SOCIETY OF ACTUARIES
Retirement Benefits Canada – Design & Pricing

Exam DP-RC

Morning Session

Date: Thursday, November 1, 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 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 1 and 6 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 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 Front Cover

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.

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

Question 1 pertains to the Case Study.

1. (*7 points*) You are the actuary for NOC's Full-Time Salaried and Union Retiree Health Benefit Program.

(a) (*2 points*) Identify the data elements needed to complete the January 1, 2013 actuarial valuation, including the development of the per capita claims cost assumption.

(b) (*5 points*) Describe the process and the considerations:

(i) To ensure data quality.

(ii) To determine the per capita claims cost assumption.

2. (*11 points*)

(a) (*2 points*) Describe the characteristics of the two (2) categories of pension plan embedded options.

(b) (*3 points*) Describe the embedded options under each of the following retirement programs:

(i) A floor-offset plan.

(ii) A defined benefit pension plan with cost of living adjustments based on the change in the Consumer Price Index (CPI), with a floor of 1% and a cap of 6% per year.

(iii) A defined benefit pension plan with cost of living adjustments that provides pension increases if the prior year's rate of return on plan assets exceeds a 'hurdle rate' of 8% per year.

(c) (*3 points*) You are given the following information for a pension plan:

Plan Provisions:

Retirement Benefits:	Greater of: (i) 1.0% of final year's earnings times years of service, and (ii) Annuitized Defined Contribution (DC) account balance at Normal Retirement Age
Normal Form of Benefit Payment:	Life only, payable monthly in advance
Normal Retirement Age:	Age 65

Participant Data as of January 1, 2012:

	Employee A	Employee B
Retirement Age:	65	65
Service:	5 years	20 years
2011 Salary:	\$60,000	\$90,000
Defined Contribution Balance:	\$50,000	\$185,000

Annuity Factor:

$\ddot{a}_{65}^{(12)} = 15.0$

Determine the additional cost to the employer of the embedded option as of January 1, 2012 for the plan.

Show all work.

2. Continued

(d) (*3 points*) You are the actuary for a company that sponsors a defined benefit pension plan that provides annual post-retirement indexing of 50% of the increase in CPI during the previous calendar year.

For actuarial valuation purposes, the current CPI increase assumption is 2.5% per year.

During collective bargaining negotiations, the union requested amending the plan to provide minimum post-retirement indexing of 0.5% per year, arguing that there is no additional cost to the company.

Evaluate the union's argument.

3. (*6 points*) You are given the following:

Year	Cash Flow (end of year)	Spot rate
5	200	1%
9	300	2%
12	500	3%
16	600	4%

(a) (*3 points*) Calculate the duration. Show all work.

(b) (*1 point*) A pension plan has a liability of $100,000,000 with a duration of 8. Calculate the estimated liability after a 50 basis points increase in the discount rate, using duration techniques.

Show all work.

(c) (*2 points*) Discuss the appropriateness of estimating the revised liability, using duration for a 200 basis point change in the discount rate.

4. (*7 points*)

(a) (*2 points*) Identify four temporary regulatory changes Organization for Economic Co-operation and Development (OECD) countries have used to address defined benefit funding challenges as a result of recent financial crises. References to specific countries are not required.

(b) (*5 points*) For the following three (3) counter-cyclical regulatory concepts, describe how each improves both the sustainability and security of defined benefit plans in the future:

(i) Avoid excessive reliance on current market values for purposes of determining contributions (i.e. permit smoothing techniques).

(ii) Allow appropriate levels of over-funding in good economic times via more flexible tax ceilings.

(iii) Flexible funding rules that reflect overall volatility of funding valuations.

5. (*13 points*) You are the actuary for a non-contributory defined benefit pension plan registered in Ontario that is not considered a Designated Plan under the Income Tax Act.

