SOCIETY OF ACTUARIES
Retirement Benefits Canada – Design & Pricing

Exam DP-RC

AFTERNOON SESSION

Date: Thursday, November 4, 2010
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 6 questions numbered 8 through 13 for a total of 60 points. 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 afternoon 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 morning or afternoon session for 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.

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Exam DP-RC

****BEGINNING OF EXAMINATION****
AFTERNOON SESSION
Beginning with question 8.

8. (*10 points*)

(a) *(1 point)* List the objectives of public pension systems in OECD countries.

(b) *(4 points)* Describe the challenges faced by public pension systems and outline reforms that have been used globally to address these challenges.

(c) *(5 points)* The following are the main provisions of the Canada Pension Plan:

Maximum Retirement Benefit at Age 65	25% of the 5 year average Yearly Maximum Pensionable Earnings (YMPE)
Normal Retirement Age	Age 65
Earliest Retirement Age	Age 60
Latest Retirement Age	Age 70
Early Retirement Reductions	6% for each year between ages 60 and 65
Postponed Retirement Adjustments	Increased by 6% for each year between ages 65 and 70
YMPE Indexation	100% of Average Industrial Wage
Post-Retirement Indexation	100% of Consumer Price Index
Employer and Employee Contributions	4.95% of earnings up to YMPE less $3,500
Additional Benefits Provided	Survivor benefits Disability benefits Orphans benefits

The Canadian government is concerned about the sustainability of the Canada Pension Plan.

Recommend and provide support for changes that would improve sustainability of the plan.

9. *(13 points)* You are the actuary for a company that sponsors a contributory defined benefit pension plan. You are given:

Plan Provisions

Retirement Benefit:	2% of final year's salary times service
Employee Contributions:	5% of annual salary, payable in advance
Normal Form of Pension:	Life only
Normal Retirement Age:	Age 65
Early Retirement Eligibility:	Age 55
Early Retirement Reduction:	4% per year before age 65
Termination Benefit:	Maximum of commuted value of accrued pension payable at age 65 or 200% of employee contributions accumulated at fund rate of return

Actuarial Assumptions and Methods

Discount Rate:	6% per year
Interest on Employee Contributions:	6% per year
Retirement Age:	Age 60
Termination Rates:	Age 33 and under: 8%; 34 and over: 0%
Salary Increases:	4% per year
Other Pre-Retirement Decrements:	None
Actuarial Cost Method:	Projected Unit Credit
Asset Valuation Method:	Market Value of Assets

$\ddot{a}_{60} = 12 \qquad \ddot{a}_{65} = 11$

Valuation results as of January 1, 2010

	Employee A	Employee B
Status	Active	Active
Age	32	59
Years of Service	1	19
2010 Salary	$50,000	$80,000
Contributions with Interest	$2,300	$95,000
Accrued Liability	$4,900	$292,500
Normal Cost	$4,900	$15,400

9. **Continued**

2010 Plan Experience

	Employee A	Employee B
Retirement Date	N/A	December 31, 2010
2010 Actual Salary	$55,000	$80,000
2011 Salary	$60,000	N/A

The company's funding policy is to contribute at the beginning of each year the normal cost plus any unfunded accrued liability amortized over 15 years.

The market value of assets at January 1, 2010 was $175,000 before the 2010 employer and employee contributions. The 2010 fund rate of return was 8%.

(a) *(5 points)* Calculate the accrued liability and market value of assets at January 1, 2011.

(b) *(6 points)* Calculate the gains and losses by source for 2010.

(c) *(2 points)* If the actuarial cost method was changed to the Entry Age Normal cost method as of January 1, 2011, for each employee, explain how the current and future accrued liability and normal costs would change.

Show all work.

10. (*14 points*) Your client currently sponsors a contributory defined benefit plan and is introducing a non-contributory option with a back-end flexible pension plan effective January 1, 2011. Plan members will have the option of remaining in the contributory option or joining the non-contributory option for future service.

Details of each option are as follows:

	Contributory Option	**Non-Contributory Option with Back-End Flexible Pension Plan**
Normal Retirement Benefit	1.5% of final average 3 year earnings per year of credited service	1.5% of final average 5 year earnings per year of credited service
Employee Contributions	4% of earnings	N/A
Normal Retirement Age	65	65
Early Retirement Age	55	55
Early Retirement Reduction	3% per year from age 60	Actuarial equivalent of normal retirement benefit
Bridge Benefit	$20 per month per year of credited service payable until age 65	None
Normal Form of Pension	Joint & Survivor 66 ⅔% with 5-year guarantee if married; Life guaranteed 15 years if single at retirement	Life only
Post-Retirement Indexing	1.5% per year	None

(a) (*2 points*) List the conditions for registration of a back-end flex plan.

