Exam RETFRC

Funding & Regulation Exam - Canada

Date: Wednesday, October 28, 2020

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 12 questions numbered 1 through 12 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. The Word and Excel files that contain your answers must be uploaded before time expires.

Recognized by the Canadian Institute of Actuaries.

1. (*7 points*) You are the actuary for Company XYZ, which sponsors a defined benefit pension plan. You are performing a funding valuation as at December 31, 2019 and received the following data.

Data – Active

ID	Date of birth (dd/mm/yyyy)	Sex	Service (years)
11010	25/05/1975	F	15.50
11012	01/02/1963	M	32.25
11012	01/02/1963	M	32.25
11022	05/06/1945	M	35.00
11024	07/03/1982	F	
11027	28/07/1988	F	6.67
11029	17/08/1992	F	20.00

Data – Inactive

ID	Date of birth (dd/mm/yyyy)	Sex	Form of pension	Pension amount	Bridge benefit
11011	26/04/1939	M	Guaranteed 10 years	$18,000	
11013	02/02/1960	M	Joint & survivor 60%	$3,000	$1,200
11021	06/02/1957	F	Guaranteed 10 years	$12,000	

You were also provided with the following table from the prior valuation report.

	December 31, 2016
Active members	
-Number	8
-Average years of pensionable service	13.4
-Average age	41.5
Deferred members	
-Number	2
-Average annual pension	$10,000
-Average age	42.2
Pensioners and survivors	
-Number	3
-Total annual lifetime pension	$33,000
-Total annual lifetime bridge	$6,000
-Average age	64.8

1. Continued

(a) (*2 points*) Describe three considerations for reviewing and assessing data for the purpose of a funding valuation based on professional standards.

ANSWER:

(b) (*2 points*) Identify potentially incorrect, missing, or incomplete data required for the valuation.

ANSWER:

(c) (*3 points*) List the required disclosures in respect of data to be included in the valuation report in accordance with the Canadian Institute of Actuaries' Standards of Practice.

ANSWER:

2. (*8 points*) Your client sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal 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 benefit:	5% reduction for each year prior to age 65
Termination benefit:	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Salary increase rate:	4% per year
Retirement age:	Age 65
Pre-retirement decrements:	None
Actuarial cost method:	Entry Age Normal

Participant Data at January 1, 2020:

	Member A	Member B	Member C
Age:	40 years	50 years	60 years
2020 Salary:	$60,000	$70,000	$80,000
Service:	10 years	20 years	25 years

Annuity Factors:

$\ddot{a}_{65}^{(12)}$ = 13.5 $\ddot{a}_{61}^{(12)}$ = 15.0

Additional Information:

Market value of assets as at January 1, 2020: $1,000,000

(a) (*2 points*) Calculate the total normal cost and the unfunded actuarial liability as at January 1, 2020.

Show all work.

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

2. Continued

You are given:

- The fund earns a rate of return of -10% during 2020.
- A contribution of $50,000 is made to the plan on December 31, 2020.
- At December 31, 2020, Member B receives a 10% salary increase.
- At December 31, 2020, Member A terminates employment and elects to defer their accrued pension to age 65; and
- At December 31, 2020, Member C retires.

(b) (*2 points*) Calculate the unfunded actuarial liability as at January 1, 2021.

Show all work.

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

(c) (*4 points*) Calculate the gains and losses by source for 2020.

Show all work.

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

3. (*11 points*) Company XYZ sponsors a defined benefit pension plan registered in Ontario.

You are given:

Going concern liabilities and normal cost as at January 1, 2020:

(in 000s)	**Excluding Indexation**	**Including Indexation**
Going concern liabilities	$335,123	$412,056
Normal cost	$13,245	$16,150

- The going concern valuation discount rate is 6.2% per year.
- The implicit assumption for investment expenses included in the discount rate is 0.10%.
- The duration of the plan's going concern liabilities is 17.2 years.

Hypothetical wind-up liabilities as at January 1, 2020:

(in 000s)	
Active (excluding indexation)	$225,854
Inactive (excluding indexation)	204,485
Cost of indexation	73,540
Total liabilities	$503,879

Other information (in 000s):

Market value of assets	$375,856
Assumed annual administrative expenses	$250
Wind-up expenses	$500

Target asset allocation:

Universe Bonds (investment grade)	25%
Long-term Bonds (investment grade)	10%
Canadian Equities	20%
Global Equities	35%
Real Estate	10%
	100%

3. Continued

Non-Fixed Income component of the Provision for Adverse Deviations (PfAD):

% 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 January 1, 2020 is 1.76%
- The formula to determine the benchmark discount rate that is used in the determination of the PfAD is:

$$0.5\% + \text{Benchmark Yield of Government of Canada Long-Term Bonds} + 5\% \times \text{allocation of non-fixed income} + 1.5\% \times \text{allocation of fixed income}$$

Calculate the minimum required and maximum permissible employer contributions at January 1, 2020, assuming there were no special payments at the last valuation date.

