CURATED PAST EXAM ITEMS
- Questions -

RET 301 – Actuarial Topics for Canadian Retirement Plans

Important Information:

- These curated past exam items are intended to allow candidates to focus on past SOA fellowship assessments. These items are organized by topic and learning objective with relevant learning outcomes, source materials, and candidate commentary identified. We have included items that are relevant in the new course structure, and where feasible we have made updates to questions to make them relevant.
- Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.
- Candidate solutions other than those presented in this material, if appropriate for the context, could receive full marks. For interpretation items, solutions presented in these documents are not necessarily the only valid solutions.
- Learning Outcome Statements and supporting syllabus materials may have changed since each exam was administered. New assessment items are developed from the current Learning Outcome Statements and syllabus materials. The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.
- Thus, while we have made our best effort and conducted multiple reviews, alignment with the current system or choice of classification may not be perfect. Candidates with questions or ideas for improvement may reach out to education@soa.org. We expect to make updates annually.

RET 301 Learning Objective 1 Curated Past Exam Questions

RETFRC, Fall 2020, Q7

(*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:

RETFRC, Spring 2021, Q10

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

(a) (*6 points*) Describe the considerations in setting the following assumptions for a solvency valuation:

(i) mortality rates assumption;

(ii) portion electing a commuted value;

(iii) wind-up expenses;

(iv) increase in average wage index

ANSWER:

(b) (*3 points*) Describe the considerations for setting the assumptions required when determining the solvency incremental cost.

ANSWER:

RETFRC, Fall 2021, Q8

(*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:

RETFRC, Spring 2022, Q6

(*9 points*) ABC Company sponsors a defined benefit pension plan registered in Ontario. Currently the plan consists of mostly active members with a small number of retirees. You are setting the going concern discount rate assumption for the actuarial valuation as at January 1, 2022.

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

Asset class	**Target asset allocation**
Cash equivalents	5%
Universe bonds	40%
Canadian equities	30%
Global equities	25%

The portfolio will be rebalanced regularly so that the asset mix will be maintained within a reasonable range of the target asset mix.

The expected return on long-term government of Canada bonds at the valuation date is 2.2%, and the estimated risk premia per year for each asset class (on a geometric basis) over three different time horizons are as follows:

Asset class	**5-year risk premium**	**10-year risk premium**	**20-year risk premium**
Cash equivalents	-0.8%	-0.9%	-1.0%
Universe bonds	0.2%	0.4%	0.3%
Canadian equities	4.3%	4.5%	4.1%
Global equities	7.5%	8.0%	8.5%

You are also given:

- The plan employs an active management strategy for equities.
- The total investment management fees are expected to be 0.60%, out of which 0.25% are for passive investment management only.
- In the past three years, the active investment manager has outperformed benchmark indices by approximately 0.5% (net of the additional investment management fees associated with active management).
- The average rate of non-investment related administrative expenses over the last three years is 0.8%.

Recommend the going concern discount rate, net of all expenses. Justify your recommendation.

ANSWER:

RETFRC, Spring 2022, Q10

(*8 points*) You are the actuary for Company XYZ that sponsors a closed defined benefit pension plan. You are undertaking a funding valuation as at December 31, 2021 and are setting assumptions that will be used for the hypothetical wind-up valuation.

You are given:

- Company XYZ is considering a de-risking strategy that will utilize a buy-in group annuity contract and received an annuity quote as at September 30, 2021.
- There are 5,000 retirees and beneficiaries currently in payment. All of the retiree and beneficiary pensions were included in the annuity quote.
- The annuity quote was lower than expected based on the Canadian Institute of Actuaries' guidance on setting annuity purchase rates at the time of the quotation.
- There have been no significant events or changes to membership between the date of the annuity quote and the valuation date.

(a) (*4 points*) Describe the considerations for setting the assumptions that will be used to measure the hypothetical wind-up liabilities given the annuity quotation received.

ANSWER:

You are preparing the December 31, 2022 valuation. Company XYZ has suggested that you use the annuity quote received on September 30, 2021 to set the assumptions for the hypothetical wind-up valuation as at December 31, 2022 because it would lower the liability.

(b) (*1 point*) Describe the considerations for using the annuity quote from September 30, 2021 for setting the assumptions for the hypothetical wind-up valuation.

ANSWER:

(c) (*3 points*) Recommend a course of action for setting assumptions that better reflect the reduction in the liability suggested by the annuity quotation.

ANSWER:

RETFRC, Fall 2022, Q2

(*6 points*)

(a) (*4 points*) Describe the considerations for adjusting the mortality assumption for a going concern valuation to reflect pension plan membership characteristics.

ANSWER:

(b) (*2 points*) Describe possible approaches for reflecting a plausible adverse scenario for the longevity risk of a pension plan.

ANSWER:

RETFRC, Fall 2022, Q5

(*12 points*) Compare and contrast the going concern and hypothetical wind-up valuations with respect to the following:

(i) Purpose of the valuation;

(ii) Valuation methods;

(iii) Economic assumptions; and

(iv) Demographic assumptions.

ANSWER:

RETFRC, Fall 2022, Q9

(*7 points*)

Company ABC sponsors a defined benefit pension plan registered in Ontario that is open to new participants.

