SOCIETY OF ACTUARIES
Retirement Benefits Canada – Design & Pricing

Exam DP-RC

Morning Session

Date: Thursday, April, 26, 2012
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 <u>numbered 1 through 7</u>.

   b) The afternoon session consists of 6 questions <u>numbered 8 through 13</u>.

   The points for each question are indicated at the beginning of the question. There are no questions that pertain to the Case Study in the morning session.

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 Exam DP-RC.

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

Tournez le cahier d'examen pour la version française.

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

1. (*6 points*) Your client's CFO has asked you to evaluate the fund investment performance of the company's pension plan in 2011. You have been given the following information:

	Asset Class Return for Pension Fund Portfolio	Average Pension Plan Fund Mix	Benchmark Return	Target Pension Fund Allocation
Domestic Equities	11%	55%	10%	50%
International Equities	13%	15%	15%	15%
Domestic Bonds	8%	28%	5%	35%
Cash	2%	2%	2%	0%

In addition, the portfolio beta was 1.2 and the variance was 25% in 2011.

(a) (*2 points*) Describe the steps in a pension fund performance evaluation.

(b) (*2 points*) Calculate the following performance ratios:

(i) Ex post alpha (Jensen's alpha)

(ii) Treynor measure

(iii) Sharpe ratio

Show all work.

(c) (*2 points*) Compare and contrast the different ratios.

2. (*11 points*) ABC company does not provide any pension benefits and is concerned that they may not be able to attract new talent. ABC is trying to decide whether they should establish a pension plan.

(a) (*3 points*) Describe the advantages and disadvantages of providing a pension plan from ABC's perspective.

(b) (*2 points*) Most of its employees are very young and mobile and ABC thinks that a capital accumulation plan may be more suitable for its employees.
Outline the reasons why ABC would favor a capital accumulation plan design over a defined benefit pension plan.

(c) (*6 points*) Compare and contrast defined contribution registered pension plans, group RRSPs, DPSPs and group TFSAs.

3. (*6 points*) Your client sponsors a non-contributory defined benefit pension plan.

You are given:

<u>Plan Provisions</u>:

Earnings:	Base Salary only
Retirement Benefit:	2% of career average earnings
Normal Form of Payment:	Life only, payable monthly in advance
Normal Retirement Age:	Age 60

<u>Actuarial Assumptions and Methods</u>:

Interest Rate:	6% per year
Salary Increase Rate:	4% per year
Retirement Age:	Age 60
Pre-retirement Decrements:	None
Asset Method:	Market value of assets

<u>Annuity Factor</u>: $\ddot{a}_{60}^{(12)} = 12.0$

<u>Participant Data at January 1, 2012</u>:

Employee:	A	B
Age:	40	50
Service:	10	20
2012 Salary:	\$80,000	\$100,000
Accrued pension (annual):	\$10,000	\$20,000

<u>Financial Information</u>:

Market value of assets at January 1, 2012: \$180,000

(a) (*4 points*) Calculate the normal cost for each participant of the plan at January 1, 2012 under the following cost methods:

(i) Unit Credit
(ii) Projected Unit Credit service prorate
(iii) Aggregate cost method allocated by total salary

(b) (*2 points*) Explain how the normal costs under the methods used in part (a) would change over time, assuming a closed plan.

Show all work.

4. (*7 points*) Large Company is in the process of acquiring Small Company.

Large Company and Small Company each sponsor defined benefit pension plans, Large Plan and Small Plan, respectively. The plan provisions of both plans are identical.

As part of the due diligence, Large Company has reviewed the last actuarial valuation report for the Small Plan. The lawyers at Large Company have noted differences in the going concern assumptions used for the actuarial valuations of Small Plan and Large Plan as follows:

Assumption	Small Plan	Large Plan
Going Concern Discount Rate	5.75% per year	6.50% per year
Mortality	UP94@2015	UP94 Fully Generational
Future Earnings Increases	4% per year	Table based on age and service
Retirement Age	Age 62	Age-based scale

Both actuarial valuations were performed as at December 31, 2010.

(a) (*3 points*) List the factors that should be considered in setting each of these assumptions.

(b) (*4 points*) Identify potential reasons for the variance between the two plans for each of the assumptions.

5. (*10 points*) Your client's executives have requested improvements to their post-retirement compensation package. The Company is willing to consider introducing one of the following three arrangements:

(i) Defined Benefit Supplemental Executive Retirement Plan (SERP)

(ii) Post-Retirement Health-Care Plan

(iii) Deferred Stock Option Arrangement

Compare and contrast the arrangements from both an employee and employer perspective.

6. (*10 points*) Company ABC was recently purchased by a large US corporation. The VP HR of the Canadian company has a mandate to adopt a plan that mirrors the retirement program in the US.

The US corporation currently offers a hybrid pension plan to all of its employees with the following provisions:

Company Contribution Credits:	< Age 30: 3% of earnings Age 30 – 39: 4% of earnings Age 40 – 49: 5% of earnings ≥ Age 50: 6% of earnings
Yearly Interest Credit:	30 year government bond yield rate, with a minimum rate of 4% per year
Contribution and interest credits are applied to an account balance on a yearly basis. This is a hypothetical account established for each participant in the plan.	
Benefit Upon Retirement or Termination:	Annuity or lump sum. The annuity is determined based on the deferred or immediate amount which could be purchased by the account balance. Vested lump sums are equal to the account balance at retirement or termination, subject to regulatory minimums. The lump sums are portable upon termination or retirement and can be transferred to another tax-deferred savings vehicle, or paid in cash.

(a) (*6 points*) Discuss the regulatory issues in implementing the above US plan in Canada.

(b) (*4 points*) Propose a plan design that would best meet the company's mandate, taking into consideration the Canadian regulatory environment.

Justify your proposal.

7. (*10 points*) You are the actuary for a company that sponsors a registered defined benefit pension plan for all of its employees.

Recently, the company has been experiencing significant turnover of their key executives. The VP of Human Resources believes that introducing a defined benefit Supplemental Executive Retirement Plan (SERP) will improve executive retention. Executives who would be eligible for the SERP are currently members of the registered defined benefit pension plan. The registered defined benefit pension plan provisions are as follows:

Eligibility	2 years of continuous service
Normal Retirement Age	Age 65
Earliest Retirement Age	Age 55
Early Retirement Reduction	5% per year from age 65
Pensionable Earnings	Base salary plus bonus
Benefit Formula	1% of 5-year Final Average Earnings for each year of credited service
Normal Form	Life Only (optional forms available on actuarial equivalent basis)
Vesting	Immediate on entry
Termination Prior to Age 55	Retire as early as 55 with an actuarially reduced pension from Normal Retirement Age, or elect a lump sum transfer of their accrued pension benefit

(a) (*4 points*) Describe the considerations in designing a SERP to address the company's turnover concerns, taking into consideration the current registered pension plan provisions.

(b) (*6 points*) Compare and contrast the following SERP funding options, including any tax implications:

(i) Retirement Compensation Arrangement (RCA)

(ii) RCA-Letter of Credit (RCA-LOC)

(iii) Pay-as-you-go

(iv) Secular Trust

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

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