Exam RETFRC

Funding & Regulation Exam - Canada

Date: Wednesday, October 27, 2021

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 9 questions numbered 1 through 9 with a total of 100 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.

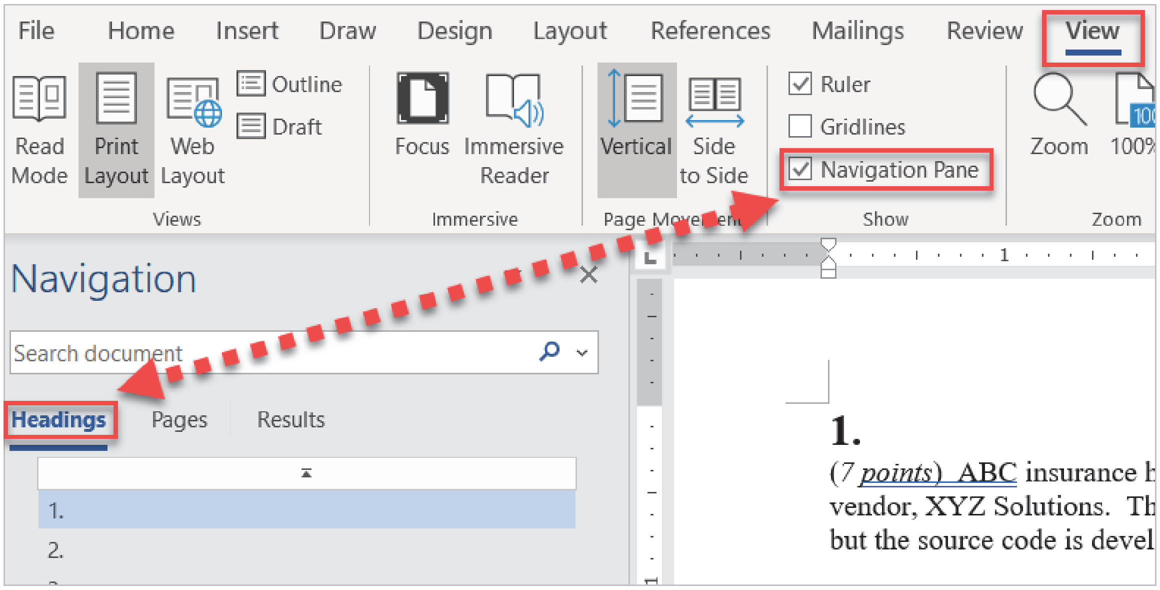
4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

Recognized by the Canadian Institute of Actuaries.

Navigation Instructions

Open the Navigation Pane to jump to questions.

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



1.

(*7 points*) Company ABC recently purchased Company XYZ, which sponsors a defined benefit pension plan (the Predecessor Plan) registered in Ontario. As part of a sale and purchase agreement, the assets and liabilities of the affected members will be transferred to Company ABC's existing pension plan (the Successor Plan), also registered in Ontario.

You are given:

Plan Provisions:

Normal retirement age:	Age 65
Normal retirement benefit:	Flat benefit of $80 per month per year of credited service
Early retirement benefit:	Unreduced pension at age 60 with 20 years of credited service; otherwise actuarially equivalent
Earliest retirement date:	Age 55
Normal Form of Pension	Life with a 5-year guarantee

Description of membership:

- 5 active members accruing benefits
- 2 deferred vested members
- 2 retirees and 1 surviving spouse

You are the actuary for the Successor Plan and are verifying the liabilities of the affected members.

(a) (*3 points*) Identify the data required for each group of membership to verify the liabilities.

ANSWER:

Based on the data you received from (a) above, you calculated the liabilities of the affected members to be 15% higher from the figures provided by the actuary of Company XYZ.

(b) (*4 points*) Recommend a course of action, taking into consideration professional standards.

ANSWER:

2.

(*11 points*) You are the actuary of a single-employer defined benefit pension plan registered in Ontario.