You are given the following information:

- All equity funds are actively managed
- Investment expenses for the equity investment managers are 0.65% of the equity asset value.
- Investment expenses for similar passive equity investment managers are 0.50% of the equity asset value.
- Investment management fees for the fixed income investment managers are 0.30% of the fixed income asset value.

Company ABC decided to adjust the asset mix for the plan and is implementing the following asset mix change over the next few months:

	Current Mix	**New Target Mix**
Equities		
Canadian	12%	4%
US	14%	7%
International	9%	9%
Fixed Income		
Canadian Corporate Bonds	15%	19%
Canadian Government Bonds	9%	14%
US Corporate Bonds	26%	29%
International Corporate Bonds	15%	18%

The diversification effect of each asset mix is as follows:

	Current Mix	**New Target Mix**
Diversification Effect	0.40%	0.20%

The long-term expected returns of the various asset classes are as follows:

	Total expected return if passively managed	**Total expected return if actively managed**
Equities		
Canadian	5.32%	6.40%
US	6.28%	7.48%
International	5.61%	6.72%
Fixed Income		
Canadian Corporate Bonds	1.39%	n/a
Canadian Government Bonds	0.96%	n/a
US Corporate Bonds	1.68%	n/a
International Corporate Bonds	1.34%	n/a

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

ANSWER:

(b) (*2 points*) Describe the consideration for using value added returns from active management when establishing a going concern discount rate.

ANSWER:

(c) (*2 points*) Describe the other available method for establishing a going concern discount rate and when it would be appropriate to use.

ANSWER:

RETFRC, Fall 2023, Q7

(*10 points*)

(a) (*4 points*) Describe the considerations for setting the following going concern valuation assumptions for a pension plan:

(i) Discount rate

(ii) Inflation rate

(iii) Average Industrial Wage growth

(iv) Salary scale

(v) Plan expenses

ANSWER:

You are the actuary for ABC Company who sponsors three defined benefit pension plans registered in Ontario. Key plan provisions of the three plans are provided below:

	Hourly Plan	**Salaried Plan**	**Executive Plan**
Plan type:	Flat dollar benefit	Career average earnings	Final average earnings
Normal retirement benefit:	$50 per month per year of service	1.0% of earnings per year of service Accrued benefit increased annually by the increase in the Average Industrial Wage (AIW)	1.5% of final average earnings up to the final 3-year average YMPE, plus 2.0% of final average earnings in excess of the final 3-year average YMPE, per year of service Final average earnings is equal to the best five consecutive years in the past ten years.
Earnings:	Not applicable	Base salary	Base salary plus bonus
Post-retirement indexation:	2.0% per year	None	75% of the Consumer Price Index (CPI) per year to a maximum of 7% per year

In 2023, the increase in CPI was in excess of 8%. Company ABC is concerned about the impact of a persistent high inflation environment on its plans.

(b) (*6 points*) Explain how the high inflation environment could impact the plans' going concern and hypothetical wind-up liabilities.

ANSWER:

RETFRC, Spring 2024, Q3

(*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

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 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:

(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.

RETFRC, Spring 2024, Q7

(*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:

RET 301 Learning Objective 2 Curated Past Exam Questions

Some of the previous questions from the FRC exams required detailed calculations of valuation results in the context of a Canadian plan. These calculations would now often be split under the new courses, with general valuation results (liability, normal cost, funded status) being on RET 201 and valuation results calculated according to specific Canadian requirements or used to develop minimum and maximum funding under the Ontario PBA being on RET 301.

RETDAC, Spring 2021, Q8

(*7 points*)

(a) (*2 points*) Describe considerations when calculating a commuted value for a former single employer defined benefit pension plan member with reduced life expectancy.

ANSWER:

(b) (*2 points*) Describe the disclosure requirements when communicating pension commuted values under Canadian Institute of Actuaries Consolidated Standards of Practice.

ANSWER:

You are given the following assumptions for a defined benefit pension plan:

Interest Rate	3.75%
Pre- and Post-Retirement Mortality	1983 Group Annuity Mortality Table (GAM83)
Spousal age difference	Males 3 years older than females

(c) (*3 points*) Assess whether each assumption listed above would be appropriate to determine the following:

(i) Commuted value for a terminated employee

(ii) (NO LONGER RELEVANT TO RET 301) Defined Benefit Obligation under International Accounting Standards IAS 19, Rev 2011

ANSWER:

RETFRC, Spring 2021, Q5

(*7 points*) You are the actuary for Company ABC which sponsors a single-employer final-average salary-based defined benefit pension plan registered in Ontario.

You are preparing the actuarial valuation report for funding purposes as at January 1, 2021 for the plan.

(a) (*3 points*) List the disclosure requirements for the actuarial valuation report according to the Standards of Practice.

ANSWER:

(b) (*4 points*) Describe three plausible adverse scenarios that you would include in the valuation report, including the elements required for reporting on each scenario.

