Exam RETFRC

Funding & Regulation Exam - Canada

Date: Thursday, April 25, 2024

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 five-digit candidate number in the filename.

4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

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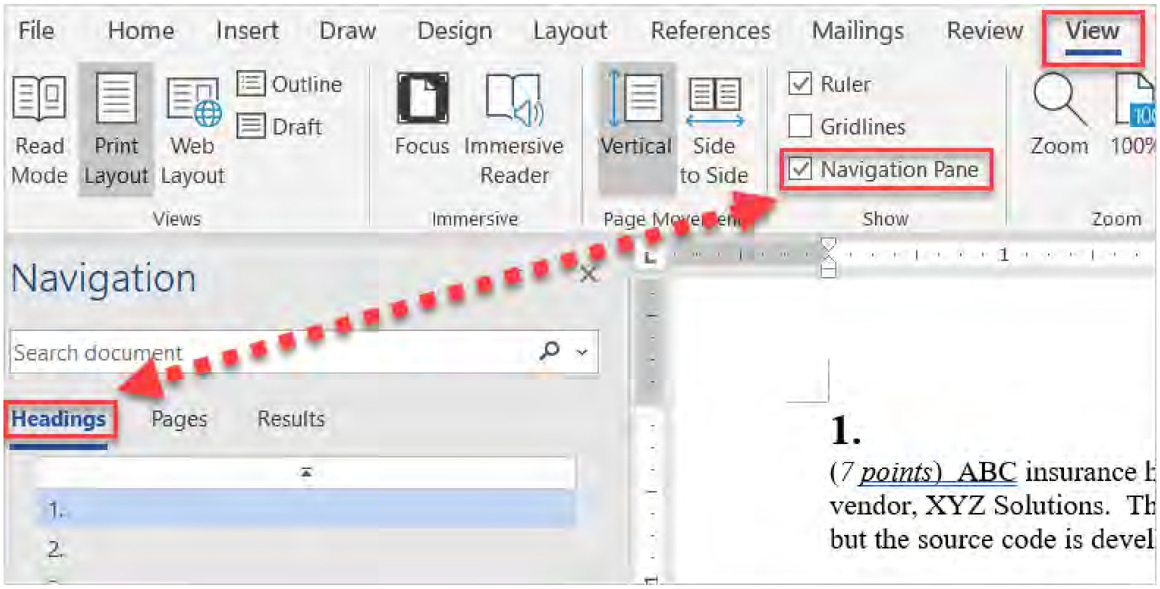
Navigation Instructions

Open the Navigation Pane to jump to questions.

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



1.

(*6 points*) You are the actuary for XYZ Company. You have just completed the December 31, 2023 actuarial valuation for XYZ's defined benefit pension plan but have not filed the report. Your client has decided to change the asset mix on March 1, 2024 as follows:

	Curent asset mix	**New asset mix**
Equities	60%	5%
Bonds	40%	95%

The new asset mix will be implemented before you file the valuation report.

(a) (*4 points*) Describe how the asset mix change affects the December 31, 2023 valuation taking into consideration the Standards of Practice.

ANSWER:

(b) (*2 points*) Describe how the asset mix change would have affected the December 31, 2023 valuation if you had learned of the change after the valuation report was filed.

ANSWER:

2.

(*30 points*) Your client sponsors a single employer contributory defined benefit pension plan registered in Ontario.

Plan provisions:

Retirement benefit:	2.00% of final 5-year average earnings multiplied by years of service
Member contributions:	8% of earnings
Normal retirement age (NRA):	Age 65
Earliest retirement age (ERA):	Age 55
Unreduced retirement age (URA):	Age 55 and 30 years of service
Early retirement reduction:	3% per year from earlier of URA and NRA
Termination benefits:	Pension deferred to NRA
Normal form of pension:	Life guaranteed for 5 years
Pre-retirement cost of living adjustments:	Deferred pensions are increased annually at 100% of CPI
Post-retirement cost of living adjustments:	Pensions in payment are increased annually at 100% of CPI

You are given the following information as at January 1, 2023:

Asset information:

