# SOCIETY OF ACTUARIES
## Retirement Benefits Canada – Design & Pricing

# Exam DP-RC

## AFTERNOON SESSION

**Date:** Thursday, April 26, 2012
**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. Questions 10 - 12 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.

## 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**
**Afternoon Session**
***Beginning with question 8***

**8.** (*12 points*) You are the actuary for a company that sponsors a defined benefit pension plan registered in Ontario.

You are given:

**Plan Provisions**

| | |
|---|---|
| Normal Retirement Benefit | $50 per month per year of service |
| Employee Contributions | None |
| Normal Form of Pension | Life only |
| Normal Retirement Age | Age 60 |
| Earliest Retirement Age | Age 50 |
| Early Retirement Reduction | 3% per year before age 60 |
| Termination Benefit | Commuted value of a deferred pension beginning at Normal Retirement Age. Early commencement permitted after Earliest Retirement Age, subject to an actuarial reduction. |

**Solvency Actuarial Assumptions and Methods**

| | |
|---|---|
| Discount Rate – Annuity Purchase | 4.25% per year |
| Discount Rate – Lump Sum Payment | 4.25% per year for 10 years, 5.0% per year thereafter |
| Percentage of Members Electing a Commuted Value | 100% of members under age 50 |
| Retirement Age | Age that produces the highest liability |
| Pre-Retirement Decrements | None |
| Wind-Up Expenses | $10,000 |
| Actuarial Cost Method | Unit Credit |
| Asset Valuation Method | Market Value |

**Active Data as at January 1, 2012**

| Employee | A | B |
|---|---|---|
| Age | 49 | 52 |
| Credited Service/Continuous Service | 2 years | 15 years |

**8.** **Continued**

**Retired Data as at January 1, 2012**

| | |
|---|---|
| Employee | C |
| Age | 59 |
| Monthly Pension, payable for life | $1,020 |

**Market Value of Assets as at January 1, 2012:** $300,000

**Annuity Factors**

| | Discount Rate | |
|---|---|---|
| Age | 4.25% | 4.25% for 10 years 5% thereafter |
| 50 | 17.0 | 17.7 |
| 52 | 16.6 | 17.2 |
| 53 | 16.3 | 16.9 |
| 59 | 14.6 | 15.1 |
| 60 | 14.3 | 14.7 |

(a) (*4 points*) Calculate the solvency position of the plan as at January 1, 2012.

(b) (*2 points*) Discuss the considerations in determining the solvency incremental cost.

(c) (*6 points*) Assume that on a going concern basis, the assumed retirement age is 55 and that there are no other pre-retirement decrements. Calculate the solvency incremental cost for 2012.

Show all work.

**9.** (*8 points*)

(a) (*2 points*) Describe the process to select a new investment manager for a pension fund.

(b) (*3 points*) Compare and contrast passive and active investment management.

(c) (*3 points*) The following potential new asset classes are being considered for a plan's investment portfolio:

(i) Government Bonds

(ii) Derivatives

(iii) Real Estate

Discuss the appropriateness of each asset class for investment in a pension fund.

***Questions 10 – 12 pertain to the Case Study.***

**10.** (*12 points*) NOC's Ontario operations are closing and as a result, NOC intends to terminate the Full-Time Hourly Union Pension. NOC has confirmed that it will fully fund any wind up deficit over the prescribed period of time.

(a) (*6 points*) Describe the process for winding up a registered pension plan in Ontario.

An agreement is in place between NOC and the union where, upon wind up, the pension plan would be amended to replace the post-retirement indexing provisions with guaranteed indexing of 1.25% per year after pension commencement.

You are given the following information for 3 participants:

| Participant | Status | Age at wind up date | Service at wind up date | Province of Employment |
|---|---|---|---|---|
| A | Active | 40 | 1.5 years | Ontario |
| B | Active | 50 | 25 years | Ontario |
| C | Retired | 75 | n/a | Ontario |

(b) (*4 points*) Describe the impact that terminating membership in the plan as a result of the wind up has on the pension entitlements for the two active participants versus terminating on a voluntary basis.

(c) (*2 points*) Describe the impact of the wind up on the retired member.

***Questions 10 – 12 pertain to the Case Study.***

**11.** (*12 points*) National Oil Company (NOC) would like to make changes to the Full-Time Salaried and Union Retiree Health Benefit Program for future retirees to reduce NOC's program costs.

(a) (*6 points*) Describe the plan design changes that NOC could make to meet this objective.

(b) (*6 points*) Describe the impact the plan design changes in (a) could have on each of the valuation assumptions.

***Questions 10 – 12 pertain to the Case Study.***

**12.** (*8 points*)

(a) (*3 points*) Describe the issues that both the NOC Full-Time Salaried Pension Plan participants and Part-Time DC Pension Plan participants face in accumulating and preserving pension benefits.

(b) (*3 points*) Describe the alternative approaches private pension systems in other countries have used to address the issues raised in (a). References to specific countries are not required.

(c) (*2 points*) Discuss the feasibility of using the alternatives described in (b) to address the issues in the NOC pension plans described in (a).

**13.** (*8 points*) Your client sponsors a non-contributory defined benefit pension plan. You are given:

**Plan Provisions:**

| | |
|---|---|
| Retirement Benefit: | \$100 per month, per year of service |
| Normal Form of Payment: | Life only, payable monthly in advance |
| Normal Retirement Age: | Age 65 |
| Earliest Retirement Age: | Age 55 |
| Early Retirement Reduction: | 3% per year that retirement age precedes age 65 |
| Optional Form of Pension: | 98% of the Normal Form of Payment payable as a Life pension, guaranteed 15 years monthly in advance |

**Actuarial Assumptions and Methods:**

| | |
|---|---|
| Interest Rate: | 6% per year |
| Retirement Age: | Age 60 |
| Pre-Retirement Decrements: | None |
| Actuarial Cost Method: | Entry Age Normal |
| Asset Method: | Market Value of Assets |

**Annuity Factors:**

| | | |
|---|---|---|
| $\ddot{a}_{65}^{(12)} = 10.9$ | $\ddot{a}_{60}^{(12)} = 12.2$ | $\ddot{a}_{58}^{(12)} = 12.7$ |
| $\ddot{a}_{65:\overline{15}\rceil}^{(12)} = 12.0$ | $\ddot{a}_{60:\overline{15}\rceil}^{(12)} = 12.9$ | $\ddot{a}_{58:\overline{15}\rceil}^{(12)} = 13.2$ |

**Participant Data at January 1, 2012:**

| | |
|---|---|
| Age: | 57 years |
| Service: | 24 years |

**Financial Information:**

Market Value of Assets at December 31, 2011: \$250,000

(a) (*4 points*) Calculate the unfunded accrued liability and normal cost of the plan at January 1, 2012.

(b) (*4 points*) During 2012 a contribution of \$10,000 is made to the plan (assume contribution at January 1, 2012). The fund earned a rate of return of 10% in 2012. The plan member retires at January 1, 2013 with a lifetime pension, guaranteed for 15 years.

Calculate the gains and losses by source for 2012.

Show all work.

****END OF EXAMINATION****
**Afternoon Session**

**USE THIS PAGE FOR YOUR SCRATCH WORK**