	Reflects increases in inflation

To reduce volatility in GAAP earnings, Mod Life plans to use derivative instruments to offset the inflation risk and obtain hedge accounting treatment under FAS 133. The company will not make any fair value elections under FAS 159.

(a) (*1 point*) Briefly define the three types of hedging, as described in FAS 133.

(b) (*2 points*) Recommend the type of hedging that Mod Life should use for each product. Justify your answer.

(c) (*1 point*) Identify the significant criteria your recommended type(s) of hedging must meet to qualify for hedge accounting treatment under FAS 133.

(d) (*3 points*) Describe the impact your recommendation would have on reducing volatility in Mod Life's GAAP earnings.

3. (*10 points*)

(a) (*2 points*) Explain the key differences between YRT reinsurance and Coinsurance.

(b) (*6 points*) LPT Life has written a block of 3-year level term policies with the following projections.

	Policy Year 1	**Policy Year 2**	**Policy Year 3**
Inforce Face Amount (FA) at beginning of year	1,000,000	900,000	800,000
Premiums	3,000	2,700	2,400
Expected Claims	2,000	1,980	1,920

Two reinsurers have offered the following reinsurance arrangements:

Arrangement 1 – YRT: ceding 70% of FA
Premium rate – Year 1: 0.00
Year 2: 3.4/1000 of Net Amount At Risk (NAR)
Year 3: 3.6/1000 of NAR

Arrangement 2 – Coinsurance – 50% quota share
Allowance – Year 1: 40%
Year 2: 10%
Year 3: 10%

You are given the following additional information:

- Reinsurance premiums are payable annually in advance with no return of unearned premiums
- Claims are paid at the end of the policy year
- Discount rate = 5%
- NAR = FA

(i) Calculate the Net Present Value (NPV) at policy inception of future cashflows, assuming no other cashflow items, for both of the arrangements above. Show all work.

(ii) Describe factors to consider when determining which reinsurance arrangement, if any, to accept.

3. Continued

(c) (*2 points*) The following approach is proposed to evaluate reinsurance arrangements:

Step 1: Calculate Gross Economic Capital (EC) for the underlying block of business
Step 2: Calculate Reinsurance % = Ratio of Reinsurance Premium to Direct Premium
Step 3: Reinsurance Economic Capital credit is equal to Gross EC * Reinsurance %

Critique this approach to evaluating reinsurance arrangements.

4 (*10 points*) Evergreen Life is considering adding an Embedded Value (EV) section to its annual report. The company sells several generations of universal life and variable annuities with guarantees, some of which have been discontinued for new business.

(a) (*3 points*) You are given the following statements:

- EV is an accounting basis applied primarily to life insurance business that provides an alternate means of measuring the value of such business at time of issue.
- Companies use EV for such purposes as profitability analysis, statutory reporting and acquisition purchase prices.
- EV is a measurement of the value that shareholders own in an insurance enterprise, comprised of capital, surplus, and the present value of earnings.

Evaluate the above statements and provide any corrections as necessary.

(b) (*3 points*) EV is expressed as EV = IBV + ANW, where:

IBV: In-force Business Value
ANW: Adjusted Net Worth

(i) Explain these two components as they pertain to the company's book of business.

(ii) Describe the difference between the calculation of present value of distributable earnings (PVDE) and IBV in terms of capital distribution.

(c) (*4 points*) You are given the following as of 31 Dec 2012:

IBV	40.0
Expected Contribution from Inforce	21.5
Expected Contribution from New Business	0.8
Experience Gain/Loss	3.5
Required Capital	20.0
Tax Reserve	320.2
U.S. GAAP Reserve	324.6
Statutory Reserve	328.3
Cost of Capital	0.5
Free Surplus	3.3

4. Continued

Also, the modeling group made the following corrections to the reporting period ending at 31 Dec 2012:

	Reported	Updated
Asset Valuation Reserve	1.4	2.5
Intangible Assets	22.0	17.0
Investment Income	33.0	40.0
Experience Refund	12.0	8.0

Calculate the EV assuming all assumptions are up-to-date and no changes in prospective assumptions. Show your work.

5. (*10 points*)

(a) (*3 points*) Describe the following Asset Liability Management (ALM) diagnostic tools and list the advantages and disadvantages of each:
(i) Immunization
(ii) Cashflow Matching
(iii) Dynamic Financial Analysis

(b) (*3 points*) Critique the following memo for completeness and appropriateness:

To: Valuation Actuary, Life Insurance Valuation
From: Line Actuary, Whole Life Insurance
Subject: Proposed Implementation of Asset Liability Management

This memo proposes the implementation of Asset Liability Management (ALM). ALM is the practice of managing a business so that decisions on assets and liabilities are coordinated. ALM is critical for the sound management of the finances of any institution that invests assets to meet liabilities.

