

Exam RETFRC

Funding & Regulation Exam - Canada

Date: Thursday, October 24, 2024

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 8 questions numbered 1 through 8 with a total of 80 points.

The points for each question are indicated at the beginning of the question.

2. 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 provided in this document.

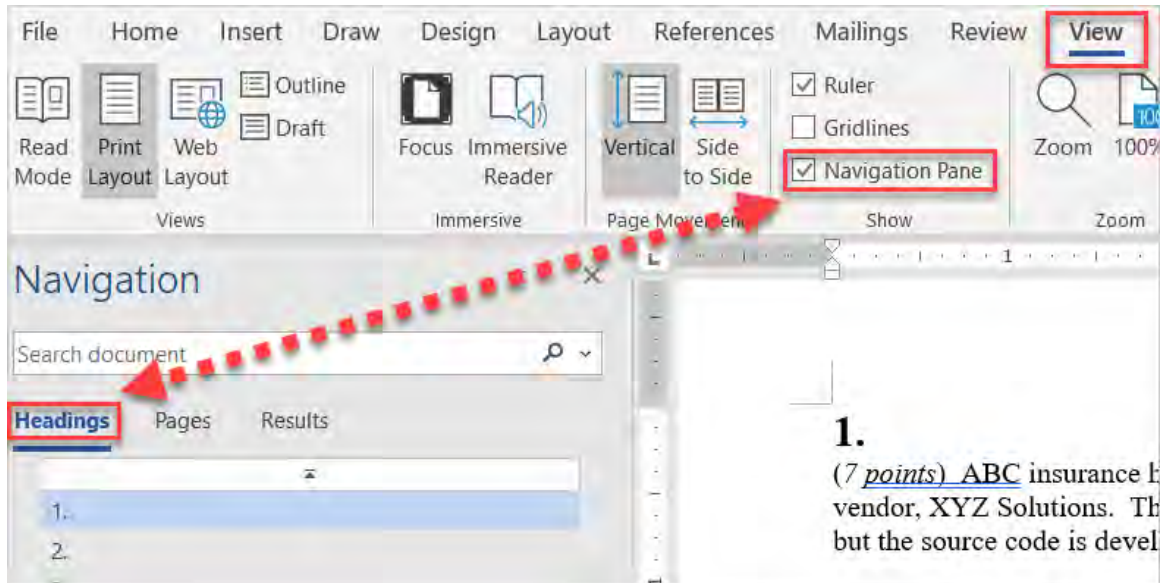
Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).
 - b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename. To maintain anonymity, please refrain from using your name and use your candidate number instead.
4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(6 points) You are the new actuary of a non-contributory defined benefit pension plan registered in Ontario.

You are performing the funding valuation as at December 31, 2024. The last funding valuation was performed and filed by an actuary from another firm as at December 31, 2023.

You are provided with the following plan provisions:

Provision	Description
Normal retirement benefit	Monthly benefit of \$50 per year of credited service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement benefit	3% reduction for each year prior to age 65
Early retirement age	55
Termination benefit	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan
Post-retirement indexation	Ad hoc increase for retiree group of 5% at January 1, 2024 for pensioners with pension in pay as at January 1, 2024 for benefit accrued up to December 31, 2023

The following benefit payment information is obtained from the 2024 financial statements (amounts paid in the calendar year):

Pension	\$53,331
Lump sum	\$79,792

You are also given the following data:

Active member data as at December 31, 2024

ID	Date of birth	Date of participation	Gender	Credited service (years)
1	1968-03-12	2005-01-01	M	20
2	2014-01-30	2011-01-01	F	14
3	1990-10-15	2018-05-01	F	7
4	1984-05-21	2021-01-01	M	4
5	1996-02-15	2013-02-31	M	1
6	1984-12-10	2015-01-01	F	10
7	1987-09-14	2017-01-01	M	8
8	1985-04-23	2014-01-01	F	11
9	1990-10-19	2020-01-01	F	5
10	1982-09-07	2009-01-01	M	16
11	1989-04-30	2019-01-01	M	6

1. Continued

Pensioner data as at December 31, 2024

ID	Status	Age	Gender	Credited service (years)	Form of pension in pay	Pension amount in pay (monthly)
12	Member	71	F	20	J&S	\$900
13	Member	52	M	10	Life, guaranteed 5 years	\$500
14	Surviving spouse	53	F	8	Life Only	\$300
15	Non-spousal beneficiary	45	M	5	J&S	\$200
16	Member	61	F	10	Life Only	\$400
17	Member	58	M	8	Life Only	\$300
18	Surviving spouse	65	F	6	Life Only	\$200
19	Surviving spouse	68	M	12	Life Only	\$500

Terminated members with lump sum payout amounts

ID	Payout year	Payout amount
20	2024	\$25,633
21	2024	\$11,211

- (a) (3 points) Identify potential incorrect, missing, or incomplete data required for the actuarial valuation.