Show all work.

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

4. (*8 points*) Compare and contrast six (6) CAPSA recommendations related to the funding of defined benefit pension plans to the requirements of the Ontario pension legislation as they relate to plan funding.

ANSWER:

5. (*12 points*) Plan A is a single-employer defined benefit pension plan registered in Ontario. Plan B is a single-employer defined benefit pension plan that is registered federally.

Compare and contrast the minimum funding regulations applicable to each plan with respect to the following:

(i) Frequency of filing

(ii) Smoothing of assets and liabilities

(iii) Provisions for adverse deviations

(iv) Maximum going-concern discount rate

(v) Funding of shortfalls

(vi) Contribution holidays

ANSWER:

6. (*9 points*) Company XYZ sponsors a non-contributory defined benefit pension plan.

You are given:

Plan Provisions:

Normal Retirement Benefit:	1.50% of final 3-year average pensionable earnings multiplied by credited service
Normal Retirement Age:	Age 65
Bridge Benefit:	0.50% of final 3-year average pensionable earnings multiplied by credited service with no reductions for early commencement
Early Retirement Age:	Age 55
Early Retirement Reduction:	4% per year from age 62
Normal Form of Payment:	Life only
Optional Forms of Payment:	Actuarially equivalent

The following two plan members are retiring effective January 1, 2021:

Member	**A**	**B**
Age	59 years	59 years
Spouse's Age	Not Applicable	56 years
Credited Service	8 years	29 years
Continuous Service	11 years	29 years
2020 Pensionable Earnings	$240,000	$300,000
2019 Pensionable Earnings	$250,000	$275,000
2018 Pensionable Earnings	$230,000	$260,000

You are also given the following information:

- The final average 3-year YMPE is $57,300
- The Income Tax Act Defined Benefit Dollar Limit in 2021 is $3,130.22 per year of credited service
- 2021 maximum monthly CPP benefit is $1,175.83
- January 1, 2021 maximum monthly OAS benefit is $613.53
- Member A elected to receive his pension as a life only form.

6. Continued

(a) (*4 points*) Calculate the lifetime and bridge pensions payable to Member A.

Show all work.

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

You are also given the following additional information for Member B:

- Member B elected to receive his pension as a Joint and 100% Survivor form.

Form of Pension	**Annuity Factors**
Life only	15.170
Joint and 60% Survivor	16.779
Joint and 100% Survivor	17.851
Joint and 66.67% Survivor Guaranteed 5 years	16.981

(b) (*5 points*) Calculate the lifetime and bridge pensions payable to Member B.

Show all work.

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

7. (*8 points*) ABC Company sponsors a single-employer defined benefit pension plan registered in Ontario. You are setting the going concern discount rate assumption for the actuarial valuation as at January 1, 2021.

You are given:

The plan is 80% funded on a solvency basis as at January 1, 2021.

The investment strategy of the plan includes a target asset allocation that changes over time depending on the solvency funded status of the plan, in accordance with the following table:

	Target Asset Allocation	
Solvency funded ratio	Equity	Fixed Income
75%	60%	40%
80%	50%	50%
85%	40%	60%
90%	30%	70%
95%	20%	80%
100%	10%	90%

(a) (*6 points*) Describe the considerations in setting the best estimate going concern discount rate for the January 1, 2021 actuarial valuation.

ANSWER:

ABC Company has committed to fully funding the solvency deficit over 5 years.

(b) (*2 points*) Describe the impact of this funding strategy on the going concern discount rate.

ANSWER:

8. (*7 points*) Your client sponsors a non-contributory defined benefit pension plan.

You are given:

Plan Provisions:

Normal retirement benefit:	2% of each year's earnings
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Termination benefit:	Monthly pension deferred to normal retirement age

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Salary increase rate:	3.5% per year
Retirement age:	Age 65
Termination rates:	5% at age 48, 5% at age 49 and 5% at age 50
Pre-retirement mortality:	None
Actuarial cost method:	Unit Credit

Participant Data at January 1, 2020:

	Member A	**Member B**
Age:	55	45
Service in years:	15	10
2020 Salary:	$80,000	$60,000
Annual accrued benefit at January 1, 2020	$20,000	$10,000

Annuity Factor:

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

(a) (*2 points*) Calculate the total actuarial liability and normal cost as at January 1, 2020.

Show all work.

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

(b) (*5 points*) Calculate the total actuarial liability and normal cost as at January 1, 2020, using the Projected Unit Credit method, prorated on service.

Show all work.