ALM will be used for a wide range of applications, including evaluating interest rate risks and sensitivities on the in-force block, for evaluating changes to the proposed cash surrender value schedule, and for evaluating whether to increase or to recapture the in-force reinsurance treaty.

Immunization will be used as the technique for ALM, and the measurement basis will be GAAP reporting. ALM will be run by the Actuarial valuation team using liability cash flows and asset data from the investment area.

(c) (*4 points*) The company's investment department is only able to provide the following asset data for the ALM analysis:

Item	**Parameters provided**
Current list of assets available for purchase	Par value, book value, coupon rates, maturity dates
Future Interest Rates	Forward rates of U.S. Treasuries

Determine the appropriateness of the data provided by the investment department and what additional information, if any, is necessary to ensure compliance with ASOP 23, Data Quality.

6. (*8 points*) Company ABC offers Fixed Annuity (FA) and Universal Life (UL) products with guaranteed minimum credited rates.

(a) (*3 points*) The company backs these products with investment grade corporate bonds that are held to maturity. Within its Asset Liability Management (ALM) strategy, ABC is willing to review and modify their investment strategy and credit risk limits depending on prevailing market conditions.

(i) Determine if convexity is an important component of the company's interest rate risk. Justify your answer.

(ii) Explain potential problems with the company's approach to its ALM strategy.

(b) (*3 points*) The company is reviewing its dynamic lapse assumptions for these products. The current lapse assumption has the following characteristics:

- Experience data reflects a 10-year period of declining interest rates, with current rates below the minimum credited rates. Lapse rates have remained fairly stable over this period.
- ABC's top selling agents are routinely consulted regarding lapse experience and they recommended a lapse assumption with low sensitivity to interest rate movements.
- A symmetric two-sided dynamic lapse formula is used as the company does not have lapse experience in an increasing interest rate environment.
- The Modeling Actuary reviewed, approved and implemented the lapse assumption.

Describe key problems with the current dynamic lapse formula and recommend changes.

(c) (*2 points*) The projected profitability of the two products, as a percentage of premiums, is summarized below:

	Fixed Annuity (FA)	**Universal Life (UL)**
Front-end commissions	-0.5%	-2.0%
Trail commissions	-0.5%	-0.5%
Acquisition expenses	-2.0%	-3.0%
Maintenance expenses	-0.5%	-0.5%
Surrender charges	+2.0%	+1.0%
Mortality gains	+0.0%	+5.5%
Investment gains	+2.5%	+2.5%
Total Profits	**+1.0%**	**+3.0%**

Determine which product has higher persistency risk, using only projected profitability. Justify your answer.

7. (*6 points*) MGF Life has a large block of Adjustable Life policies, whose contracts state:

> *"At the policy's tenth anniversary and every fifth year thereafter, the company may, at its sole discretion, change the death benefit amount of this policy. The determination of the new death benefit will be based on the company's expectations for future mortality, interest, and expenses."*

The Appointed Actuary has sent the following communication to the Chief Financial Officer, in order to fulfill MGF's obligation to OSFI with respect to adjustable policies.

> *To: The Chief*
> *From: Chris Lee, Appointed Actuary*
> *Date: June 1, 2013*
>
> *This memo confirms our adherence to the OSFI Guidelines with respect to adjustable policies for the past two years. I will share this information with OSFI at the end of this year.*
>
> *During the past 24 months we have adjusted the face amounts of our Adjustable Life product according to the following parameters:*
>
> - *Policies continue to be grouped by smoking status even though more than 98% of the block is non-smoking.*
> - *Although issued on the same basis, observed mortality on policies over 1,000,000 face amount is significantly lower than on smaller policies. We are therefore separating these policies into different groups so that we can reflect a higher mortality basis on smaller policies.*
> - *We have added an additional load onto our current expense assumption so that we recover our expense overruns of the past three years. This will be implemented through an additional administration charge to the policy.*
> - *Lapse rates are consistent with recent experience on this block.*
> - *As we have changed our long-standing investment strategy to more conservative AAA Corporate Bonds, we have reflected those expected rates in our pricing. This has a negative impact on policy values compared to our original illustration basis, but we are completely within our rights according to the terms of the contract.*
> - *Experience from a Par product sold in the same years as this product has been ignored in determining the pricing basis.*

7. Continued

- *We have not adjusted face amounts downward for those policyholders over attained age 85, as it would provide undue hardship to that cohort, nor have we adjusted face amounts upward where the percentage change would be less than 2%, in order to reduce adjustment costs.*
- *We have written to each policyholder whose death benefit has been adjusted, providing the new death benefit, quoting the contract terms which allow us to make this adjustment and providing information on our new Critical Illness product.*

Critique this communication.

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

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