Exam RETFRC

Funding & Regulation Exam - Canada

Date: Thursday, April 24, 2025

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 7 questions numbered 1 through 7 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.

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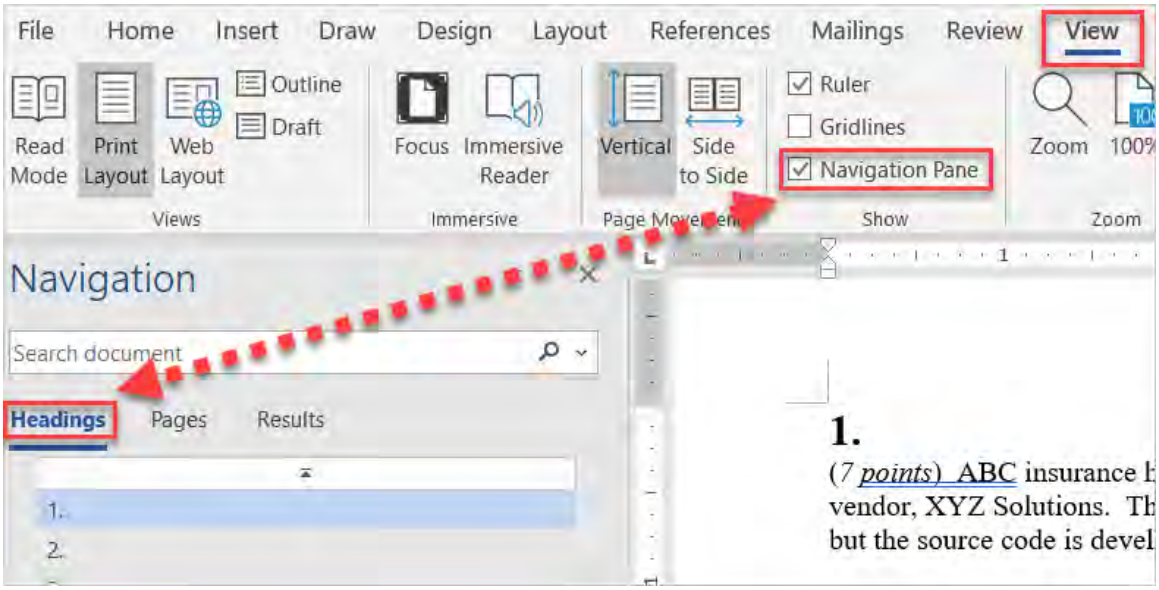
Navigation Instructions

Open the Navigation Pane to jump to questions.

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



1.

(*9 points*) XYZ Company sponsors a defined benefit pension plan registered in Ontario.

The asset smoothing method for the funding valuation is described as follows:

- The Adjusted Value of Assets is set equal to the Market Value of Assets with a linear recognition of both realized and unrealized gains and losses over a 7-year period.
- The Adjusted Value of Assets is constrained by a corridor such that it is no less than 90% of the Market Value of Assets, and no greater than 105%.

(a) (*3 points*) Assess the appropriateness of the above asset smoothing valuation method, taking into consideration the Canadian Institute of Actuaries' guidance on asset valuation methods.

ANSWER:

(b) (*4 points*) Describe the advantages and disadvantages of using asset smoothing for:

(i) Going concern valuations; and

(ii) Solvency valuations

ANSWER:

(c) (*2 points*) Describe the considerations for changing the asset valuation methods from one actuarial valuation to the next, taking into account the actuarial standards of practice.

ANSWER:

2.

(*23 points*) Your client sponsors a non-contributory defined benefit pension plan with members in Ontario only.

Plan Provisions:

Retirement benefit	1.75% of final 3-year average earnings
Normal retirement age (NRA)	65
Earliest retirement age	55
Early retirement reduction	20 or more years of service: benefit reduced by 4.0% 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 only
Cost of living adjustments	None

The following information is as at December 31, 2023:

Actuarial Assumptions and Methods:

Going concern assumptions		
Discount rate	5.00% per year	
Provision for Adverse Deviation (PfAD)	7.00%	
Salary increases	3.00% per year	
Pre-retirement mortality	None	
Actuarial cost method	Projected Unit Credit, prorated on service	
Retirement age (actives)	**Age**	**Rate per year**
	60	70.0%
	65	100.0%
Retirement age (deferred)	Assume retirement at NRA	
Termination rates	**Age**	**Rate per year**
	35	10.0%
	45	5.0%
Asset valuation method	Market value of assets	