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

9. (*6 points*) You have been provided mortality experience study results for a final average pay defined benefit pension plan. A summary of the experience study results, with expected deaths based on CPM2014Priv is provided below:

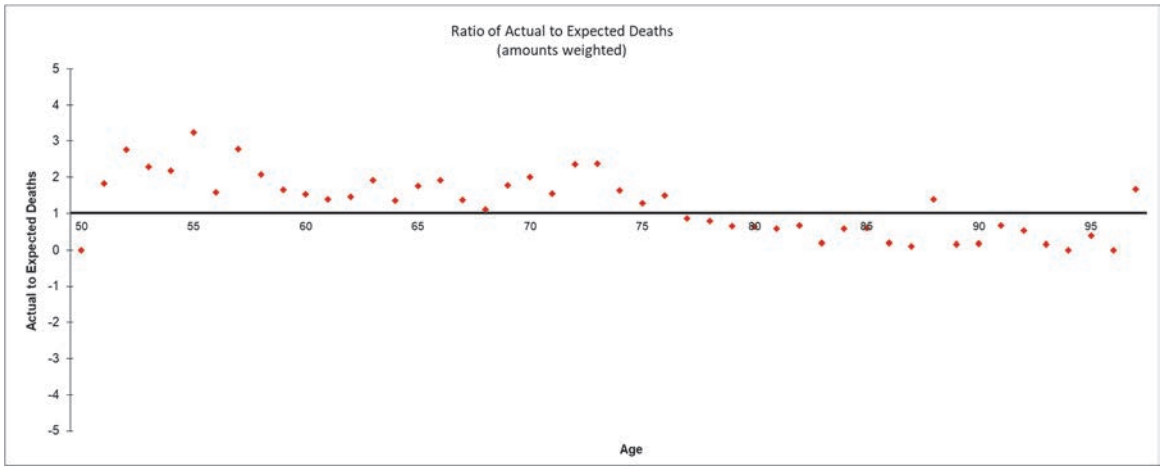
Age groups	Number of lives	Benefit Amount ($)	Actual Deaths (lives)	Actual Deaths ($ benefit amount)	Expected Deaths (lives)	Expected Deaths ($ benefit amount)
<50	26	829,878	0	0	0	2,052
50-59	3,295	110,407,713	43	1,076,040	15	491,213
60-69	4,253	108,919,379	84	1,362,101	35	879,925
70-79	1,909	30,829,784	92	913,535	38	585,224
79+	489	4,964,710	49	156,172	34	319,430
Total	**9,972**	**255,951,463**	**268**	**3,507,847**	**122**	**2,277,844**

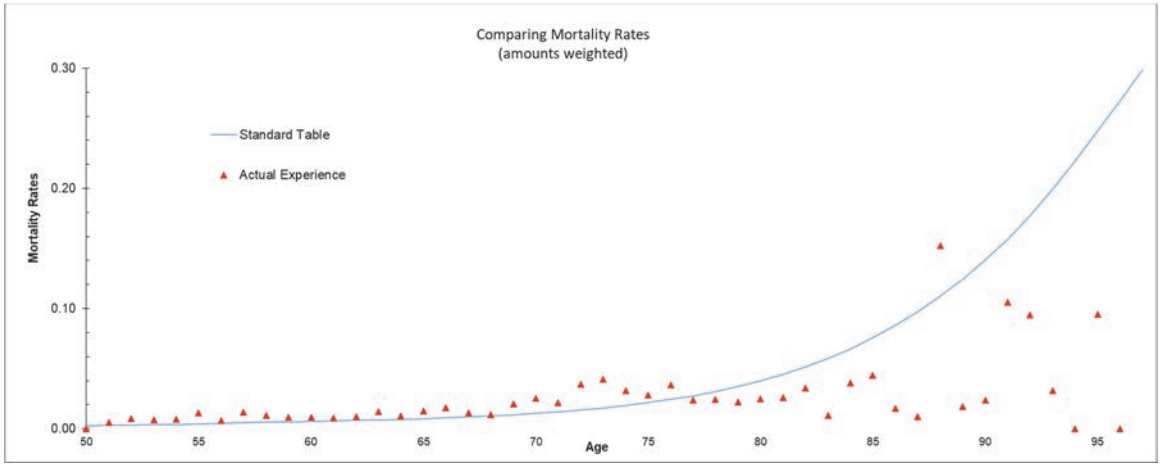
(a) (*3 points*) Assess the appropriateness of using amounts- versus counts-weighted results.

ANSWER:

9. Continued

You are provided the following charts based on the experience study:





(b) (*3 points*) Recommend adjustments to the standard mortality table based on the experience study.

ANSWER:

10. (*6 points*) Your client sponsors a non-contributory defined benefit pension plan registered in Ontario.