ANSWER:

RETFRC, Spring 2021, Q8

(*8 points*) You are given the following information for a member terminating from a single-employer defined benefit pension plan registered in Ontario:

Member data:

Date of birth	January 1, 1966
Date of termination	January 1, 2021
Pensionable service (years)	10
Eligibility service (years)	11
Accrued benefit	$ 25,000

Plan provisions:

Normal retirement age	Age 65
Normal retirement benefit	1.5% times the sum of earnings for each year of pensionable service
Eligibility for early retirement	Age 55
Early retirement benefit	Unreduced with 80 age-plus-service points (service based on Eligibility service); otherwise 2% per year from age 65
Termination benefit	Deferred pension starting at age 65 Payable from age 55 in accordance with the Early retirement benefit
Portability	Participants may choose a lump-sum commuted value in lieu of an immediate or deferred pension at all ages
Cost-of-living adjustments	50% of CPI, pre- and post-retirement

Additional information:

Month	V122542 (7 year)	V122544 (long)	V122553 (real)	Mid-Term Provincial Bond Index	Mid-Term Corporate Bond Index	Long-Term Provincial Bond Index	Long-Term Corporate Bond Index
January 2021	1.32%	1.45%	0.15%	1.81%	2.42%	2.21%	2.94%
December 2020	1.63%	1.67%	0.32%	2.24%	2.99%	2.54%	3.39%
November 2020	1.50%	1.58%	0.31%	2.06%	2.75%	2.40%	3.21%

Month	Mid-Term Federal Non-Agency Bond Index	Long-Term Federal Non-Agency Bond Index
January 2021	1.38%	1.53%
December 2020	1.71%	1.76%
November 2020	1.57%	1.67%

Annuity factors:

$\ddot{a}_{55}^{(12)}$	23.9
${}_{1\|}\ddot{a}_{55}^{(12)}$	22.9
${}_{2\|}\ddot{a}_{55}^{(12)}$	22.0
${}_{3\|}\ddot{a}_{55}^{(12)}$	21.0
${}_{4\|}\ddot{a}_{55}^{(12)}$	20.0
${}_{5\|}\ddot{a}_{55}^{(12)}$	19.2
${}_{6\|}\ddot{a}_{55}^{(12)}$	18.3
${}_{7\|}\ddot{a}_{55}^{(12)}$	17.4
${}_{8\|}\ddot{a}_{55}^{(12)}$	16.5
${}_{9\|}\ddot{a}_{55}^{(12)}$	15.7
${}_{10\|}\ddot{a}_{55}^{(12)}$	14.9

(a) (*4 points*) Calculate the commuted value interest 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.

(b) (*4 points*) Calculate the commuted value at the member's date of termination assuming the member terminated:

(i) Voluntarily; and

(ii) Involuntarily.

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

RETFRC, Fall 2021, Q2

(*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

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%

(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:

RETFRC, Spring 2022, Q8

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

Member data:

	Member A	Member B
Date of birth:	January 1, 1973	January 1, 1988
Date of termination:	January 1, 2023	January 1, 2023
Pensionable service (years):	4	10.5
Eligibility service (years):	5	10.5

You are given:

Year	Member A		Member B		ITA Maximum DB Pension Limit
	Service	Salary	Service	Salary	
2012	0		0.5	$28,000	$2,646.67
2013	0		1	$61,000	$2,696.67
2014	0		1	$62,000	$2,770.00
2015	0		1	$64,000	$2,818.89
2016	0		1	$64,500	$2,890.00
2017	0		1	$67,000	$2,914.44
2018	0	$147,000	1	$68,000	$2,944.44
2019	1	$158,000	1	$70,500	$3,025.56
2020	1	$161,000	1	$69,500	$3,092.22
2021	1	$167,000	1	$71,500	$3,245.56
2022	1	$172,000	1	$71,500	$3,420.00

Plan provisions:

Normal retirement age:	Age 65
Normal retirement benefit:	2.0% per year of service times the average of the best 3 years of salary
Eligibility for early retirement:	Age 55
Early retirement benefit:	Unreduced at age 62; otherwise 3% reduction from age 62
Termination benefit:	Deferred pension starting at the Normal Retirement Age Payable from age 55, reduced by 4% per year from age 65
Portability:	Participants may choose a lump-sum commuted value in lieu of an immediate or deferred pension at all ages
Cost-of-living adjustments:	CPI minus 1%, pre- and post-retirement
ITA Maximum Pension Test:	Calculated at pension commencement date

Additional information:

Month	V122542 (7 year)	V122544 (long)	V122553 (real)
January 2023	0.52%	1.45%	-0.08%
December 2022	0.48%	1.24%	-0.24%
November 2022	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
January 2023	1.149%	2.165%	1.802%	2.994%	0.683%	1.316%
December 2022	1.104%	2.010%	1.843%	2.878%	0.614%	1.124%
November 2022	1.191%	2.051%	1.996%	2.957%	0.608%	1.060%

Annuity factors:

Annuity factors exclude pre-retirement indexation.