2. Continued

Solvency assumptions	
Form of benefit settlement elected by member:	
Active and deferred members	Under age 55: 100% elect lump sum Age 55 and over: 100% elect an annuity
Pensioners	100% annuity purchase
Basis for benefits assumed to be settled through a lump sum	
Discount rates	4.50% per year for 10 years; 4.50% per year thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
Discount rate	4.55% per year
Plan termination expenses	$400,000
Retirement age	In accordance with Standards of Practice

Membership information at December 31, 2023:

Active members	**ID1**	**ID2**
Age	60	40
Earnings for 2021	$149,000	$97,000
Earnings for 2022	$149,000	$98,000
Earnings for 2023	$150,000	$100,000
Years of service	20	6

Deferred members	**ID3**
Age	60
Termination type	Voluntary
Monthly deferred pension	$3,000

Pensioners	**ID4**	**ID5**	**ID6**
Age	61	55	76
Spouse's age	60	52	70
Monthly pension	$2,200	$1,600	$4,000
Form of pension	J&S60%	J&S60%	J&S100%

Asset Information:

Market value of assets as at December 31, 2023: $2,500,000

2. Continued

Annuity factors:
[Provided in Excel]

You are asked to perform the actuarial valuation as at December 31, 2023.

(a) (*8 points*) Calculate the funded status of the plan on going concern and solvency bases.

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

You are given the amortization schedules as at December 31, 2022 from the prior valuation:

Type	Monthly amortization payment	Date established	Start date	Date of last payment
Going concern	$500	12/31/2022	1/1/2024	12/31/2033
Solvency	$2,400	12/31/2022	1/1/2024	12/31/2028

(b) (*5 points*) Calculate the minimum required and maximum permissible employer contributions for 2024 and the new amortization schedule.

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

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

- On December 31, 2024 a buy-out group annuity was purchased for pensioners ID4 and ID5 (annuities were discharged)
- ID2 terminated and elected a lump sum payment of $60,000
- ID3 retired
- Decrements and the lump sum payment occurred at the end of the year

Membership information as at December 31, 2024:

	Status	**Age**	**Monthly benefit**	**Credited service**	**Earnings for 2024**
ID1	Active	61	n/a	21	$154,500
ID2	Terminated	41	n/a	n/a	$110,000
ID3	Retired	61	$2,400	n/a	n/a
ID4	Annuity Buyout	62	$2,200	n/a	n/a
ID5	Annuity Buyout	56	$1,600	n/a	n/a
ID6	Retired	77	$4,000	n/a	n/a

2. Continued

Actuarial Assumptions and Methods:
The going concern assumptions and methods as at December 31, 2024 are unchanged from those used in the December 31, 2023 valuation.

Asset Information:

	2024
January 1 market value of assets	2,500,000
Contributions (mid-year)	85,500
Pension paid	(93,600)
Lump sums paid	(60,000)
Annuity purchase	(700,000)
Administration and investment fees (mid-year)	(65,120)
Investment income	80,000
Realized and unrealized gains (losses)	(146,780)
December 31 market value of assets	1,600,000

(c) (*10 points*) Calculate the gains and losses by source on a going concern basis for 2024.

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

3.

(*11 points*) Your client sponsors a non-contributory defined benefit pension plan.

You are given:

Plan Provisions

Eligibility	The plan was closed to new entrants as of January 1, 2017
Retirement benefit	2.0% of final 5-year average earnings multiplied by years of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement age	55
Early retirement reduction (from active status)	0.25% reduction per month from age 65
Termination benefit	Accrued pension deferred to normal retirement age Early commencement from age 55 on an actuarially equivalent basis
Post-retirement cost of living adjustments	None

Actuarial Assumptions and Methods for Funding Purposes as at January 1, 2024

Discount rate	5.0% per year	
Inflation	2.0% per year	
Salary increases rate	3.5% per year	
Retirement rates	**Age**	**Rate**
	55	25%
	60	50%
	62	75%
	65	100%
Annual termination rates	**Age**	**Rate**
	Up to 45	10%
	Between 45 and 55	8%
Other pre-retirement decrements	None	
Expense allowance	Investment expenses: 1.0% implicit in discount rate Non-investment expenses: $450,000 per year	
Actuarial cost method	Projected unit credit, prorated on service	
Asset valuation method	Market value of assets	

3. Continued

January 1, 2024 membership data summary

Type	Count	Average age	Average service	Average monthly pension
Active	20	55	25 years	$4,500 (accrued)
Deferred	15	50		$2,000
Pensioners	80	70		$3,500

Your client is concerned with the high turnover rates experienced in the last few years. In an effort to improve employee retention, your client has done the following:

- Effective January 1, 2025 the early retirement provision of the plan was changed to 0.25% reduction per month before the earlier of:
    - 85 points (age + years of service) and
    - Age 65
- Salaries will be increased by 6% per year for the next three years.

