

# Exam RETFRC

## Funding and Regulation Exam – Canada AFTERNOON SESSION

Date: Wednesday, October 31, 2018

Time: 1:30 p.m. – 3:45 p.m.

### 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.

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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) You are the actuary for Company XYZ's defined benefit pension plan.

You are given the following as at January 1, 2019:

<b>Plan Provisions</b>	
Retirement benefit	\$80 per month per year of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	Age 65
Early retirement reduction	4% per year from normal retirement age

<b>Actuarial Assumptions</b>	
Interest rate	4.50% per annum
Retirement age	Age 60
Pre-retirement decrements	None

**Annuity Factor:**

$$\ddot{a}_{60}^{(12)} = 15.5$$

**Active Member Data as at January 1, 2019:**

<b>Member</b>	<b>A</b>	<b>B</b>
Age in years	30	50
Years of service	10	30

- (a) (4 points) Calculate the normal cost and the actuarial liability as at January 1, 2019 under the following methods:

- (i) Projected Unit Credit method
- (ii) Entry Age Normal method

Show all work.

- (b) (3 points) The CEO of Company XYZ has requested that you help ensure that contributions are as stable as possible over the long term.

Recommend an appropriate funding method.

Justify your recommendation.

**9.** (9 points)

- (a) (4 points) Describe how you would build a replicating portfolio for the purpose of calculating the hypothetical wind-up liabilities in accordance with the CIA Educational Note on Alternative Settlement Methods for Hypothetical Wind-up and Solvency Valuations.
- (b) (3 points) Describe the three other alternative settlement methods contained in the CIA Educational Note.
- (c) (2 points) Describe when it would be appropriate to use an alternative settlement method for a hypothetical wind-up valuation.

- 10.** (9 points) Your client establishes a new non-contributory defined benefit pension plan on January 1, 2018.

You are given:

**Plan Provisions:**

Retirement benefit: \$50 per month times years of service  
Normal form of payment: Life only, payable monthly in advance  
Normal retirement age: Age 65

**Actuarial Assumptions and Methods:**

Interest rate: 5% per annum  
Retirement age: Age 65  
Pre-retirement decrements: None  
Timing of decrements: Beginning of year  
Actuarial cost method: Individual Level Premium, Level Dollar  
Asset method: Market value of assets

Annuity factor:

$$\ddot{a}_{65}^{(12)} = 13.5$$

**Member Data at January 1, 2018:**

<b>Member:</b>	<b>A</b>	<b>B</b>	<b>C</b>
Age in Years:	54	44	64
Years of Service:	14	9	4

- (a) (3 points) Calculate the total normal cost as at January 1, 2018.

You are given the following for 2018:

- On December 31, 2018:
    - Member B terminates employment and receives a lump sum of \$8,000 from the Plan.
    - Member C retires and starts receiving a pension from the Plan.
  - A contribution of \$65,000 was made to the plan on January 1, 2018.
  - The plan's assets earn a return of 8% during 2018.
- (b) (2 points) Calculate the unfunded actuarial liability as at January 1, 2019.
- (c) (4 points) Calculate the gains and losses, by source, for 2018.

Show all work.

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

You are given:

**Actuarial Assumptions and Methods:**

Basis	Going Concern	Hypothetical Wind-up / Solvency
Liability discount rate	5.0% per annum	3.0% per annum
Asset valuation method	Market value of assets	Market value of assets less estimated wind-up expenses
Estimated wind-up expenses (\$000s)	N/A	\$1,000

**Asset Information (\$000s):**

Market value of assets at January 1, 2017: \$550,000

**Liability Information at January 1, 2017:**

(\$000s)	Going Concern	Hypothetical Wind-up / Solvency
Liabilities	\$500,000	\$620,000
Normal cost (mid-year)	\$60,000	N/A

**Previously Established Amortization Schedules:**

Type	Annual Amortization Payment (\$000s)	Date Established	Date of Last Payment
Solvency	\$4,000	January 1, 2015	December 31, 2019
Solvency	\$2,000	January 1, 2016	December 31, 2020

**Annuity Factors:**

	Discount Rate	
	5.00%	3.00%
$\ddot{a}_{\overline{3} }^{(12)}$	2.79	2.87
$\ddot{a}_{\overline{4} }^{(12)}$	3.63	3.77
$\ddot{a}_{\overline{5} }^{(12)}$	4.43	4.64
$\ddot{a}_{\overline{15} }^{(12)}$	10.62	12.10



## 11. Continued

- (a) (5 points) Calculate the following for 2017 in accordance with the Pension Benefits Act (Ontario) as it existed prior to May 1, 2018 and the Income Tax Act:
- (i) the minimum required employer contributions
  - (ii) the maximum permissible employer contributions.

Assume no deferral of amortization schedules.

You are given:

- Actual benefit payments made during 2017 (\$000s): \$10,000
- 2017 solvency incremental cost (mid-year) (\$000s): \$70,000
- The minimum required contribution as per the January 1, 2017 actuarial valuation was remitted to the fund
- The rate of return on the pension fund assets during 2017 was 21%

Assume the following:

- No liability gains or losses during 2017
- No changes in actuarial assumptions
- Mid-period cash flows
- The January 1, 2018 valuation will be filed.
- The normal cost in accordance with the January 1, 2018 valuation (\$000): \$60,000.

- (b) (2 points) Calculate the estimated going concern and solvency positions at January 1, 2018.
- (c) (2 points) Calculate the maximum permissible employer contribution for 2018 in accordance with the Pension Benefits Act (Ontario) as it existed prior to May 1, 2018 and the Income Tax Act.

Show all work.

**Question 12 pertains to the Case Study**

**12.** (6 points) You are given the following information:

Member A

- Participates in a registered defined contribution (DC) pension plan
- The employer contributes 9% of annual earnings
- No member contributions
- Joined the plan on January 1, 2008
- Sum of the Pension Adjustments from 2008 to 2017 is \$69,000

Member B

- Participates in the Pension Plan for Employees of DPC Limited (DPC Plan)
- Joined the plan on January 1, 2008
- Sum of the Pension Adjustments from 2008 to 2017 is \$97,000

At January 1, 2018:

- Member A and Member B both terminate employment.
  - Member A's DC account balance is \$92,000.
  - Member B's lump sum commuted value is \$92,000.
- (a) (2 points) Explain why the sum of the Pension Adjustments for Member B is higher than the sum of the Pension Adjustments for Member A, in spite of the fact that Member A's DC account balance and Member B's lump sum commuted value are the same at January 1, 2018.
- (b) (2 points) List changes to the DPC Plan that would increase the lump sum value for DPC Plan members upon termination without increasing the members' Pension Adjustments.
- (c) (2 points) Explain the principles underlying Pension Adjustment Reversals.

**\*\*END OF EXAMINATION\*\***

**Afternoon Session**

**USE THIS PAGE FOR YOUR SCRATCH WORK**

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