Market value of assets:	$1,875,870

2. **Continued**

<u>Membership information:</u>

Member ID:	**A**	**B**	**C**	**D**
Member Status	**Active**	**Active**	**Retired**	**Retired**
Age (in years):	49	60	66	70
Earnings for 2018:	63,000	96,000	n/a	n/a
Earnings for 2019:	65,000	97,000	n/a	n/a
Earnings for 2020:	67,000	105,000	n/a	n/a
Earnings for 2021:	70,000	110,000	n/a	n/a
Earnings for 2022:	75,000	120,000	n/a	n/a
Years of service:	15.0	8.0	n/a	n/a
January 1, 2023 annual pension:	n/a	n/a	42,000	36,000
Age at retirement:	n/a	n/a	60	65
Form of pension:	n/a	n/a	Life guaranteed for 5 years	Life guaranteed for 5 years

2. Continued

<u>Actuarial assumptions and methods:</u>

Going concern assumptions:

<table>
<tr><td>Discount rate:</td><td colspan="2">5.00% per year</td></tr>
<tr><td>Inflation rate:</td><td colspan="2">2.00% per year</td></tr>
<tr><td>Salary increase:</td><td colspan="2">4.00% per year</td></tr>
<tr><td>Pre-retirement mortality:</td><td colspan="2">None</td></tr>
<tr><td>Actuarial cost method:</td><td colspan="2">Projected Unit Credit, prorated on service</td></tr>
<tr><td rowspan="2">Retirement age (actives):</td><td>Age</td><td>Rate per year</td></tr>
<tr><td>URA:
NRA:</td><td>50%
100%</td></tr>
<tr><td rowspan="2">Termination rates (all involuntary):</td><td>Age</td><td>Rate per year</td></tr>
<tr><td>Under age 50:
50 and over:</td><td>5.0%
0.0%</td></tr>
<tr><td>Form of benefit elected:</td><td colspan="2">100% of members elect to receive an immediate or deferred pension from the plan</td></tr>
<tr><td>Assets:</td><td colspan="2">Market value of assets</td></tr>
<tr><td>Explicit expense allowance for administrative expenses:</td><td colspan="2">$10,000</td></tr>
</table>

<u>Information for calculation of the provision for adverse deviations (PfAD):</u>

Plan type (Closed):	5.00%
PfAD asset mix component:	4.00%
Benchmark discount rate (BDR):	6.50%

2. Continued

<u>Solvency and hypothetical wind-up assumptions:</u>

Solvency basis:	Solvency excludes indexation
Form of benefit settlement elected by member	
- Active and deferred members:	100% elect lump sum
- Pensioners:	100% annuity purchase
Basis for benefits assumed to be settled through a lump sum	
- Discount rate:	4.1% per year for 10 years; 4.1% per year thereafter
- Inflation rate:	1.9% per year for 10 years; 1.9% per year thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
- Discount rate:	3.8% per year
- Inflation rate:	2.1% per year
Plan termination expenses:	$200,000
Retirement age:	In accordance with Standards of Practice

<u>Amortization schedules from previous valuation:</u>

	Monthly amortization payment	Number of years remaining
Going concern	5,000	7
Solvency	2,500	2

<u>Annuity Factors:</u>

[Provided in the Excel worksheet]

(a) (*12 points*) Calculate the funded status of the plan on going concern, solvency and hypothetical wind-up bases as at January 1, 2023.

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

(b) (*3 points*) Calculate the minimum required and maximum permissible contributions for 2023 based on the January 1, 2023 valuation.

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

2. **Continued**

You are provided with the following asset and demographic experience for the period from January 1, 2023 to December 31, 2023:

2023 asset reconciliation ($):

January 1, 2023 market value of assets:	1,875,870
Employer contributions:	240,000
Member contributions:	12,300
Pension paid:	(78,000)
Administration fees:	(25,000)
Investment income:	(600,000)
December 31, 2023 market value of assets:	1,425,170

Demographic experience in 2023:

- Member A received a salary increase of 5.00%
- Member B received a salary increase of 4.00%
- Member D died on December 15, 2023
- Cost of living adjustment for pensions in pay of 7% effective January 1, 2024

The going concern assumptions for the January 1, 2024 valuation remain unchanged from the prior valuation.

(c) (*5 points*) Calculate the funded status on a going concern basis as at January 1, 2024.

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

(d) (*8 points*) Calculate the actuarial gains and losses by source for the period between January 1, 2023 and December 31, 2023.

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

The plan remains in a solvency surplus at January 1, 2024 and your client decides to file the January 1, 2024 valuation.