Additionally, your client has decided to de-risk the plan, and the plan's target asset mix as stipulated in its Statement of Investment Policies and Procedures was changed as follows:

Prior to December 31, 2024:

Asset class	Target asset allocation
Canadian equities	30%
Global equities	30%
Universe bonds	35%
Cash equivalents	5%

Effective January 1, 2025:

Asset class	Target asset allocation				
	Jan. 1, 2025	Jan. 1, 2027	Jan. 1, 2029	Jan. 1, 2031	Jan. 1, 2033
Canadian equities	30%	25%	25%	15%	10%
Global equities	25%	20%	10%	10%	5%
Universe bonds	40%	50%	60%	70%	80%
Cash equivalents	5%	5%	5%	5%	5%

3. Continued

(a) (*5 points*) Describe the considerations for setting the going concern discount rate for the January 1, 2025 funding valuation.

ANSWER:

(b) (*6 points*) Describe the considerations for setting the following assumptions for the funding valuation as at January 1, 2025:

(i) Salary increase rates

(ii) Retirement rates

(iii) Termination rates

ANSWER:

4.

(*8 points*) ABC company sponsors a defined benefit pension plan registered in Ontario with members across Canada. You are given the following:

Plan Details:

Eligibility for early retirement	55
Eligibility for unreduced early retirement	Age 55 with 30 years of credited service
Eligibility for portability	All ages
Early retirement reductions	5% per year from 65
Normal retirement age	65
Indexation	None

You are also provided with the following information for a recently terminated member of that plan:

Personal Information:

Date of birth	February 1, 1980
Date of termination	February 1, 2024
Termination type	Voluntary
Pensionable service (years)	23
Accrued benefit (annual)	$17,500
Province of employment	Ontario

4. Continued

You are given the following bond yields:

Month	Government of Canada 7-year Bond (V122542)	Government of Canada Long-term Bond (V122544)	Government of Canada 10-year Bond (V122553)
Jan 2024	3.32%	3.27%	1.63%
Feb 2024	3.52%	3.40%	1.66%
Mar 2024	3.41%	3.35%	1.51%

Month	Mid-Term Provincial Bond Index	Mid-Term Corporate Bond Index	Mid-Term Federal Non-Agency Bond Index
Jan 2024	3.91%	4.90%	3.35%
Feb 2024	4.09%	5.01%	3.54%
Mar 2024	3.99%	4.91%	3.43%

Month	Long-Term Provincial Bond Index	Long-Term Corporate Bond Index	Long-Term Federal Non-Agency Bond Index
Jan 2024	4.26%	5.06%	3.30%
Feb 2024	4.38%	5.11%	3.44%
Mar 2024	4.35%	5.08%	3.38%

(a) (*3 points*) Calculate the non-indexed commuted value discount rates under section 3500 of the Canadian Institute of Actuaries Standards of Practice as at the member's date of termination.

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

4. Continued

You are given the following annuity factors:

$_{11|}\ddot{a}_{44}^{(12)} =$ 10.7
$_{12|}\ddot{a}_{44}^{(12)} =$ 10.1
$_{13|}\ddot{a}_{44}^{(12)} =$ 9.5
$_{14|}\ddot{a}_{44}^{(12)} =$ 9.0
$_{15|}\ddot{a}_{44}^{(12)} =$ 8.5
$_{16|}\ddot{a}_{44}^{(12)} =$ 8.0
$_{17|}\ddot{a}_{44}^{(12)} =$ 7.5
$_{18|}\ddot{a}_{44}^{(12)} =$ 7.1
$_{19|}\ddot{a}_{44}^{(12)} =$ 6.7
$_{20|}\ddot{a}_{44}^{(12)} =$ 6.3
$_{21|}\ddot{a}_{44}^{(12)} =$ 5.9

(b) (*3 points*) Calculate the commuted value for the member at their date of termination.