You are given the following as at January 1, 2022:

Plan provisions:

Normal retirement benefit:	1.25 % of final 3-year average salary multiplied by years of service
Bridge benefit:	$800 annual pension multiplied by years of service payable from retirement on or after Age 62 to the earlier of Age 65 or death
Normal retirement age:	Age 65
Earliest retirement age:	Age 55
Unreduced early retirement age:	Age 60
Early retirement reduction:	3 % per year prior to Age 60
Normal form of payment:	Life only, payable monthly in advance
Termination benefit:	Deferred pension payable at age 65 or actuarial equivalent if received earlier
Portability option:	Lump sum commuted value option permitted at all ages

Member data:

	Member 1	**Member 2**
Age	35	45
2021 salary	$85,000	$102,000
2020 salary	$79,000	$100,000
2019 salary	$75,000	$97,500
Years of service	9	11

2. Continued

Commuted value annuity factors at January 1, 2022:

Member 1	Lifetime factor	Bridge factor
${}_{20\|}\ddot{a}_{35}^{(12)}$	14.2	
${}_{21\|}\ddot{a}_{35}^{(12)}$	13.5	
${}_{22\|}\ddot{a}_{35}^{(12)}$	12.9	
${}_{23\|}\ddot{a}_{35}^{(12)}$	12.4	
${}_{24\|}\ddot{a}_{35}^{(12)}$	11.8	
${}_{25\|}\ddot{a}_{35}^{(12)}$	11.2	
${}_{26\|}\ddot{a}_{35}^{(12)}$	10.7	
${}_{27\|}\ddot{a}_{35}^{(12)}$	10.2	1.6
${}_{28\|}\ddot{a}_{35}^{(12)}$	9.7	1.1
${}_{29\|}\ddot{a}_{35}^{(12)}$	9.2	0.5
${}_{30\|}\ddot{a}_{35}^{(12)}$	8.7	0

Member 2	Lifetime factor	Bridge factor
${}_{10\|}\ddot{a}_{45}^{(12)}$	18.5	
${}_{11\|}\ddot{a}_{45}^{(12)}$	17.6	
${}_{12\|}\ddot{a}_{45}^{(12)}$	16.9	
${}_{13\|}\ddot{a}_{45}^{(12)}$	16.1	
${}_{14\|}\ddot{a}_{45}^{(12)}$	15.3	
${}_{15\|}\ddot{a}_{45}^{(12)}$	14.6	
${}_{16\|}\ddot{a}_{45}^{(12)}$	13.9	
${}_{17\|}\ddot{a}_{45}^{(12)}$	13.3	2.1
${}_{18\|}\ddot{a}_{45}^{(12)}$	12.6	1.4
${}_{19\|}\ddot{a}_{45}^{(12)}$	12.0	0.7
${}_{20\|}\ddot{a}_{45}^{(12)}$	11.3	0

Additional information:

Month	V122542 (7 year)	V122544 (long)	V122553 (real)
Jan-22	0.52%	1.45%	-0.08%
Dec-21	0.48%	1.24%	-0.24%
Nov-21	0.51%	1.22%	-0.26%

Month	Mid-Term Provincial Bond Index	Long-Term Provincial Bond Index	Mid-Term Corporate Bond Index	Long-Term Corporate Bond Index	Mid-Term Federal Non-Agency Bond Index	Long-Term Federal Non-Agency Bond Index
Jan-22	1.15%	2.17%	1.80%	2.99%	0.68%	1.32%
Dec-21	1.10%	2.01%	1.84%	2.88%	0.61%	1.12%
Nov-21	1.19%	2.05%	2.00%	2.96%	0.61%	1.06%

2. Continued

(a) (*3 points*) Calculate the discount rates applicable to commuted value calculations for terminations in January 2022.

Show all work.

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

(b) (*3 points*) Calculate the commuted value for each active member assuming they voluntarily terminated employment on January 1, 2022.

Show all work.

