SOCIETY OF ACTUARIES
Funding & Regulation Exam - Canada

Exam RETFRC

MORNING SESSION

Date: Wednesday, April 25, 2018
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).

   a) The morning session consists of 7 questions numbered 1 through 7.

   b) The afternoon session consists of 5 questions numbered 8 through 12.

   The points for each question are indicated at the beginning of the question. Questions 4 pertains 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 because 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 RETFRC.

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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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

1. (*9 points*) Your client sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Retirement benefit:	2% of final earnings per year of credited service
Normal form of payment:	Life Only, payable monthly in advance
Normal retirement age:	Age 65
Unreduced retirement age:	Age 62
Early retirement reduction:	4% for each year prior to unreduced retirement age
Termination benefit:	Deferred pension payable at age 65, or actuarial equivalent if received earlier
Pre-retirement death benefit:	Actuarial present value of deferred pension payable from when the member would have attained age 65

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Salary increase rate:	3% per year
Actuarial cost method:	Projected Unit Credit, prorated on service
Pre-retirement mortality:	None
Termination rates:	10% at age 50
Retirement rates:	See table below
Timing of decrements:	Beginning of year

Retirement Rates:

Age	Retirement
55	25%
62	50%
65	100%

Annuity Factors:

$\ddot{a}_{50}^{(12)}$	16.7
$\ddot{a}_{55}^{(12)}$	15.8
$\ddot{a}_{62}^{(12)}$	14.2
$\ddot{a}_{65}^{(12)}$	13.3

1. **Continued**

<u>Member Data as at December 31, 2017:</u>

	Member A	Member B
Age	50	61
Earnings for 2017	$80,000	$100,000
Credited Service	10 years	14 years

(a) (*3 points*) Calculate the accrued liability and normal cost at December 31, 2017 for each member.

Show all work.

You are given:

- Member A receives a salary increase of 7% at December 31, 2018.
- Member B died on December 31, 2018. As of December 31, 2018, the death benefit has not been paid.

(b) (*2 points*) Calculate the accrued liability at December 31, 2018 for each member.

Show all work.

(c) (*4 points*) Calculate the gains and losses by source for 2018.

Show all work.

2. (*8 points*) You are the actuary for three defined benefit pension plans. The industry and membership summary of these plans are as follows:

	Plan A	**Plan B**	**Plan C**
Industry	Banking	Mining	Education
Active			
Count	1,500	100	10,650
Average Age	45.5	53.2	42.6
Average Earnings	$98,000	$42,000	$70,600
Deferred Vested			
Count	110	15	5,750
Average age	54.4	56.4	50.2
Average annual benefit	$21,000	$1,050	$18,650
Pensioners			
Count	450	250	50
Average age	66.4	69.5	56.8
Average annual benefit	$54,000	$11,050	$45,600

You are given the following additional information:

- Plan C has completed multiple experience studies that show the plan has super-standard mortality.
- Plan C recently completed an annuity buy-out of approximately 10,000 pensioners. The pricing of the annuity purchase was much higher than other annuity purchases of similar size and plan provisions.

Describe how you would set the going concern post-retirement mortality assumption for the January 1, 2018 funding valuation of each plan.

3. (*10 points*) You are the actuary for a company that sponsors a non-contributory defined benefit pension plan registered in Ontario. The company is undergoing restructuring and is considering the following options with respect to the pension plan:

(a) Converting the pension plan from defined benefit to defined contribution for past and future service; or

(b) Fully winding up the pension plan and implementing a Group RRSP.

As of the date of the most recent actuarial valuation, the funded status of the plan is as follows:

- Going concern surplus
- Solvency surplus (including a letter of credit)
- Wind-up deficit (including a letter of credit)

Describe the regulatory considerations for options (a) and (b) with respect to each of the following:

(i) Communication to members

(ii) Regulatory reporting

(iii) Tax implications for members

(iv) Impact on benefits

(v) Funding implications

Question 4 pertains to the case study.

4. (*10 points*) You are the actuary for the DPC Plan.

The Company has noted the following:

- Members are retiring later than expected.
- Fewer members are terminating when compared to past experience.
- Inflation has decreased over the last 5 years.
- Future salary increases are expected to be 2.0% per annum over the next 3 years.