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

The following hypothetical wind-up information was reported in the last filed valuation as at June 30, 2023.

Market Value of Assets	$2,500,000
Termination Expense	$100,000
Wind-up Assets	$2,400,000
Wind-up Liabilities	$3,250,000
Transfer Ratio	77%

4. Continued

The total of the lump sum commuted values paid from the pension fund between June 30, 2023 and January 31, 2024 is $540,000. The terminated member would like the commuted value calculated in part b) to be paid in February 2024.

The transfer ratio was estimated to be 77% as at February 1, 2024.

(c) (*2 points*) Describe the considerations in paying out the commuted value to this member.

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

5.

(*8 points*) Compare and contrast the CAPSA Recommendations on Funding of Benefits for Plans other than Defined Contribution Plans to the Ontario Pension Benefits Act in respect of the following:

(i) Going concern and solvency funding;

(ii) Amortization periods;

(iii) Side car funds;

(iv) Letters of credit; and

(v) Contribution holidays

ANSWER:

6.

(*13 points*) Your client sponsors a contributory defined benefit pension plan registered in Ontario. You are given:

Plan Provisions:

Normal retirement benefit	1.5% of final 3-year average earnings multiplied by years of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement benefit for active members	3% reduction for each year prior to age 65
Early retirement benefit for deferred members	Actuarial equivalent
Termination benefit	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan
Member Contribution Requirement	4% of pensionable earnings Assume employee contribution balances would not generate any 50% excess contributions

Actuarial Assumptions and Methods:

Interest rate	5% per year
Salary increase rate	3% per year
Retirement age	Age 63 for members age 62 or younger, and 1 year after the valuation date for others
Pre-retirement decrements	None
Actuarial cost method	Entry Age Normal
Asset valuation method	Market value of assets

Participant Data as at January 1, 2024:

	Member A	**Member B**	**Member C**	**Member D**	**Member E**
Age	35	50	67	62	42
2021 salary	$61,000	N/A	N/A	$103,000	$52,000
2022 salary	$63,000	N/A	N/A	$106,000	$55,500
2023 salary	$65,000	N/A	N/A	$109,000	$59,000
Service	5	18	29	9	7
Annual pension	N/A	$17,000	$39,000	N/A	N/A
Status	Active	Deferred	Retired	Active	Active
Province of employment	Ontario	Ontario	Ontario	Ontario	Ontario

6. Continued

Annuity Factors:

$\ddot{a}_{65}^{(12)} = 14.2$ $\ddot{a}_{67}^{(12)} = 13.7$
$\ddot{a}_{64}^{(12)} = 14.5$ $\ddot{a}_{68}^{(12)} = 13.4$
$\ddot{a}_{63}^{(12)} = 14.8$

Additional Information:

Market value of assets as at January 1, 2024: $880,000

(a) (*4 points*) Calculate the employer normal cost and the unfunded actuarial liability as at January 1, 2024.

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

You are given:

- All assumptions remain the same as at January 1, 2025;
- The fund earned a rate of return of 12% during 2024;
- Total contributions of $67,000 were made to the plan on December 31, 2024;
- At December 31, 2024, Member A received a 10% salary increase;
- At December 31, 2024, Member D received a 3% salary increase; and
- Member E passed away during 2024 and a commuted value of $87,000 was paid to their spouse on December 31, 2024.

(b) (*3 points*) Calculate the unfunded actuarial liability as at January 1, 2025.

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

(c) (*6 points*) 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*)

(a) (*4 points*) Describe the considerations for setting the assumptions required to calculate the solvency incremental cost (SIC).

ANSWER:

You are the actuary for Company ABC's defined benefit pension plan registered in Ontario. In October 2024, Company ABC went to market to purchase annuities for all deferred vested members and pensioners; however, the quotations received were higher than expected and Company ABC decided not to transact.

You are preparing the December 31, 2024 solvency actuarial valuation for Company ABC's pension plan.

You are given:

Group	**Duration for benefits assumed to be settled by an annuity purchase**
Active members	16
Deferred members	10
Pensioners	8

You are considering using different assumption bases for benefits assumed to be settled by purchase of annuities for the group included in the annuity quote and for the active members.

(b) (*4 points*) Describe the considerations for setting the solvency assumptions for benefits assumed to be settled by purchase of annuities for:

(i) the group included in the annuity quote; and

(ii) active members

ANSWER:

****END OF EXAMINATION****