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

(c) (*3 points*) Calculate the commuted value for each active member assuming the plan was wound up on January 1, 2022.

Show all work.

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

(d) (*2 points*) Describe how the calculation of the commuted value would differ if the plan were a target benefit plan in accordance with the Canadian Institute of Actuaries' Standards of Practice.

ANSWER:

3.

(*33 points*) MNO Limited sponsors a non-contributory defined benefit pension plan, registered in Ontario.

You are given:

<u>Plan Provisions:</u>

Normal retirement age (NRA):	65
Normal retirement benefit:	2% of Final 3-year Average Earnings (FAE3)
Early retirement reduction:	With 10+ years of service, benefit is reduced 3% per annum from age 60. Otherwise, benefit is reduced by 6% per annum from NRA
Termination benefit:	Monthly pension deferred to NRA. Deferred members can start their pensions as early as age 55, but on an actuarially equivalent basis.

The following information is from the last actuarial valuation for funding purposes as at **January 1, 2020**:

<u>Actuarial Assumptions and Methods:</u>

<u>Going Concern Assumptions:</u>

Going-concern discount rate:	5.0% (per annum)	
Provision for Adverse Deviation (PfAD):	10.0%	
Salary increase rate:	3.0% (per annum)	
Pre-retirement mortality:	None	
Actuarial Cost Method:	Projected Unit Credit, service prorate	
Retirement age:	100% at Age 60	
Termination rates:	**Age**	**Rate**
	40	10%
	50	5%

<u>Solvency Assumptions:</u>

Solvency discount rate:	2.5% (per annum)
Pre-retirement mortality:	None
Windup expense assumption:	50,000
Retirement age:	As per the Standards of Practice

3. Continued

Liability Information:

ID	Status	Age	Going Concern Liability	Normal Cost (BOY)	Solvency Liability
1	Active	38	193,000	16,000	185,000
2	Active	57	1,051,000	36,000	1,503,000
3	Active	58	489,000	29,000	662,000
4	Deferred	44	85,000	0	193,000
5	Deferred	60	248,000	0	372,000
6	Retired	76	338,000	0	414,000

Asset Information:

Market value of assets	2,500,000
Fixed income allocation	50%
Duration of Asset Portfolio	8.00

Amortization Schedules:

Type	Annual Amortization Payment	Date of First Payment	Date of Last Payment
Going concern	19,000	1/1/2021	12/31/2030
Solvency	263,000	1/1/2021	12/31/2025
Solvency	50,000	1/1/2020	12/31/2024

3. Continued

For an actuarial valuation for funding purposes at January 1, 2021, you are given:

Participant data as at January 1, 2021:

ID	Status	Age	Accrued Monthly Benefit	Credited Service
1	Active	39	n/a	13.00
2	Active	58	n/a	30.50
3	Retired	59	n/a	18.00
4	Deferred	45	1,500	n/a
5	Retired	61	2,000	n/a
6	Retired	77	3,000	n/a

ID	Salary Current Year (CY)	Salary CY-1	Salary CY-2	Salary CY-3
1	108,000	98,000	85,000	83,000
2	141,000	138,000	135,000	133,000
3	n/a	110,000	105,000	100,000
4	n/a	n/a	n/a	n/a
5	n/a	n/a	n/a	n/a
6	n/a	n/a	n/a	n/a

Assume that all membership movements occurred on December 31, 2020.

Actuarial Assumptions and Methods:

Going-concern discount rate:	4.8%	(per annum)
Solvency discount rate:	2.2%	(per annum)

All other assumptions and methods are unchanged from the prior valuation.