${}_{5\|}\ddot{a}_{50}^{(12)}$	23.2	${}_{20\|}\ddot{a}_{35}^{(12)}$	16.4
${}_{6\|}\ddot{a}_{50}^{(12)}$	22.3	${}_{21\|}\ddot{a}_{35}^{(12)}$	15.7
${}_{7\|}\ddot{a}_{50}^{(12)}$	21.5	${}_{22\|}\ddot{a}_{35}^{(12)}$	14.9
${}_{8\|}\ddot{a}_{50}^{(12)}$	20.6	${}_{23\|}\ddot{a}_{35}^{(12)}$	14.2
${}_{9\|}\ddot{a}_{50}^{(12)}$	19.8	${}_{24\|}\ddot{a}_{35}^{(12)}$	13.5
${}_{10\|}\ddot{a}_{50}^{(12)}$	19.0	${}_{25\|}\ddot{a}_{35}^{(12)}$	12.8
${}_{11\|}\ddot{a}_{50}^{(12)}$	18.0	${}_{26\|}\ddot{a}_{35}^{(12)}$	12.2
${}_{12\|}\ddot{a}_{50}^{(12)}$	17.1	${}_{27\|}\ddot{a}_{35}^{(12)}$	11.6
${}_{13\|}\ddot{a}_{50}^{(12)}$	16.2	${}_{28\|}\ddot{a}_{35}^{(12)}$	11.0
${}_{14\|}\ddot{a}_{50}^{(12)}$	15.3	${}_{29\|}\ddot{a}_{35}^{(12)}$	10.4
${}_{15\|}\ddot{a}_{50}^{(12)}$	14.5	${}_{30\|}\ddot{a}_{35}^{(12)}$	9.8

(a) (3 *points*) Calculate the 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) (*4 points*) Calculate the commuted value at the members' date of termination assuming the members terminated:

(iii) Voluntarily; and

(iv) Involuntarily.

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

(c) (*2 points*) The members terminated their employment voluntarily and elected to receive lump-sum commuted values.

Calculate the pension adjustment reversals (PARs) for both members.

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

RETFRC, Fall 2022, Q3

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

Plan Provisions:

Retirement benefit:	2.00% of Final 3-year Average Earnings multiplied by years of service
Member contribution requirements:	5.0% of previous year earnings, contributed at the beginning of the year. Assume employee contribution balances would not trigger the 50% excess contribution rule.
Normal retirement age (NRA):	Age 65
Earliest retirement age:	Age 55
Unreduced early retirement age (UERA):	Age 62 with 20 years of service
Early retirement reduction:	*With 20 or more years of service:* 2% per year prior to age 65 *Otherwise:* Actuarial equivalent to pension deferred to NRA
Termination benefits:	Pension deferred to NRA Early commencement with actuarial equivalent benefit
Normal form of pension:	Life guaranteed for 5 years
Pre-retirement cost of living adjustments:	None
Post-retirement cost of living adjustments:	Pensions in payment are increased annually at 100% of CPI capped at 4%

The following information is as at December 31, 2021:

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 expense 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	60.0%
	65	100.0%
Retirement age (deferred):	Assume retirement at NRA	
Termination rates:	**Age**	**Rate per year**
	under age 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 calculation of the provision for adverse deviations (PfAD):

Plan Type (Closed):	5.00%
Non-Fixed Income Percentage is 60%. Related PfAD Component:	7.00%
Benchmark discount rate (BDR):	5.90%

Solvency and Hypothetical Wind-up assumptions:

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:	2.30% for 10 years, 3.40% thereafter
- Inflation rate:	1.50% for 10 years, 2.10% thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
- Discount rate:	2.70%
- Inflation rate:	2.20%
Termination Expenses:	$100,000
Retirement age:	In accordance with Standards of Practice

Amortization Schedules from previous valuation:

Type	Monthly Amortization Payment	Date Established	Start Date	Date of Last Payment
GC One	5,500	12/31/2020	1/1/2021	12/31/2021
GC Two	750	12/31/2020	1/1/2022	1/1/2032
Solvency One	1,000	12/31/2017	1/1/2018	12/31/2022
Solvency Two	2,000	12/31/2020	1/1/2022	12/31/2026

Membership information:

Active Members:	**ID1**	**ID2**
Age:	43	60
Earnings for 2019:	49,000	78,000
Earnings for 2020:	50,000	78,000
Earnings for 2021:	65,000	83,000
Years of service:	12.0	5.0
Status:	Full-time	Full-time

Deferred Members:	**ID3**	**ID4**
Age:	58	35
Termination Type:	Voluntary	Voluntary
Annual deferred pension:	25,000	10,000

Pensioners:	**ID5**	**ID6**
Age:	72	68
Spouse's age:	70	n/a
Retirement Date:	1/1/2012	1/1/2015
January 1, 2022 Annual Pension:	50,000	36,000
Form of pension:	J&S60%	Life guaranteed for 5 years

Asset Information:

Market value of assets at December 31, 2021: $1,287,780

There are no in-transit amounts as at December 31, 2021 or December 31, 2022.

Annuity factors:

[Provided in Excel]

You are asked to perform the actuarial valuation as at December 31, 2021.

(a) (*8 points*) Calculate the funded status of the plan on a going concern basis. (MORE LIKELY PART OF A RET 201 QUESTION)

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

(b) (*6 points*) Calculate the funded status of the plan on a solvency basis and on a hypothetical wind-up basis.

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

(c) (*6 points*) Calculate the minimum required and maximum permissible employer contributions for 2022 and the estimated minimum required employer contributions for 2023.

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

The next valuation date is December 31, 2022 based on the information provided below:

Member ID	**Status at December 31, 2022**
ID1	Terminated June 30, 2022, Lump Sum Payout of $215,000 on December 31, 2022
ID2	Active
ID3	Deferred
ID4	Deferred
ID5	Pensioner deceased March 2022. Spouse received spousal pension effective April 1, 2022
ID6	Pensioner deceased June 2022.