As a result, the Company has proposed the following assumption changes for the going concern valuation of the plan:

	Company's Proposed Assumptions
Retirement scale	100% at age 65
Termination scale	None
Inflation	0.50% per annum
Salary scale	2.00% per annum for the next 3 years and 0% thereafter

(a) (*5 points*) Critique the Company's proposed assumptions, taking into account professional standards.

As the actuary for the DPC plan, you have concerns with the Company's proposed assumptions.

(b) (*5 points*) Recommend revised assumptions given the Company's recent experience and professional standards.

Justify your recommendations.

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5. (*7 points*) XYZ Company sponsors two Quebec registered private sector single employer registered pension plans for its employees. You are the actuary for both plans.

You have determined the following valuation results as at December 31, 2017:

	Salaried Plan	**Hourly Plan**
Asset Information		
Market Value of Assets	$15 million	$55 million
Target Equity Allocation	60%	75%
Target Fixed Income Allocation	40%	25%
Fixed Income Duration	15 years	9 years
Liability Information		
Going-Concern Discount Rate	5.0% per year	5.25% per year
Going-Concern Liability	$16 million	$47 million
2017 Normal Cost	$1 million	$2 million
Liability Duration	15 years	18 years

Stabilization Provision Calculation Chart

		Investment Duration / Liability Duration (%)				
		0	**25**	**50**	**75**	**100**
Variable Income Securities (%)	**0**	12	10	8	6	5
	20	14	12	10	8	6
	40	16	14	12	10	8
	50	17	15	13	11	9
	60	19	17	15	13	11
	70	22	20	18	16	14
	80	24	22	20	18	16
	100	27	25	23	21	20

5. Continued

(a) (2 *points*) Calculate the stabilization provision percentage for each plan as at December 31, 2017.

Show all work.

For a December 31, 2017 valuation of a Quebec registered plan, the deficit amortization period is 13 years.

(b) (5 *points*) Calculate the 2018 minimum funding requirements for each plan.

Show all work.

6. (*8 points*) A member who participates in a non-contributory defined benefit pension plan is retiring at January 1, 2017.

You are given:

Plan Provisions:

Retirement benefit:	2.00% of final average earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Early retirement eligibility:	Age 55
Unreduced early retirement age:	Age 62; or, age 60 and 90 points (age plus service)
Early retirement reduction:	3.00% per year prior to age 65
Optional forms of payment:	(i) Joint and Survivor 66 2/3% pension (ii) Level income option, where CPP and OAS commence at age 65
Actuarial equivalence basis:	As determined by administrator
Post-retirement annual indexation:	None

Member Data as at January 1, 2017:

Member's age:	61
Spouse's age:	60
Service:	25 years
Final average earnings:	$140,000

Annuity Factors:

$\ddot{a}_{61}^{(12)}$	$\ddot{a}_{60}^{(12)}$	$\ddot{a}_{61:60}^{(12)}$	$_{4\|}\ddot{a}_{61}^{(12)}$	$\ddot{a}_{61:\overline{4}\|}^{(12)}$
17.7	18.1	15.3	14.3	3.7

Additional Information:

C/QPP Maximum Pension Benefit for 2017:	$1,114.17 per month
Maximum OAS payable January 2017:	$578.53 per month
Income Tax Act Defined Benefit Dollar Limit for 2017:	$2,914.44 per year of service
Three-year average YMPE at January 1, 2017:	$54,600

6. **Continued**

(a) (*1 point*) Calculate the monthly early retirement pension payable under the normal form of payment as at January 1, 2017.

Show all work.

(b) (*4 points*) Calculate the monthly early retirement pension payable under each optional form of payment as at January 1, 2017.

Show all work.

Assume that the plan's early retirement reduction is changed to actuarial equivalence from age 65.

(c) (*1 point*) Calculate the monthly early retirement pension payable under the normal form of payment as at January 1, 2017.

Show all work.

(d) (*2 points*) Explain, in words, how a 2% increase in the actuarial equivalence interest rate would affect the early retirement pension payable under the normal form.

7. (*8 points*)

(a) (*3 points*) Describe six of the principles that the Task Force on Protecting Pensions in New Brunswick established for the purposes of developing the Shared Risk Model.

(b) (*5 points*) Describe the features of New Brunswick's Shared Risk Model that help reduce the volatility of funding requirements while providing adequate protection of benefits.

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

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