3. Continued

Annuity Factors:

Going Concern annuity factors:

Discount rate	$\ddot{a}_{59}^{(12)}$	$\ddot{a}_{60}^{(12)}$	$\ddot{a}_{61}^{(12)}$	$\ddot{a}_{65}^{(12)}$	$\ddot{a}_{77}^{(12)}$
4.8%	15.1	14.8	14.6	13.4	9.2
5.0%	14.8	14.5	14.3	13.2	9.0

Solvency annuity factors:

	d =	x = 39	d =	x = 58
${}_{d\mid}\ddot{a}_{x}^{(12)}$	16	16.50		
	17	15.90		
	18	15.20		
	19	14.60	0	21.60
	20	14.00	1	20.70
	21	13.40	2	19.80
	22	12.80	3	18.90
	23	12.30	4	18.10
	24	11.70	5	17.20
	25	11.20	6	16.40
	26	10.60	7	15.70
${}_{20\mid}\ddot{a}_{45}^{(12)}$	12.0			
$\ddot{a}_{59}^{(12)}$	21.1			
$\ddot{a}_{61}^{(12)}$	20.1			
$\ddot{a}_{77}^{(12)}$	11.2			

Asset Information:

Rate of return in 2020	12%
Contribution on Dec 31, 2020	150,000

Assume no change to the asset mix and no prior year credit balance is established.

3. Continued

(a) (*8 points*) Calculate the total normal cost, going concern liability and the unfunded actuarial liability as at January 1, 2021.

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

(b) (*9 points*) Calculate the gains and losses on a going concern basis by source for 2020, excluding PfAD.

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

(c) (*6 points*) Calculate the solvency funded position as at January 1, 2021.

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

You have determined the projected solvency liability as at January 1, 2022 to be $3,700,000.

(d) (*2 points*) Calculate the 1-year Solvency Incremental Cost.

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

(e) (*5 points*) Calculate the minimum required and maximum permissible employer contributions for 2021 and the minimum required special payments for 2022.

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

The consultant for MNO Limited has provided 3 adverse scenarios:

- Immediate 1.0% decrease in interest rates resulting in a 0.5% decrease in going concern discount rate.
- 15% decrease in non-fixed income portfolio.
- Increase in life expectancy approximated by a 5% increase in liabilities and current service cost.

(f) (*3 points*) Develop the plausible adverse scenario disclosure as at January 1, 2021.

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

4.

(*6 points*) You are the actuary for a defined benefit pension plan.

(a) (*3 points*) Describe the considerations for setting a retirement rates assumption.

ANSWER:

(b) (*3 points*) You are the actuary for a plan with the following provisions:

Normal Retirement Age:	65
Normal Retirement Benefit:	Monthly benefit of $60 per year of credited service
Earliest Retirement Age:	55
Early Retirement Benefit:	Unreduced at Age 60 Reduced by 3% for each year by which retirement precedes age 60
Bridge Benefit:	Monthly benefit of $20 per year of credited service Payable from Early Retirement Age to Age 65

The company that sponsors the plan has asked you to use the following retirement assumption:

Age	**Probability of Retirement**
62	50%
65	100%

Critique the company's proposed retirement assumption, referencing the applicable professional standards.

ANSWER:

5.

(*8 points*) Your client is downsizing and wants to incent members to retire early under a special downsizing program. The program must meet the Canada Revenue Agency's (CRA) special downsizing program requirements.

You are given the following information about the current plan provisions:

Benefit Formula:	1.50% of Final 5-year Average Earnings times credited service
Early Retirement Reduction:	
More than or equal to 20 years of credited service:	Unreduced at age 60; 4% per year reduction prior to age 60
Less than 20 years of credited of service:	5% per year reduction from age 65
Normal Form of Payment:	Life Guaranteed for 10 years

(a) (*4 points*) Describe the CRA's special downsizing program requirements and the additional benefits that may be provided.

ANSWER:

Your client has decided they do not want to seek the CRA's approval for a special downsizing program. However, your client wants to maximize the retirement benefits in a manner that does not generate a Past Service Pension Adjustment (PSPA).

(b) (*4 points*) Recommend changes to the plan provisions that meet the client's goals.

ANSWER:

6.