Other Data Experience

	ID2
Earnings for 2022:	87,150
CPI for 2022:	6.10%

Going Concern Assumption Changes

Discount rate:	5.20% (per year)
Salary Scale:	3.75% (per year)
Benchmark discount rate (BDR):	6.00% (per year)

Asset information (in $)

December 31, 2021 market value:	**1,287,780**
Company Current Service Cost, Expense Allowance and PfAD	100,000
Company special payments	50,000
Member contributions	6,200
Pension paid	(53,000)
Lump sums paid	(215,000)
Administration expenses	(24,000)
Investment expenses	(12,000)
Investment income	75,000
Realized and unrealized gains (losses)	(300,000)
December 31, 2022 market value:	**914,980**

You are performing the valuation at December 31, 2022.

(d) (*4 points*) Calculate the funded status of the plan on a going concern basis. (MORE LIKELY PART OF A RET 201 QUESTION)

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

(e) (*11 points*) Calculate the sources of gain/(loss) of the going concern funded status from December 31, 2021 to December 31, 2022. (MORE LIKELY PART OF A RET 201 QUESTION)

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

RETFRC, Fall 2022, Q7

(*9 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:	March 1, 1970	March 1, 1975
Date of Termination:	March 1, 2022	March 1, 2022
Pensionable Service:	12 years	5 years
Eligibility Service:	13 years	5 years
Accrued Benefit:	$25,000 per year	$15,000 per year

Plan Details:

Indexation:	50% of inflation (pre- and post-retirement)
Eligibility for Early Retirement:	Age 55
Eligibility for Unreduced Early Retirement:	85 Points (Age plus Eligibility Service)
Eligibility for Portability:	All ages
Early Retirement Reductions:	2% per year from age 65
Normal Retirement Age:	Age 65

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)
Feb 2022	1.81%	2.23%	0.56%
Mar 2022	2.41%	2.41%	0.58%
Apr 2022	2.64%	2.79%	0.91%

Month	Mid-Term Provincial Bond Index	Mid-Term Corporate Bond Index	Mid-Term Federal Non-Agency Bond Index
Feb 2022	2.54%	3.41%	1.92%
Mar 2022	3.02%	4.05%	2.42%
Apr 2022	3.35%	4.48%	2.76%

Month	Long-Term Provincial Bond Index	Long-Term Corporate Bond Index	Long-Term Federal Non-Agency Bond Index
Feb 2022	3.20%	4.03%	2.24%
Mar 2022	3.35%	4.29%	2.45%
Apr 2022	3.78%	4.83%	2.82%

(a) (*4 points*) Calculate the commuted value discount rates under section 3500 of the Canadian Institute of Actuaries' Standards of Practice as at the members' date of termination.

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

You are given the following annuity factors:

${}_{8\|}\ddot{a}_{47}^{(12)}$	18.4	${}_{14\|}\ddot{a}_{47}^{(12)}$	13.9	${}_{4\|}\ddot{a}_{52}^{(12)}$	20.0	${}_{10\|}\ddot{a}_{52}^{(12)}$	15.1
${}_{9\|}\ddot{a}_{47}^{(12)}$	17.6	${}_{15\|}\ddot{a}_{47}^{(12)}$	13.2	${}_{5\|}\ddot{a}_{52}^{(12)}$	19.2	${}_{11\|}\ddot{a}_{52}^{(12)}$	14.4
${}_{10\|}\ddot{a}_{47}^{(12)}$	16.8	${}_{16\|}\ddot{a}_{47}^{(12)}$	12.5	${}_{6\|}\ddot{a}_{52}^{(12)}$	18.3	${}_{12\|}\ddot{a}_{52}^{(12)}$	13.6
${}_{11\|}\ddot{a}_{47}^{(12)}$	16.0	${}_{17\|}\ddot{a}_{47}^{(12)}$	11.9	${}_{7\|}\ddot{a}_{52}^{(12)}$	17.5	${}_{13\|}\ddot{a}_{52}^{(12)}$	12.9
${}_{12\|}\ddot{a}_{47}^{(12)}$	15.3	${}_{18\|}\ddot{a}_{47}^{(12)}$	11.3	${}_{8\|}\ddot{a}_{52}^{(12)}$	16.7		
${}_{13\|}\ddot{a}_{47}^{(12)}$	14.6	${}_{3\|}\ddot{a}_{52}^{(12)}$	20.9	${}_{9\|}\ddot{a}_{52}^{(12)}$	15.9		

(b) (*5 points*) Calculate the commuted values for Member A and Member B at their 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.

RETFRC, Fall 2023, Q6

(*10 points*) You are the actuary for a company that sponsors a defined benefit pension plan registered in Ontario.

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

Valuation data:

Member	Age (years)	Service (years)	Earnings		
			2020	2021	2022
A	49	5	70,000	73,000	75,000
B	60	30	90,000	95,000	98,000

Pension plan provisions:

Normal retirement benefit:	2% of final 3-year average earnings multiplied by service
Normal form of pension:	Life only
Normal retirement age:	Age 65
Earliest retirement age:	Age 55
Early retirement reduction:	4% per year prior to age 60
Termination benefit:	Deferred pension payable at age 65. Early commencement of pension subject to an actuarial equivalent reduction.