You are given the following:

Plan Provisions

Normal Retirement Benefit:	2% of Final Earnings times credited service
Normal Form of Payment:	Life only
Early Retirement Benefit:	0.25% per month that the early retirement precedes age 62
Defined Benefit Dollar Limit:	$2,646.67 per annum

Actuarial Assumptions and Methods

	Going Concern	Solvency/Hypothetical Wind-up
Discount Rate:	6.0% per annum	3.3% per annum
Salary Increases:	3.0% per annum	N/A
Assumed Retirement Age:	Age 62	Age that maximizes the value of the benefit
Other Decrements:	None	None
Liability Valuation Method:	Projected Unit Credit	Unit Credit
Asset Valuation Method:	Market Value	Market Value less wind-up expenses
Estimated Wind-up Expenses:	N/A	$50,000

Participant Data as at January 1, 2012

	Employee A	Employee B
Status:	Active	Retired
Age:	62	71
Service:	10 years	N/A
2011 Earnings:	$225,000	N/A
Monthly Pension (life only):	N/A	$1,000

Market Value of Assets at January 1, 2012 $ 400,000

5. Continued

Previously established amortization schedules:

Type	Annual Amortization Payment	Date Established	Date of Last Payment
Going Concern	$2,500	January 1, 2011	December 31, 2025
Solvency	$15,000	January 1, 2010	December 31, 2014
Solvency	$20,000	January 1, 2011	December 31, 2015

Annuity Factors	6.0%	3.3%
$\ddot{a}_{62}^{(12)}$	11.7	15.2
$\ddot{a}_{63}^{(12)}$	11.5	14.7
$\ddot{a}_{71}^{(12)}$	9.3	11.2
$\ddot{a}_{72}^{(12)}$	9.0	10.8

(a) (*7 points*) Calculate the minimum required and maximum permissible employer contributions for 2012.

Show all work.

(b) (*3 points*) During 2012, the pension fund earned 3%, there were no decrements and all other experience was in line with the assumptions. The employer contributed the minimum required contribution on January 1, 2012. There are no assumption changes as at January 1, 2013.

Calculate the going concern gain and loss by source as at January 1, 2013.

Show all work.

(c) (*3 points*) Discuss the effect on the minimum required and maximum permissible contributions if the plan were considered a Designated Plan as of January 1, 2012.

No calculations are required.

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Question 6 pertains to the Case Study.

6. (*9 points*) You have been asked to review NOC's Full-Time Salaried Pension Plan's going concern valuation assumptions.

(a) (*5 points*) Describe the factors to consider when setting the Plan's going concern discount rate, taking into consideration the Canadian Institute of Actuaries' December 2010 Educational Note on the Determination of Best Estimate Discount Rates for Going Concern Funding Valuations.

(b) (*4 points*) Based on your analysis, you have proposed a decrease in the discount rate of 0.5%. NOC has requested that the discount rate remain unchanged.

Prepare a response to NOC's request taking into consideration the applicable professional standards.

7. (*7 points*) You are the actuary for a company that sponsors a non-contributory defined benefit pension plan.

You are given:

Plan Provisions

Retirement Benefits:	1.5% of final year's earnings times years of service
Normal Retirement Age:	Age 65
Normal Form of Pension:	Life only, payable monthly in advance
Optional Form of Pension:	Joint and Survivor 60%, payable monthly in advance

All optional form of benefit payments are actuarial equivalent to the normal form.

Actuarial Assumptions and Methods

Interest Rate:	5.25% per annum
Salary Increase:	3.75% per annum
Retirement Age:	Age 65
Pre-retirement Death Benefits:	None
Cost Method:	Individual Level Premium

Annuity Factors

$\ddot{a}_{65}^{(12)}$:	12.0
$\ddot{a}_{62}^{(12)}$:	13.5
$\ddot{a}_{65:62}^{(12)}$:	11.5

Participant Data as at January 1, 2012

	Employee A	**Employee B**
Status:	Active	Active
Age:	35	64
Service:	0 years	20 years
2012 Salary:	$60,000	$90,000
Spouse Age:	N/A	61

2012 Plan Experience

	Employee A	**Employee B**
Retirement Date:	N/A	December 31, 2012
Salary Increase effective December 31, 2012:	3.0%	N/A

7. Continued

2012 Financial Information

Assets as at January 1, 2012:	$300,000
Employer Contribution on December 31, 2012:	$40,000
2012 Fund Rate of Return:	3%

(a) (*1 point*) Employee B elected a Joint and Survivor 60% Pension. Calculate his monthly pension amount as at December 31, 2012.

(b) (*3 points*) Calculate the actuarial liability as at January 1, 2013.

(c) (*3 points*) Calculate the 2013 normal cost and the unfunded actuarial liability as at January 1, 2013.

Show all work.

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

USE THIS PAGE FOR YOUR SCRATCH WORK

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