(*10 points*) Your client sponsors a newly established non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal retirement benefit:	$100 per month, times years of service (including past service)
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 60
Termination benefit:	Deferred pension payable at age 60
Postponed retirement benefit:	Continued accrual

Actuarial Assumptions and Methods:

Interest rate:	5.00% per year	
Retirement age:	Later of: Age 60; or 1 year after the valuation date	
Termination rate (BOY):	Prior to age 45:	5% per year
	At or after age 45:	0% per year
Pre-retirement mortality	None	
Actuarial cost method:	Attained Age Normal	

Participant Data at January 1, 2021:

	Member A	Member B	Member C
Age:	43	50	59
Service:	13 years	15 years	19 years

Annuity Factors:

$\ddot{a}_{60}^{(12)} =$ 14.8 $\ddot{a}_{61}^{(12)} =$ 14.5

Additional Information:

Market value of assets at January 1, 2021: $0

(a) (*4 points*) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2021.

Show all work.

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

6. Continued

You are given:

- A contribution of $150,000 is made to the plan on December 31, 2021.
- Member C does not retire as expected on December 31, 2021.

(b) (*3 points*) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2022.

Show all work.

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

(c) (*3 points*) Calculate the impact of demographic experience, by source, between January 1, 2021 and January 1, 2022, on the normal cost **per active member**.

Show all work.

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

7.

(*12 points*) Compare and contrast the principles set out in Core Principle 7 of the OECD Core Principles of Private Regulations against the established framework for defined benefit pension plans regulated by the Pension Benefits Act (Ontario) and the Income Tax Act (Canada) for the following:

(i) Measurement of pension plan liabilities;

(ii) Funding requirements of pension plans, and the treatment of surpluses or deficits; and

(iii) Wind-up or termination of pension plans.

ANSWER:

8.

(*7 points*) You are setting the going concern discount rate for a jointly-sponsored public sector pension plan registered in Ontario.

(a) (*4 points*) Describe the considerations for setting the best estimate going concern discount rate.

ANSWER:

The Board of the pension plan would like to develop an approach for determining provisions for adverse deviations that would be used for current and future funding valuations to increase conservatism.

(b) (*3 points*) Recommend an approach for establishing the margin on the going concern discount rate.

ANSWER:

9.

(*6 points*) You are the actuary for a non-contributory defined benefit pension plan.

You are given:

<u>Plan Provisions:</u>

Normal Retirement Benefit	1.0% of pensionable earnings up to the Years' Maximum Pensionable Earnings (YMPE), plus 1.5% of pensionable earnings in excess of YMPE per year of credited service
Normal Retirement Age	Age 65
Early Retirement Age	Age 55
Early Retirement Reduction	3% per year from age 62
Normal Form of Payment	Life Only
Optional Forms of Payment	Actuarially equivalent
Re-employment	Treated as new members
Disability Leave	Members cease accruing service. Upon returning to work, members are credited service for the period of disability. Members' earnings are deemed during the period of leave at the annualized salary rate in effect prior to the leave.

The Income Tax Act Defined Benefit Dollar Limit in 2021 is \$3,245.56 per year of credited service. The YMPE for 2021 is \$61,600.

You are also given salary information for the following members of the plan:

Member	2021 Annualized Salary Rate
A	\$250,000
B	\$110,000
C	\$130,000
D	\$30,000

9. Continued

You are also given the following:

- Member A terminated employment on June 30, 2021 and elected a lump-sum commuted value. Member A was re-employed on September 30, 2021 at the same annualized salary rate.
- Member B started a leave of absence due to disability on March 31, 2021 and returned to work on January 31, 2022. He is automatically granted credited service in respect of the leave of absence upon returning to work.
- Member C terminated employment on July 31, 2021 and moved to another employer on the same date. The new employer's pension plan has the same plan provisions as the current plan. Member C joins the plan immediately upon hire and earns an annualized salary of $140,000 at the new employer.
- Member D joined the plan on November 1, 2021.

Calculate the total 2021 Pension Adjustment for each member from all employers.

Show all work.

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

****END OF EXAMINATION****