Solvency assumptions:

Discount rate – annuity purchase:	4% per year
Discount rate – lump sum payment:	5% per year for 10 years, 5% per year thereafter
Percentage of members electing a commuted value:	100% of members under age 55, 0% otherwise
Retirement age:	In accordance with the Standards of Practice
Pre-retirement decrements:	None

Going concern assumptions and methods:

Discount rate:	6% per year
Salary increase:	3% per year
Retirement age:	Age 65
Termination decrement:	None
Other pre-retirement decrements:	None
Actuarial cost method:	Projected Unit Credit

Solvency annuity factors
[provided in the Excel Worksheet]

(a) (*6 points*) Calculate the 2023 solvency incremental cost (SIC).

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

(b) (*4 points*) Describe the considerations in setting the SIC projection assumptions.

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

RETFRC, Spring 2024, Q1

(*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:

RETFRC, Spring 2024, Q2

(*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

Membership information:

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

Actuarial assumptions and methods:

Going concern assumptions:

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

Information for calculation of the provision for adverse deviations (PfAD):

Plan type (Closed):	5.00%

PfAD asset mix component:	4.00%
Benchmark discount rate (BDR):	6.50%

Solvency and hypothetical wind-up assumptions:

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

Amortization schedules from previous valuation:

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

Annuity Factors:

[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.

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.

RETFRC, Spring 2024, Q4

(*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

Plan Provisions:

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%

Annuity factors:

[Provided in the Excel worksheet]

(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.

RETFRC, Fall 2024, Q3

(*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

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%

Solvency and hypothetical wind-up assumptions:	
Exclusions from solvency liabilities	Exclude 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	
Non indexed rates	4.50% for 10 years, 4.50% thereafter
100% indexed rates	2.70% for 10 years, 2.80% thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
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

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.

(f) (*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.

(g) (*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.

(h) (*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.

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

(i) (*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.

(j) (*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.

RETFRC, Fall 2024, Q5

(*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

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]

[Commuted 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:

RETFRC, Fall 2024, Q7

(*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:

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

ANSWER:

RET 301 Learning Objective 3 Curated Past Exam Questions

RETFRC, Fall 2020, Q6

(*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.

(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.

RETFRC, Fall 2020, Q10

(*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

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.

RETFRC, Fall 2020, Q11

(*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.

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.

RETDAC, Spring 2021, Q7

(*10 points*) Company A offers a retirement savings plan that has the following two options for their Canadian employees:

Feature	Option A	Option B
Type of Arrangement	Registered Retirement Savings Plan (RRSP)	Tax-Free Savings Account (TFSA) and bank account
Eligibility	1 year	Immediate
Annual Employee Contribution	Between $1,000 and 50% of the Maximum Allowable Amount under the Income Tax Act (ITA)	7% of salary after income tax up to $16,000
Contributions in Excess of Maximum Allowable Amount under the ITA	None	Invested in bank account earning guaranteed interest of 2% per year
Employer Matching Contribution	100% match	75% match

(a) (*4 points*) Compare and contrast the design features of each option with respect to generating retirement savings.

No calculations required.

ANSWER:

You are provided with the following information for a new hire:

Current age	50
Planned retirement age	65
Life expectancy at age 65	20 years
Current annual salary	$300,000
Current RRSP maximum annual dollar limit	$27,830
Current TFSA maximum annual contribution	$6,000
Investment rate of return	5%
Annual salary increase	3%
Annual RRSP and TFSA limits increase	2%
Average income tax rate before retirement	35%
Average income tax rate after retirement	25%
Timing of contributions	End of year

The employee will contribute the minimum required to receive the maximum company matching contribution.

(b) (*6 points*) Assess which option provides the higher expected annual retirement income for the new hire.

Show all work.

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

RETFRC, Spring 2021, Q6

(*6 points*) Company ABC sponsors a defined benefit pension plan registered in Ontario. You are given:

Membership Data as at January 1, 2019:

Member	Class	Date of Membership	Salary	Bonus
X	A	January 1, 2015	$ 90,000	$ 18,000
Y	A	January 1, 2000	$ 180,000	$ 36,000

Pension Plan Provisions:

Retirement benefit	1.8% of final average 3-year salary (FAE3) times credited service
Earnings	Base pay, including bonuses
Member contribution rate	No member contributions are allowed
Normal retirement age	Age 65
Disability	Accrual of benefits continues with salary frozen at the salary in the year prior to disability

Company ABC Pay Scale for all Class A Members:

Years of membership	Annual Pay Scale
0 to <5	4.5% p.a. increase
5 to <10	3.0% p.a. increase
10 to <15	2.5% p.a. increase
15+	1.0% p.a. increase

Bonus: 20% of salary if meeting 100% of sales target; otherwise, no bonus payable.

Income Tax Act defined benefit dollar limit for 2020: $3,092.22

Effective December 31, 2019, Member X goes on an authorized leave of absence (disability leave) for one year. Member Y remains active, received only the pay adjustment identified above for Class A members, and achieved 100% of her sales target.