You are given:

Plan Provisions:

Retirement benefit:	1.75% of 3-year final average earnings multiplied by years of service
Normal form of payment:	Life Only, payable monthly in advance
Normal retirement age:	Age 65
Earliest retirement age:	Age 55
Unreduced early retirement age:	Age 60, with 10 or more years of service
Early retirement reduction:	With 10 or more years of service: 3% per year prior to age 60 Otherwise: 3% per year prior to normal retirement age
Termination benefits:	Pension deferred to normal retirement age
Portability option:	Lump sum commuted value option permitted at all ages

Member Data as at January 1, 2020:

	Member A	**Member B**
Age	40	60
Earnings for 2019	$75,000	$90,000
Earnings for 2018	$69,000	$85,000
Earnings for 2017	$65,000	$80,000
Years of Service	16	5

10. Continued

Commuted Value Annuity Factors at January 1, 2020:

Member A	Annuity Factors
$15\vert\ddot{a}_{40}^{(12)}$	13.9
$16\vert\ddot{a}_{40}^{(12)}$	13.2
$17\vert\ddot{a}_{40}^{(12)}$	12.6
$18\vert\ddot{a}_{40}^{(12)}$	12.0
$19\vert\ddot{a}_{40}^{(12)}$	11.4
$20\vert\ddot{a}_{40}^{(12)}$	10.9
$21\vert\ddot{a}_{40}^{(12)}$	10.3
$22\vert\ddot{a}_{40}^{(12)}$	9.8
$23\vert\ddot{a}_{40}^{(12)}$	9.3
$24\vert\ddot{a}_{40}^{(12)}$	8.8
$25\vert\ddot{a}_{40}^{(12)}$	8.4

Member B	Annuity Factors
$\ddot{a}_{60}^{(12)}$	19.6
$1\vert\ddot{a}_{60}^{(12)}$	18.6
$2\vert\ddot{a}_{60}^{(12)}$	17.6
$3\vert\ddot{a}_{60}^{(12)}$	16.7
$4\vert\ddot{a}_{60}^{(12)}$	15.7
$5\vert\ddot{a}_{60}^{(12)}$	14.9

(a) (*3 points*) Calculate the solvency liabilities for the two active members as at January 1, 2020.

Show all work.

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

(b) (*3 points*) Calculate the commuted value of the benefits for the two members, assuming that they terminate employment voluntarily on January 1, 2020.

Show all work.

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

11. (*12 points*) You are the actuary for a defined benefit pension plan that is being wound up effective September 30, 2020.

You are given:

Member	Member's Age at September 30, 2020	2020 Earnings up to September 30	2020 Service to September 30	Accrued Pension as of December 31, 2019
A	66.4	$104,000	0.75 years	$72,405
B	62.8	$128,000	0.75 years	$59,455

Year	Income Tax Act Defined Benefit Limit	Year's Maximum Pensionable Earnings (YMPE)
2020	$3,092.22	$58,700
2021	$3,170.00	$60,100

The Plan provides a career average earnings benefit of 1.5% of earnings up to the YMPE and 2% of earnings above the YMPE for each year of service.

Members continue to accrue benefits beyond the normal retirement age of 65.

The Income Tax Regulations maximum transfer value factors are as follows:

Attained Age	Factor
62	12.0
63	12.2
64	12.4
65	12.4
66	12.0
67	11.7

(a) (*2 points*) Calculate the 2020 Pension Adjustment for each member.

Show all work.

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

(b) (*2 points*) Calculate the maximum transfer value for each member as at September 30, 2020.

Show all work.

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

11 Continued

You are given:

Member	Available RRSP contribution room at the end of 2019	RRSP contributions made in 2020	2020 Earnings from October 1 to December 31
A	$6,400	$2,000	$37,000
B	$8,600	$0	$46,000

(c) (*4 points*) Calculate the 2021 available RRSP contribution room for each member.

Show all work.

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

You are given:

Member	2021 Earnings
A	$144,000
B	$177,000

The Company is considering establishing a new capital accumulation plan for employees effective January 1, 2021.

(d) (*4 points*) Calculate the maximum of the combined employee and employer contributions in dollars that could be made in 2021 to:

(i) a Defined Contribution Registered Pension Plan (DCRPP)

(ii) a Group Registered Retirement Savings Plan (Group RRSP)

(iii) a Deferred Profit Sharing Plan (DPSP)

Show all work.

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

12. (*6 points*) You have been engaged to provide a third-party actuarial review of the merger between Company ABC and Company XYZ. As part of your review, you discover that the actuary representing Company ABC and the actuary from Company XYZ are married to each other. Neither company was aware of the relationship before the announcement of the merger.

(a) (*3 points*) Describe potential areas of non-compliance with rules of professional conduct.

ANSWER:

(b) (*3 points*) Recommend a course of action, taking into consideration professional standards.

ANSWER:

****END OF EXAMINATION****