10. Continued

You have estimated the following flex account balances for two sample members who will join the plan on January 1, 2011, assuming that they contribute 4% of earnings per year to the flex plan:

Member	Age at January 1, 2011	Earnings at January 1, 2011	Estimated Flex Account at Age 60	Estimated Flex Account at Age 65
A	25	$35,000	$252,000	$363,000
B	45	$63,000	$81,000	$134,000

The estimated costs of purchasing ancillary benefits at retirement under the flex plan are as follows:

Ancillary Benefit	Cost per year of service	
	Age 60	Age 65
Upgrade to final 3-year average earnings	$500	$500
Unreduced pension at age 60	$1,700	N/A
Post-retirement indexing at 1.5% per year	$2,900	$2,600
Joint and survivor 66 ⅔ % pension with 5 year guarantee	$2,000	$2,800
Bridge benefit to age 65	$1,000	N/A

Assume that:

(i) members are married at retirement;

(ii) members participating in the non-contributory option will want to purchase the same ancillary benefits as provided by the contributory option; and

(iii) ancillary benefit costs are independent.

(b) (*8* points) Determine the ancillary benefits each member can purchase at retirement ages 60 and 65.

Show all work.

(c) (*4 points*) For each of the two employees recommend whether they should join the contributory option or the flex plan. Provide support for your recommendation.

11. (*4 points*)

(a) (*1 point*) Explain the concept of multi-national pooling.

(b) (*3 points*) Discuss the advantages and disadvantages of using multi-national pooling for insured benefits globally.

12. (*10 points*)

(a) (*5 points*) List the factors to consider in selecting the following assumptions for a going concern valuation:

(i) discount rate;

(ii) salary increase;

(iii) retirement age; and

(iv) mortality.

(b) (*5 points*) A pension plan has experienced a transaction in 2009, which has resulted in the following changes in plan membership:

	Active Members	**Deferred Members**	**Pensioners**
Pre-2010	5,000	400	1000
Post-2009	100	0	0

Explain how the significant reduction in membership affects the selection of each assumption mentioned in part (a) for a going concern valuation.

13. (*9 points*) You are the actuary for a client who sponsors a non-contributory Ontario registered pension plan.

You are given the following:

Plan Provisions

Normal Retirement Benefit	1.4% of final salary times years of service
Normal Retirement Age	Age 65
Early Retirement Age	Age 55
Early Retirement Reduction	3% per year from earliest of age 62 or 80 points (age + service)
Normal Form of Payment	Life only payable monthly in advance
Other Ancillary Benefits	None

Actuarial Assumptions and Methods:

	Going Concern	**Solvency**
Discount Rate	6% per year	Annuity Purchase rate: 4% per year Lump Sum rate: 4.2 % per year for first 10 years, 5.3% per year thereafter
Discount Rate for Amortization Payments	6% per year	4.20% per year
Percentage of Members Electing a Commuted Value	N/A	100% of members under age 55
Retirement Age	Age 55	Age that produces the highest liability
Salary Increase	3% per annum	N/A
Other Pre-Retirement Decrements	None	None
Wind-Up Expenses	N/A	$10,000
Liability Cost Method	Entry Age Normal (percent of salary)	Unit Credit
Asset Valuation Method	Market Value	Market Value

Participant Data as of January 1, 2010:

Age: 45
Credited Service: 13 years
Salary: $85,000

13. Continued

Financial Information: Market Value of Assets at January 1, 2010 - $50,000

Annuity Factors:

	Discount Rate		
	6%	4%	4.2% first 10 years and 5.3% thereafter
$\ddot{a}_{55}^{(12)}$	13.1	16.4	15.2
$\ddot{a}_{60}^{(12)}$	11.9	14.7	13.8
$\ddot{a}_{65}^{(12)}$	11.3	12.9	12.3

Funding Policy

Going concern normal cost plus amortization of the unfunded going concern liabilities over a 5 year period.

(a) (*4* points) Calculate the 2010 company contribution in accordance with the company's funding policy.

(b) (*5 points*) Calculate the 2010 company contribution subject to the minimum regulatory funding requirements using the Projected Unit Credit liability cost method for the going concern valuation.

Show all work.

****END OF EXAMINATION****

USE THIS PAGE FOR YOUR SCRATCH WORK

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