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**SOCIETY OF ACTUARIES**  
**Funding and Regulation Exam – Canada**

**Exam RETFRC**

**AFTERNOON SESSION**

**Date:** Wednesday, November 2, 2016

**Time:** 1:30 p.m. – 3:45 p.m.

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**INSTRUCTIONS TO CANDIDATES**

**General Instructions**

1. This afternoon session consists of 5 questions numbered 8 through 12 for a total of 40 points. The points for each question are indicated at the beginning of the question. Question 12 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.



## **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.** (7 points) Your client sponsors a contributory defined benefit pension plan.

You are given:

**Plan Provisions:**

Normal retirement benefit:	1% of final year's earnings per year of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Unreduced early retirement age:	Age 62 and 20 years of service
Employee required contribution rate:	3.0% of earnings
Optional form of payment:	Life only, level income option integrated with the Government Pension at age 65  Actuarially equivalent to the Normal form of payment

**Government Pension:**

Normal retirement age:	Age 65
Normal form of payment:	Life only, payable monthly in advance
Normal retirement benefit:	\$12,000 per year

**Actuarial Assumptions and Methods as at January 1, 2017:**

Interest rate:	5.0% per year
Salary increase rate:	3.0% per year
Retirement decrements:	50% at age 62 and 20 years of service; and 100% at age 65
Pre-retirement decrements:	None
Actuarial cost method:	Projected unit credit, pro-rated on service

**Additional Information:**

$$\ddot{a}_{62}^{(12)} = 13.8$$

$$\ddot{a}_{65}^{(12)} = 13.1$$

$${}_3p_{62} = 0.98$$

## 8. Continued

### Participant Data as at January 1, 2017:

	<u>Member A</u>	<u>Member B</u>
Age:	50	62
Years of service:	5 years	25 years
Salary for 2016:	\$50,000	\$100,000

### Financial Information:

Market value of assets as at January 1, 2017: \$300,000

- (a) (3 points) Calculate the total employer normal cost and unfunded accrued liability as at January 1, 2017.
- (b) (2 points) Calculate the total employer normal cost as at January 1, 2017 using the Aggregate, level percent of pay actuarial cost method.
- (c) (2 points) Member B retires on January 1, 2017.

Calculate the lifetime pension payable to Member B under the following forms of payment:

- (i) The Normal form of payment.
- (ii) The Optional form of payment.

Show all work.

9. (11 points) You are the actuary for a single employer non-contributory defined benefit pension plan registered in Ontario.

You are given the following information from the January 1, 2016 funding valuation:

**Going concern assumptions:**

Discount rate	4.5% per year
Retirement decrement	100% at age 65
Pre-retirement decrements	None
Post-retirement mortality rates	CPM2014Priv table with projection scale CPM-B

**Valuation results:**

	Going concern	Solvency/Hypothetical wind-up
Market value of assets	\$47,865,000	\$47,865,000
Provision for windup expenses	N/A	\$200,000
Accrued liability	\$50,745,000	\$58,865,000
Surplus/(deficit)	(\$2,880,000)	(\$11,200,000)
2016 Normal cost	\$750,000	N/A
2017 Normal cost	\$784,000	N/A

**Additional information:**

- The blended solvency discount rate is 2.90%.
- The client elected not to smooth discount rates and asset values.
- New amortization schedules will be deferred for 12 months.

**Previously established amortization schedules:**

Type	Date established	Date of First Payment	Date of Last Payment	Annual Amortization Amount
Going Concern	01/01/2011	01/01/2011	12/31/2025	\$600,000
Solvency	01/01/2013	01/01/2013	12/31/2017	\$1,150,000
Solvency	01/01/2015	01/01/2016	12/31/2020	\$925,000

## 9. Continued

### Annuity factors:

n (years)	i	$\ddot{a}_{\overline{n} i}^{(12)}$
10	4.50%	8.0
6	2.90%	5.5
5	2.90%	4.7
3	2.90%	2.9
2	2.90%	1.9

- (a) (6 points) Calculate the 2016 minimum required and maximum permissible contributions.

Show all work.

- (b) (1 point) Calculate the 2017 minimum required contributions based on the January 1, 2016 valuation.

Show all work.

- (c) (4 points) Your client would like you to change your valuation assumptions and/or methods to reduce contributions to the pension plan.

Assess your client's request with respect to the assumptions and methods above, taking into account professional standards.

**10.** (8 points) XYZ Company is winding up its large defined benefit pension plan registered in Ontario.

You are given:

- XYZ Company is a successful company with a low probability of bankruptcy.
- XYZ Company's funding policy is to make the minimum required contributions.
- All active and inactive members are or were employed in Ontario.
- The XYZ employee group is collectively bargained.
- On the effective date of the wind-up, the plan is in a deficit position.
- All eligible expenses related to the wind-up will be paid from the pension fund.

- (a) (3 points) Describe the considerations for setting the wind-up expense assumption for purposes of the wind-up valuation report.
- (b) (2 points) Describe how these considerations differ when setting the wind-up expense assumption for a hypothetical wind-up valuation.
- (c) (3 points) At the time of the approval of the wind-up report, interest rates have increased significantly. It is determined that there is a wind-up surplus in the XYZ pension plan that is to be shared between the employer and the members.

Describe the surplus distribution process.

**11.** (8 points) Describe considerations in setting the going concern mortality assumption for the following pension plans:

- (i) A private sector pension plan for a small mining company
- (ii) A large public sector pension plan covering teachers
- (iii) The Canada Pension Plan (CPP).

**Question 12 pertains to the Case Study.**

- 12.** (6 points) You are the actuary for the NOC Full-Time Salaried Pension Plan. The last filed actuarial valuation for the plan was January 1, 2016. NOC has asked you to estimate the transfer ratio at June 30, 2016.

You are given the following for the period January 1, 2016 to June 30, 2016:

**(in \$000s)**

Contributions made:	\$45,000
Pensioner benefit payments:	\$13,250
Commuted value payments:	\$20,000
Net rate of return on assets:	-5.5%

**Additional information:**

Solvency incremental cost for 2016 (in \$000s):	\$50,000
Solvency valuation interest rates at June 30, 2016:	
– Commuted value interest rates:	1.4% per year for 10 years, 3.1% per year thereafter
– Annuity purchase rate:	2.8% per year
Transfer ratio at January 1, 2016:	91%

It is assumed that 100% of active members elect a lump sum commuted value.

- (a) (3 points) Calculate the estimated transfer ratio of the plan as at June 30, 2016 assuming mid-period cash flows.

Show all work.

## 12. Continued

Several members terminated from the plan and elected to receive a lump sum commuted value. The lump sum payments are scheduled to be made after June 30, 2016.

- (b) *(1 point)* Explain why NOC may not be able to immediately pay out 100% of the commuted values to the terminated members.
- (c) *(2 points)* List the items that must be included in the Actuarial Certification that accompanies the application to the regulator for approval to pay out 100% of the commuted values.

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**