The response for this part is to be provided in the Excel spreadsheet.

You are also the actuary for a large multi-employer pension plan. The Plan Administrator is not able to provide a number of data items required for the actuarial valuation that you need to perform.

- (b) (3 points) Describe the considerations for performing the actuarial valuation given the limitations on the data, taking into consideration the Canadian Institute of Actuaries' Standards of Practice.

ANSWER:

2.

(8 points) Your client, Company ABC, currently sponsors the Hourly Pension Plan, a defined benefit pension plan registered in Ontario. In a recent business transaction, Company ABC acquired Company XYZ. As part of the acquisition agreement, your client will also acquire the Unionized Pension Plan, also registered in Ontario.

Your client wishes to merge the newly acquired pension plan into their existing Hourly Pension plan effective March 1, 2024. Both plans' fiscal year ends on December 31.

You are provided the following information as at March 1, 2024:

	Hourly Pension Plan	Unionized Pension Plan
Solvency Assets	\$800,000	\$90,000
Solvency Liabilities	\$1,000,000	\$100,000

- (a) (4 points) Describe the requirements and considerations for merging the Unionized Pension Plan into the Hourly Pension Plan.

ANSWER:

- (b) (3 points) Calculate the contribution that must be made in order to satisfy the asset transfer funding conditions.

The response for this part is to be provided in the Excel spreadsheet.

- (c) (1 point) Describe the contribution and filing requirements for your client in respect of the two pension plans while waiting for the asset transfer application to be approved.

ANSWER:

3.

(22 points) Your client sponsors a contributory defined benefit pension plan with Ontario members only.

Plan Provisions:

Retirement benefit	1.75% of final 3-year average earnings
Member contribution requirements	6.5% of previous year earnings, contributed at the beginning of the year. Assume employee contribution balances would not generate any excess contribution.
Normal retirement age (NRA)	65
Earliest retirement age (ERA)	55
Unreduced early retirement age (UERA)	62 with 20 or more years of service
Early retirement reduction	20 or more years of service: benefit reduced by 5.0% per year from age 60; Less than 20 years of service: actuarial equivalent to NRA
Termination benefits	Deferred pension starting at age 65 Early commencement from age 55 on an actuarially equivalent basis
Form of payment	Life guaranteed for 5 years
Pre-retirement cost of living adjustment	None
Post-retirement cost of living adjustment	Pensions in payment are increased annually at 100% of inflation

3. Continued

The following information is as at December 31, 2023:

Actuarial Assumptions and Methods:

Going concern assumptions:	
Discount rate	5.00% per year
Inflation	2.00% per year
Salary increases	3.50% per year
Explicit allowance for administrative expenses	\$50,000
Pre-retirement mortality	None
Actuarial cost method	Projected Unit Credit, prorated on service
Retirement age (actives)	Age Rate per year
	62 65.0%
	65 100.0%
Retirement age (deferred)	Assume retirement at NRA
Termination rates	Age Rate per year
	Under 45 5.0%
	45 and over 0.0%
Form of benefit elected	100% of members elect to receive an immediate or deferred pension from the plan
Termination assumption (from active status)	Assume 100% of terminations are involuntary
Assets	Market value of assets

Information for the calculation of the Provision for Adverse Deviation (PfAD)	
Plan type (closed)	5.00%
Asset allocation component (non-fixed income percentage is 55%)	6.00%
Benchmark discount rate (BDR)	7.00%

3. Continued

Solvency and hypothetical wind-up assumptions:	
Exclusions from solvency liabilities	Exclude indexation
<i>Form of benefit settlement elected by member</i>	
Active and deferred Members	100% elect lump sum
Pensioners	100% annuity purchase
<i>Basis for benefits assumed to be settled through a lump sum</i>	
Non indexed rates	4.50% for 10 years, 4.50% thereafter
100% indexed rates	2.70% for 10 years, 2.80% thereafter
<i>Basis for benefits assumed to be settled through the purchase of an annuity</i>	
Non indexed rates	4.60%
100% indexed rates	1.40%
Termination expenses	\$100,000
Retirement age	In accordance with Standards of Practice