(a) (*3 points*) Calculate the 2020 Pension Adjustment for Members X and Y.

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

(b) (*3 points*) Describe the benefit improvements than can be made to maximize the pension benefit payable from the plan without generating a Past Service Pension Adjustment.

ANSWER:

RETFRC, Fall 2021, Q5

(*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:

RETFRC, Fall 2021, Q9

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

Plan Provisions:

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

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.

RETFRC, Spring 2022, Q2

(*3 points*) Company XYZ sponsors a single-employer pension plan that consists of both a defined benefit provision and a defined contribution provision. The plan provides the following benefits:

Defined Benefit Provision	Annual pension of 1.2% of pensionable earnings per year of credited service.
Defined Contribution Provision	Required employer contribution of 1% of pensionable earnings. Plus Required employee contribution of 2% of pensionable earnings.

You are given:

Member data:

	Member A
2022 Pensionable earnings	$200,000
2022 T4 earnings	$250,000
2022 Defined benefit limit	$3,420
2022 Money purchase limit	$30,780
Available RRSP contribution room in 2022	$3,500

Company XYZ is considering increasing the employer DC contributions.

(a) (*2 points*) Calculate the maximum contribution, in dollars, to the defined contribution provision that Company XYZ may make for Member A in 2022.

ANSWER:

(b) (*1 point*) Company XYZ decides not to change the defined contribution provision. Calculate the maximum total contribution (employee and employer) to the DC plan plus to Member A's personal Registered Retirement Savings Plan (RRSP) for 2022.

ANSWER:

RETFRC, Fall 2022, Q4

(*6 points*) You are given:

Plan Provisions:

Normal Retirement Benefit:	0.8% of 3-year Final Average Earnings (FAE3) below 3-year Average YMPE (AYMPE) plus 1.4% of FAE3 in excess of AYMPE multiplied by years of credited service up to a maximum of 35 years
Normal Retirement Age:	Age 65
Postponed retirement:	No service accrual. Pension is increased actuarially
Credited service accrual:	Prorated based on completed months

You are given the following member information as at December 31, 2021:

Member	Age at 12/31/2021	Credited Service Earned in 2021	Credited Service at 12/31/2021	Pensionable Earnings in 2021
1	28	1	1	70,000
2	58	1	35	280,000
3	41	1	10	130,000
4	59	1	9	75,000
5	65	1	23	92,000
6	36	1	4	115,000

You are also given the following information for the year 2022:

Member	Pensionable Earnings in 2022 (not annualized)	Status
1	35,000	Terminated on July 1, 2022 and elected a lump sum payment of $6,500
2	288,500	Worked full year
3	66,000	Terminated on July 1, 2022 and elected a deferred pension
4	68,750	Deceased December 1, 2022
5	93,000	Worked full year
6	87,000	Terminated on October 1, 2022 and transferred pension entitlement to Plan B under a Reciprocal Transfer Agreement (RTA). Plan B is less generous than Plan A. Under Plan A, the total pension credits equal $48,000. For the same years of service under Plan B, the total pension credits equal $42,000. The commuted value of the benefits under Plan A is $40,500 and the commuted value of the benefits under Plan B is $35,080; based on the RTA, $35,080 will be transferred to Plan B, and the excess commuted value of $5,420 will be paid to the employee.

Additional information:

Year	YMPE	Income Tax Act Maximum Defined Benefit Pension Limit
2021	61,600	3,245.56
2022	64,900	3,420.00

(a) (*1 point*) Calculate the 2021 Pension Adjustments for all members.

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

(b) (*3 points*) Calculate the 2022 Pension Adjustments for all members.

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

(c) (*2 points*) Calculate the Pension Adjustment Reversals for 2022.

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

RETFRC, Fall 2022, Q8

(*8 points*) Three members who participate in a defined benefit pension plan retired on January 1, 2022. You are given the following as at January 1, 2022:

Plan provisions:

Normal retirement benefit:	$200 per month, multiplied by years of service
Bridge benefit:	None
Normal retirement age:	Age 65
Earliest retirement age:	Age 55
Unreduced early retirement age:	Age 62
Early retirement reduction:	Employment terminated on or after age 55: 3% per year prior to age 65 Employment terminated before age 55: actuarially equivalent
Postponed retirement:	Continued accrual after normal retirement age. In addition, benefits accrued prior to the normal retirement age are increased 6% per year of postponement
Normal form of payment:	Life only, payable monthly in advance
Optional forms of payment (available on an actuarially-equivalent basis):	Life guaranteed for 10 years, payable monthly in advance Level income option, payable monthly in advance, to the earlier of age 65 or death
Post-retirement annual indexation:	None

Member data as at January 1, 2022:

	Member A	**Member B**	**Member C**
Age at retirement at January 1, 2022:	61	61	66
Age at termination of employment:	46	56	66
Years of service accrued before age 65:	20	20	19
Years of service accrued after age 65:	0	0	1
Years of service (Total):	20	20	20
Elected optional form:	Life Only	Level Income Option, taking into account CPP and OAS	Life guaranteed for 10 years

Annuity factors:

