SOCIETY OF ACTUARIES
Retirement Benefits Canada – Design & Pricing, Segment B

Exam DP-RC,B

Date: Thursday, October 30, 2008
Time: 2:00 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 30 points.

   This exam consists of 5 questions, numbered 1 through 5.

   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 Exam DP-RC,B.

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,B Front Cover

****BEGINNING OF EXAMINATION****
Retirement Benefits Canada – Design & Pricing, Segment B

1. (*5 points*) You are the actuary for a company that established a contributory defined benefit pension plan as at January 1, 2008. You are given:

Plan Provisions

Normal retirement age:	Age 65
Retirement benefit:	2% of final year's salary times years of participation
Form of payment:	Life only, payable monthly in advance
Employee contribution rate:	6% of pay payable at the beginning of the year
Interest on employee contributions:	5.75% per annum
Termination benefit:	Present value of accrued benefits based on valuation assumptions. In addition, if the member contributions with interest exceed 50% of the present value of accrued benefits, this excess would be refunded to the member. This benefit is not applicable at retirement.

Actuarial Assumptions and Method

Interest:	5.75% per annum
Salary increase:	4.0% per annum
Retirement age:	Age 65
Pre-retirement mortality:	None
Termination rates:	5% at the end of the first year, 0% after
$\ddot{a}_{65}^{(12)}$	11.0
Cost method:	Projected Unit Credit

Participant Data as at January 1, 2008

Age:	35
Salary:	$75,000
Date of Hire:	January 1, 2008

Calculate the first year employer normal cost.

Show all work.

2. (*7 points*) You are the actuary for a company that sponsors a non-contributory, defined benefit pension plan. You are given:

Plan Provisions

Retirement benefit:	\$100 per month per year of service
Normal retirement age:	Age 65
Early retirement eligibility:	Age 55
Early retirement reduction:	0.25% per month before normal retirement age
Other ancillary benefits:	None
Normal form of payment:	Life only, payable monthly in advance

Actuarial Assumptions and Methods

Interest rate:	6% per annum
Pre-retirement decrements:	None
Retirement age:	Age 58
Actuarial method:	Entry age normal
Actuarial value of assets:	Market value of assets
Amortization of unfunded actuarial liability:	10 years

$\ddot{a}_{58}^{(12)} = 12$

Financial Information

Market value of assets as at January 1, 2008: \$70,000

Participant Data as at January 1, 2008

Age:	40
Service:	12 years

(a) Calculate the annual contribution for 2008.

(b) During 2008, the company contributed the normal cost on January 1, 2008 and the fund earned 2%. Effective January 1, 2009, the monthly pension accrual rate increased for all service to \$110 per month per year of service. Calculate the change in unfunded accrued liability by source as at January 1, 2009.

(c) Calculate the annual contributions for 2009.

(d) The company wants to minimize its 2009 contribution. Recommend a new actuarial cost method and determine the revised annual contribution for 2009.

Show all work.

3. (*6 points*) You are the actuary for a company that sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Retirement benefit:	1% of final year's earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 60

Actuarial Assumptions and Methods:

Interest rate:	6% per annum
Retirement age:	Age 60
Salary increases:	4.0% per annum
Pre-retirement decrements:	None
Actuarial cost method:	Attained age normal
Asset method:	Market value of assets

$\ddot{a}_{60}^{(12)} = 12.0$

Participant Data as at January 1, 2008:

Employee	Age	Service	2007 earnings
A	50	10	$50,000
B	40	10	$50,000

Financial Information:

Market value of assets at January 1, 2008:	$60,000
Unfunded liability at January 1, 2008:	$10,000

(a) Calculate the normal cost of the plan at January 1, 2008.

(b) During 2008, the fund earned 0%, no contributions were made to the fund and there were no salary increases. Calculate the accrued liability and normal cost of the plan at January 1, 2009.

Show all work.

4. (*6 points*) You are the actuary for a company that sponsors a non-contributory defined benefit plan for its employees. You are given:

Plan Provisions:

Retirement benefit:	2% of final salary times years of service
Normal retirement age:	Age 60
Normal form of payment:	Life Only, payable monthly in advance

Actuarial Assumptions and Methods:

Interest rate:	6% per annum
Salary increase:	2% per annum
Retirement age:	Age 60
Pre-retirement decrements:	None
Actuarial cost method:	Aggregate Method

$\ddot{a}_{60}^{(12)} =$ 12.2

Active Participant Data as at January 1, 2008:

Employee	Age	Salary	Service
A	30	$25,000	2
B	50	$40,000	15

The normal cost for 2008 is equal to $15,000.

The present value of future salaries is equal to $792,000. The present value of future salaries is equal to $863,000 if the annual salary increase assumption is equal to 3%.

Determine the 2008 normal cost if the salary increase assumption is changed to 3% per annum.

Show all work.

5. (*6 points*) You are the actuary for a company that sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions

Retirement benefit:	2% of final year's salary times years of service up to 30 years of service; 1% of final year's salary after 30 years of service
Normal retirement age:	Age 60
Normal form of payment:	Life only, payable monthly in advance
Optional forms of payments:	• 10 year certain and life • Joint and survivor 60% • Life only, level payment option (integrated with government benefits) • All optional forms of pension are actuarial equivalent to the normal form
Early retirement age:	Age 55
Early retirement reductions:	5% per year before normal retirement age

Actuarial basis

Interest rate: 6.5% per annum

	Member	Spouse	Member:Spouse
${}_{10}p_{58}$	0.92	0.93	
${}_{7}p_{58}$	0.95	0.96	
${}_{10}p_{65}$	0.83	0.84	
$\ddot{a}_{58}^{(12)}$	11.9	12.5	$\ddot{a}_{58:58}^{(12)} = 10.8$
$\ddot{a}_{60}^{(12)}$	11.5	12.1	$\ddot{a}_{65:65}^{(12)} = 9.1$
$\ddot{a}_{65}^{(12)}$	10.4	11.1	
$\ddot{a}_{68}^{(12)}$	9.6	10.4	

Participant Data as at January 1, 2008

Age:	Age 58
Spouse's age:	Age 58
Service:	31 years
2007 Salary:	$110,000

5. Continued

Government Benefits as at January 1, 2008
Monthly pension of $1,300 payable at age 65

The member retires at January 1, 2008. Under each form of payment determine the monthly benefits payable during the lives of the member and the surviving beneficiary.

Show all work.

****END OF EXAMINATION****