Membership information

Active members	ID1	ID2
Age	43	60
Earnings for 2021	\$79,000	\$92,000
Earnings for 2022	\$80,000	\$92,000
Earnings for 2023	\$85,000	\$98,000
Years of service	12.0	7.0

Deferred members	ID3
Age	61
Termination Type	Voluntary
Age at termination	35
Service at termination	9
Annual deferred pension	\$21,000

3. Continued

Pensioners	ID4
Age	75
Spouse's age	73
Retirement date	1/1/2018
January 1, 2024 annual pension	\$53,000
Form of pension	J&S60%

Asset Information:

Market value of assets at December 31, 2023: \$1,888,770

Annuity factors:

[Provided in Excel]

You are performing the actuarial valuation as at December 31, 2023.

- (a) (8 points) Calculate the funded status of the plan on going concern, solvency, and hypothetical wind-up bases.

The response for this part is to be provided in the Excel spreadsheet.

- (b) (4 points) Calculate the available actuarial surplus and minimum required and maximum permissible employer contributions for 2024.

The response for this part is to be provided in the Excel spreadsheet.

- (c) (3 points) Describe the regulatory requirements and process for determining the minimum required and maximum permissible funding requirements in 2025.

The response for this part is to be provided in the Excel spreadsheet.

3. Continued

You are given the following information as at December 31, 2024:

Asset information:

December 31, 2024 market value	\$1,700,000
Pensions paid during 2024	\$50,000

Assumption and liability information:

Hypothetical wind up incremental cost	\$50,000
Assumptions	No change from the prior valuation

- (d) (4 points) Calculate the extrapolated going concern and hypothetical wind-up funded positions as at December 31, 2024.

The response for this part is to be provided in the Excel spreadsheet.

- (e) (3 points) Calculate the minimum required and maximum permissible employer contributions for 2025 assuming you are not filing a complete actuarial valuation as at December 31, 2024.

The response for this part is to be provided in the Excel spreadsheet.

4.

(9 points) Your client established a new non-contributory defined benefit pension plan as at January 1, 2024, which will recognize service prior to plan implementation.

You are given:

Plan Provisions:

Retirement benefit	1.25% of final year's earnings per year of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement age	55
Early retirement reduction	3% per year prior to normal retirement age
Termination benefit	Accrued pension deferred to normal retirement age

Actuarial assumptions and methods:

Discount rate	4.5% per year
Salary increase rate	3.25% per year
Decrements	Beginning of year
Retirement rates	40% at age 55; remainder at age 65
Termination rates	5% per year prior to age 40, 0% thereafter
Other pre-retirement decrements	None

Annuity factors:

$$\ddot{a}_{65}^{(12)} = 14.5; \ddot{a}_{55}^{(12)} = 17.0$$

Participant data at January 1, 2024:

	Member A	Member B
Age	39	50
Years of service	10	15
Earnings (2023)	\$75,000	\$220,000

- (a) (4 points) Calculate the accrued liability and normal cost as at January 1, 2024 using the projected unit credit, prorated on service actuarial cost method

The response for this part is to be provided in the Excel spreadsheet.

4. Continued

- (b) (3 points) Calculate the accrued liability and normal cost as at January 1, 2024, using the Individual Level Premium cost method.

The response for this part is to be provided in the Excel spreadsheet.

- (c) (2 points) Explain, in words, why the results from (a) and (b) above are different.

The response for this part is to be provided in the Excel spreadsheet.

5.

(8 points) Company ABC sponsors a defined benefit pension plan registered in Ontario and has decided to wind up the plan effective December 31, 2024.

You are given:

Plan Provisions:

Retirement benefit	1% up to the 3-year average YMPE plus 1.5% of the 3-year final average earnings above the 3-year average YMPE, multiplied by years of credited service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement age	55
Earliest unreduced retirement age	60 with 10 years of service
Early retirement reduction	Retirement prior to 10 years of service: actuarial reduction With 10 or more years of service: 6% per year from age 60
Pre and post-retirement annual indexation	None

Wind-up Assumptions:

Form of benefit settlement elected by member	
Active under age 55	100% lump sum election
Active age 55 and older	75% annuity purchase 25% lump sum election
Basis for benefits assumed to be settled through a commuted value	
Discount rate	4.00% for the first 10 years, 4.50% thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
Discount rate	5.00%
Plan termination expenses	\$50,000

5. Continued

Participant Data at December 31, 2024:

Employee	Member A	Member B
Age	50	58
Earnings for 2022	\$56,000	\$94,000
Earnings for 2023	\$58,000	\$97,000
Earnings for 2024	\$60,000	\$100,000
Service (years)	3	11
Province of employment	Ontario	Ontario

Additional Information:

Market value of assets as at December 31, 2024: \$200,000

3-year average YMPE as at December 31, 2024: \$66,667

[Annuity purchase factors are provided in Excel]

[Commutated value factors are provided in Excel]

- (a) (4 points) Calculate the wind-up funded status of the plan as at December 31, 2024 and the contribution requirements for 2025.