(e) (*2 points*) Explain why your client may have decided to file the January 1, 2024 valuation.

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

3.

(*9 points*) Company ABC sponsors a defined benefit pension plan registered in Ontario that is closed to new participants. You are setting the going concern discount rate assumption for the actuarial valuation as at December 31, 2023.

The plan's target asset mix as stipulated in its Statement of Investment Policies and Procedures (SIPP) is as follows:

Asset class	**Target asset allocation**
Long-term bonds	40%
Canadian equities	25%
Global equities	25%
Real estate	10%

You are given the following information:

- The total investment management fees are expected to be 0.5%, of which 0.2% are for passive investment management only
- The non-investment related administrative expenses are expected to be 0.4%
- Long-term expected inflation of 2.2% per year
- Long-term expected real returns of the various asset classes are as follows:

Asset class	**Long-term expected real return**
Long-term bonds	2.5%
Canadian equities	4.8%
Global equities	5.0%
Real estate	4.5%

- 75% of the target allocation to long-term bonds meets the minimum credit rating per Ontario regulations
- Duration of the going concern liabilities is 15

3. Continued

<u>Non-fixed income component of the Provision for Adverse Deviations (PfAD):</u>

% of non-fixed income assets	Closed plans	Open plans
0%	0%	0%
20%	2%	1%
40%	4%	2%
50%	5%	3%
60%	7%	4%
70%	11%	6%
80%	15%	8%
100%	23%	12%

- Benchmark Yield of Government of Canada Long-Term Bonds (V39056) at December 31, 2023 is 3.0%

(a) (*3 points*) Calculate the best estimate going concern discount rate using the building block approach.

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

Company ABC is considering a de-risking glide-path investment strategy whereby the asset mix will be gradually shifted from equities into bonds, dependent on the solvency funded status of the plan. The final trigger in the de-risking glide-path is scheduled to occur when the plan is 100% funded on a solvency basis, at which point the asset mix of the plan would become:

Asset class	End state target asset allocation
Long-term bonds	80.0%
Canadian equities	2.5%
Global equities	2.5%
Real estate	15.0%

(b) (*3 points*) Describe the considerations for establishing a going concern discount rate for the next valuation if the de-risking glide-path investment strategy is adopted by Company ABC.

ANSWER:

3. **Continued**

(c) (*3 points*) Determine the PfAD applicable for a valuation at December 31, 2023 assuming Company ABC adopted the de-risking glide-path investment strategy and that the current target asset allocation in the SIPP has not changed.

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

4.

(*11 points*) You are given the following information for two members who have terminated from a single-employer defined benefit pension plan registered in Ontario:

Personal Information:

	Member A	**Member B**
Date of birth:	January 1, 1974	January 1, 1989
Date of termination:	January 1, 2024	January 1, 2024
Pensionable service (years):	5	15
Eligibility service (years):	6	15
Contribution with interest at date of termination:	25,000	100,000

	Member A		**Member B**			
Year	**Pensionable service**	**Salary**	**Pensionable service**	**Salary**	**ITA maximum DB pension limit**	**YMPE**
2009			1	75,000	2,444.44	46,300
2010			1	77,500	2,494.44	47,200
2011			1	80,000	2,552.22	48,300
2012			1	82,400	2,646.67	50,100
2013			1	83,000	2,696.67	51,100
2014			1	85,200	2,770.00	52,500
2015			1	85,700	2,818.89	53,600
2016			1	85,900	2,890.00	54,900
2017			1	86,400	2,914.44	55,300
2018			1	84,800	2,944.44	55,900
2019	1	210,000	1	84,800	3,025.56	57,400
2020	1	215,000	1	85,100	3,092.22	58,700
2021	1	245,000	1	85,400	3,245.56	61,600
2022	1	255,500	1	86,000	3,420.00	64,900
2023	1	230,000	1	86,500	3,506.67	66,600

4. Continued

<u>Plan Provisions:</u>

Normal retirement age (NRA):	Age 65
Normal retirement benefit:	2% of the average of the best 5 years of salary multiplied by pensionable service
Eligibility for early retirement:	Age 55
Early retirement benefit:	Unreduced at age 62, otherwise 3% reduction per year from age 62. Bridge pension: $500 annual pension multiplied by years of pensionable service payable on or after age 62 to the earlier of age 65 or death.
Termination benefit:	Deferred pension starting at the NRA reduced by 4% per year from age 65
Portability:	Lump sum commuted value option permitted at all ages
Cost-of-living adjustments:	2% per year, pre-retirement and post-retirement
ITA maximum pension test:	Calculated at pension commencement date