The response for this part is to be provided in the Excel spreadsheet.

- (b) (4 points) Describe the regulatory wind-up process in Ontario.

ANSWER:

6.

(10 points) Your client sponsors a non-contributory defined benefit pension plan with two members. The plan completes annual going concern valuations. You are given:

Pension Plan Provisions

Normal retirement benefit	1.50% of final year's earnings multiplied by service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age (NRA)	65
Early retirement provisions	Members can retire as early as age 55 with a 1/4% per month reduction from NRA. Members who retire on or after age 62 with 25 years of service are eligible for an unreduced bridging benefit of 0.75% of final year's earnings multiplied by service, payable monthly in advance up until age 65.
Termination benefit	Deferred pension payable at age 65. Retirement from age 55 possible on an actuarially equivalent basis
Optional forms	Actuarially equivalent to the normal form of payment

Actuarial Assumptions

Discount rate	5.00% per year	
Salary increase rate	3.00% per year	
Retirement rates	Age	Rate
	62	50%
	63	50%
	64	50%
	65	100%
Termination rates	Age	Rate
	45	2.00%
	50	1.00%
Other pre-retirement decrements	None	
Timing of decrements	Beginning of year	
Asset valuation method	Investment gains and losses are amortized over three years	
Actuarial cost method	Projected Unit Credit	

6. Continued

Participant Data at December 31, 2023

	Member A	Member B
Age	62	45
Service (years)	25	5
2023 salary	\$85,000	\$60,000
2024 salary	\$90,000	N/A

Annuity Factors

$\ddot{a}_{62}^{(12)} = 14.3$	$\ddot{a}_{62}^{(12):3} = 2.8$
$\ddot{a}_{63}^{(12)} = 14.0$	$\ddot{a}_{63}^{(12):2} = 1.9$
$\ddot{a}_{64}^{(12)} = 13.8$	$\ddot{a}_{64}^{(12):1} = 0.9$
$\ddot{a}_{65}^{(12)} = 13.5$	

You are given:

	Member A	Member B
Actuarial liability as at December 31, 2023	\$443,826	\$41,448
2024 normal cost	\$17,753	\$8,198
Actuarial liability as at December 31, 2024	\$484,102	N/A

Member B terminated and received a lump sum of \$26,702 on December 31, 2024.

Additional Information

2022 investment gain/(loss)	\$9,000
2023 investment gain/(loss)	(\$33,000)
Market value of assets at December 31, 2023	\$410,000
Contribution made on June 30, 2024	\$30,000
Fund rate of return during 2024	15.0%
Salary increase rate assumption effective December 31, 2024	4.00%
All other assumptions for the December 31, 2024 valuation	No change

An actuarial valuation was performed as at December 31, 2024.

Calculate the gains and losses by source for 2024.

The response for this part is to be provided in the Excel spreadsheet.

7.

(8 points) You are the new actuary for Company ABC. You have been asked to review the following email from the prior actuary for Company ABC.

“The purpose of this email is to provide additional information to the Union representatives regarding a potential benefit improvement to the ABC Pension Plan (the “Plan”) as at January 1, 2024.

Based on prior discussions, Company ABC would like to improve pension benefits from the Plan as follows:

- *Adding an early retirement subsidy that allows employees to retire with an unreduced pension at age 62 instead of age 65, for those with at least 20 years of service.*

Plan Provisions & Membership Data

These estimates are based on the plan provisions we have on file and the membership data used for the most recent valuation, reflecting data changes received from Management.

Actuarial Assumptions & Methods

We have adjusted the actuarial assumptions from the most recent actuarial valuation report. The assumption changes that had a material impact on the results are:

	Valuation – January 1, 2023	Costing – January 1, 2024
Retirement age	50% at 63, 50% at 65	100% at 65
Discount rate	5.5%	6.0%

Results

The estimated increase in going concern liabilities as of January 1, 2024 is \$3,000,000 and the estimated increase in normal cost as of January 1, 2024 for the following year is \$90,000.

Regards,

J.Q. Actuary, FCIA”

- (a) (4 points) Describe areas of non-compliance with Canadian actuarial professional standards.

ANSWER:

7. Continued

- (b) (4 points) Recommend a course of action to address the non-compliance. Justify your answer.

ANSWER:

8.

(9 points)

- (a) (3 points) Describe the considerations in setting the base mortality assumption for a going concern valuation of a defined benefit pension plan

ANSWER:

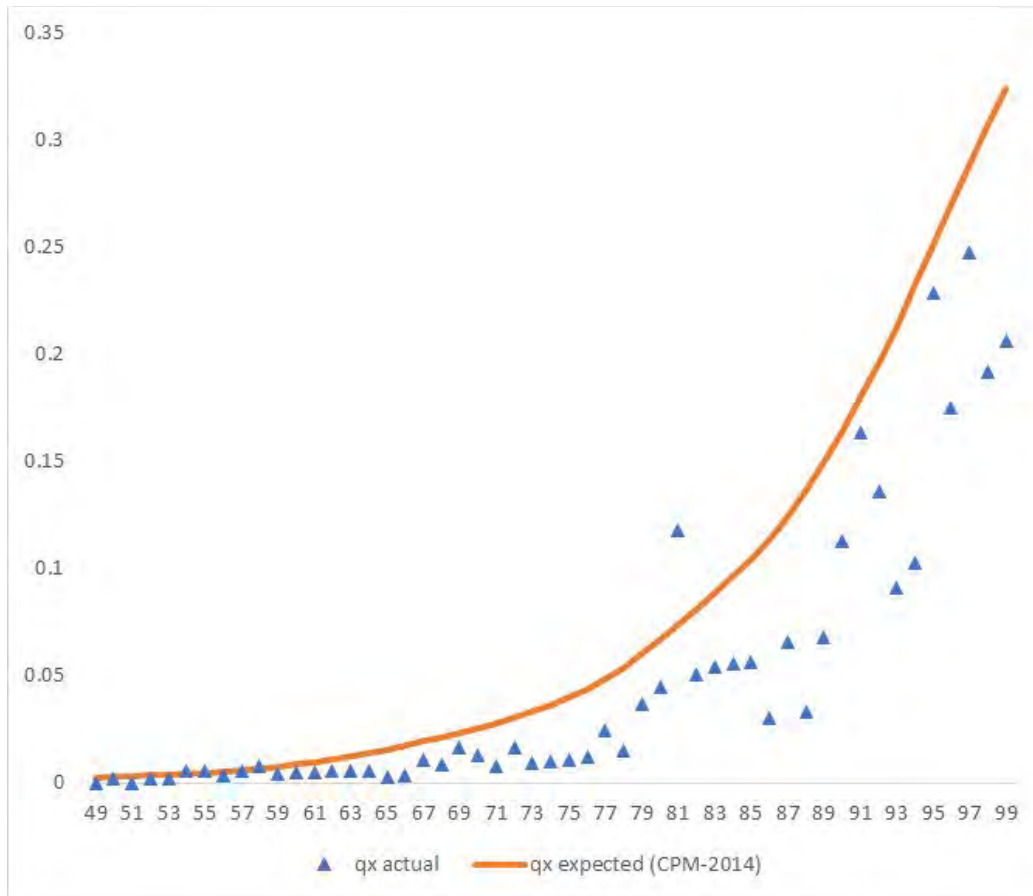
- (b) (3 points) Describe the assumptions needed to establish a mortality improvement scale for a going concern funding valuation of a defined benefit pension plan.

ANSWER:

You are performing the January 1, 2024 going concern valuation for a defined benefit pension plan for high earning professionals. The mortality assumption used for the prior valuation was 100% of the CPM2024Priv table. You have been provided with mortality experience study results for the plan. A summary of the experience study results, as well as the expected deaths based on the CPM2014Priv table, is provided below:

Age groups	Number of lives	Benefit amount (\$)	Actual deaths (lives)	Actual deaths (\$ benefit amount)	Expected Deaths (lives)	Expected Deaths (\$ benefit amount)
<50	525	69,483,834	-	0	1	173,779
50-59	5,374	583,586,749	20	2,231,949	26	2,840,836
60-69	3,278	372,712,744	20	2,187,214	47	5,171,926
70-79	990	165,064,022	14	2,308,197	37	5,924,877
79+	567	90,072,179	54	8,701,415	86	13,849,314
Total	10,734	1,280,919,528	108	15,428,775	197	27,960,732

8. Continued



- (c) (3 points) Describe the considerations for adjusting the base mortality assumption for the January 1, 2024 going concern valuation.

ANSWER:

****END OF EXAMINATION****