You are given the following bond yields:

Month	V122542 (7 year)	V122544 (long)	V122553 (real)	Mid-Term Provincial Bond Index	Long-Term Provincial Bond Index
November 2023	3.37%	3.30%	1.35%	4.01%	4.34%
December 2023	2.90%	3.04%	1.34%	3.58%	4.09%
January 2024	2.92%	3.06%	1.37%	3.65%	4.15%

Month	Mid-Term Corporate Bond Index	Long-Term Corporate Bond Index	Mid-Term Federal Non-Agency Bond Index	Long-Term Federal Non-Agency Bond Index
November 2023	5.17%	5.29%	3.38%	3.05%
December 2023	4.95%	5.12%	2.92%	3.05%
January 2024	5.00%	5.15%	2.95%	3.05%

<u>Annuity factors:</u>

[Provided in the Excel worksheet]

4. Continued

(a) (*4 points*) Calculate the non-indexed commuted value interest rates under Section 3500 of the Canadian Institute of Actuaries' Standards of Practice as at the date of termination.

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

(b) (*1 point*) Calculate the implied inflation rates under Section 3500 of the Canadian Institute of Actuaries' Standards of Practice as at the date of termination.

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

(c) (*6 points*) Calculate the commuted value at the members' date of termination assuming the members terminated:

(i) Voluntarily; and

(ii) Involuntarily

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

5.

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

You are given:

<u>Plan Provisions:</u>

Retirement benefit:	2% of final year's earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Early retirement age:	Age 55
Early retirement reduction:	Retirement prior to 10 years of service: actuarial reduction With 10 or more years of service: 3% per year from age 65
Employee contributions:	8% of earnings
Termination benefit:	Accrued pension deferred to normal retirement age. The pension shall be increased at the date of termination, if applicable, so that the value of the pension is not less than 2 times the accumulated employee contributions with interest, based on the actuarial assumptions below.

<u>Actuarial assumptions and methods:</u>

Discount rate:	5% per year	
Salary increase rate:	4% per year	
Return on employee contributions:	4% per year	
Decrements:	Beginning of year	
Retirement rates:	50% at later of 10 years of service or age 55; remainder at age 65	
Termination rates:	**Service**	**Rate**
	Less than 5 years	10% per year
	At least 5 years, less than 10 years	5% per year
	10 or more years	0% per year
Other pre-retirement decrements	None	
Actuarial cost method:	Aggregate	
Asset method:	Market value of assets	

5. **Continued**

Annuity factors:

$\ddot{a}_{65}^{(12)} = 12.5$ $\ddot{a}_{55}^{(12)} = 15.5$

Participant Data at December 31, 2023:

Employee	**Member A**	**Member B**
Age (years):	30	50
Service (years):	5	15
2023 earnings:	$75,000	$100,000
Total contributions with interest:	$32,000	$190,000

Additional Information:

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

(a) (*4 points*) Calculate the normal cost of the plan as at December 31, 2023.

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

You are given the following for 2024:

- Member B terminates employment on January 1, 2024 and remains eligible to receive a deferred pension payable at normal retirement age from the plan
- Member A receives a salary increase of 10% on January 1, 2024
- The Plan sponsor makes a contribution of $30,000 to the plan on January 1, 2024
- The plan's fund earns a rate of return of 15% during 2024
- Interest on employee contributions is 4% during 2024

(b) (*4 points*) Calculate the accrued liability and normal cost for the plan as at December 31, 2024.

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

6.

(*8 points*) The Government of Country XYZ is establishing a regulatory framework for employer-sponsored pension plans with the following objectives:

- Incentivize retirement savings
- Enhance benefit security
- Allow reasonable but limited tax-sheltering

Recommend five features from the Pension Benefits Act (Ontario) or the Income Tax Act (Canada) that the Government of Country XYZ could adopt in order to meet these objectives.

Justify your recommendations.

ANSWER:

7.

(*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 group of physicians;

(ii) a large public sector pension plan covering firefighters; and

(iii) the Canada Pension Plan

ANSWER:

****END OF EXAMINATION****