	Immediate factors		
Age	**Life only**	**Life guaranteed for 10 years**	**Temporary to age 65**
55	19.3	19.5	8.2
56	19.1	19.3	7.6
57	18.8	19.1	6.8
58	18.6	18.9	6.1
59	18.3	18.6	5.3
60	18.0	18.3	4.5
61	17.7	18.0	3.6
62	17.4	17.8	2.8
63	17.1	17.5	1.9
64	16.8	17.2	1.0
65	16.5	17.0	0.0
66	16.1	16.6	0.0
67	15.8	16.4	0.0

	Factors deferred to age 65	
Age	**Life only**	**Life guaranteed for 10 years**
55	11.1	11.2
56	11.5	11.6
57	12.0	12.2
58	12.5	12.7
59	13.0	13.2
60	13.5	13.7
61	14.1	14.4
62	14.6	14.9
63	15.2	15.6
64	15.8	16.2
65	16.5	17.0

Additional information:

C/QPP Maximum Pension Benefit for 2022:	$1,253.59 per month
Maximum OAS payable in January 2022:	$642.25 per month
Income Tax Act Maximum Defined Benefit Limit for 2022:	$3,420 per year of service
YMPE for 2022:	$64,900

(a) (*1 point*) Calculate the maximum lifetime pension that applies to the three members under the Income Tax Act at their respective pension commencement ages.

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

(b) (*7 points*) Calculate the monthly early retirement pension payable under the elected optional form of payment as at January 1, 2022 for each member.

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

RETFRC, Spring 2023, Q1

(*6 points*) You are the actuary for a contributory defined benefit pension plan registered in Ontario.
You are given:

Pension Plan Provisions

Employee contributions	7.5% of pensionable earnings up to 31 years of pensionable service, 0% after 31 years of pensionable service
Lifetime pension	2.0% of best average earnings times the minimum of years of pensionable service and 31 years
Bridge pension (payable from retirement to age 65)	Flat benefit of $2,000 per month
Best average earnings	Average of the three consecutive years' pensionable earnings in the past five years that has the highest value
Normal retirement age	Age 65
Early retirement age	Age 55
Earliest unreduced retirement date	30 years of pensionable service
Early retirement reduction	6% per year from age 65 on lifetime and bridge pension

Year	YMPE	ITA maximum pension limit	Maximum monthly OAS pension	Maximum monthly CPP
2022	$64,900	$3,420.00	$642.25	$1,253.59
2021	$61,600			
2020	$58,700			
2019	$57,400			
2018	$55,900			
2017	$55,300			

You are given the following information about two plan members who retired on December 31, 2022:

	Member A	**Member B**
Age at December 31, 2022	56	59
Pensionable service at December 31, 2022	9	31
Pensionable service at January 1, 2022	8	30.25
Pensionable earnings in 2022	$300,000	$100,000
Pensionable earnings in 2021	$320,000	$98,039
Pensionable earnings in 2020	$313,725	$96,117
Pensionable earnings in 2019	$307,574	$94,232
Pensionable earnings in 2018	$301,543	$92,385
Pensionable earnings in 2017	$295,631	$90,573
Immediate annuity factor at retirement	18.3	17.4
Deferred to 65 annuity factor at retirement	10.7	12.0

(a) (*4 points*) Calculate the lifetime and bridge pensions payable to both members.

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

(b) (*1 point*) Calculate the 2022 Pension Adjustments for both members.

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

(c) (*1 point*) Calculate the 2022 employee contributions for Member A.

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

RETFRC, Fall 2024, Q2

(*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:

RET 301 Learning Objective 4 Curated Past Exam Questions

Some of the previous questions from the FRC exams required detailed calculations of valuation results in the context of a Canadian plan. These calculations would now often be split under the new courses, with general valuation results (liability, normal cost, funded status) being on RET 201 and valuation results calculated according to specific Canadian requirements or used to develop minimum and maximum funding under the Ontario PBA being on RET 301.

RETDAC, Fall 2020, Q10

(*7 points*)

(a) (*4 points*) Describe the tax treatment of the following when using a Retirement Compensation Arrangement (RCA) to fund a Defined Benefit Supplemental Executive Retirement Plan (DB SERP) :

(i) Contributions

(ii) Investment returns

ANSWER:

An RCA is set up to provide a pension for a long-service executive who will retire in January 2022. On June 30, 2022 she will receive 20% of the total fund balance.

Year	2020	2021
Contribution	$400,000	$600,000

Contributions are paid at the beginning of the year and are invested in term deposits earning a fixed interest rate of 2% per year.

(b) (*3 points*) Calculate the refundable tax payable in 2020, 2021, and 2022 to the Canada Revenue Agency.

Show all work.

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

RETFRC, Spring 2021, Q3

(*13 points*) Your client sponsors a single-employer non-indexed closed defined benefit pension plan registered in Ontario. The plan is not a designated plan as defined under the Income Tax Act.
You are given the following valuation results as at December 31, 2020:

Going concern assets (including buy-in annuity; excluding present value of special payments previously established in respect of any past service unfunded actuarial liability)	$ 25,600,000
Going concern liabilities (including buy-in annuity; excluding PfAD)	$ 30,000,000
Buy-in annuity value included in going concern assets and liabilities	$ 10,000,000
Going concern annual employer current service cost (excluding PfAD)	$ 120,000
Annual provision for administrative expenses	$ 50,000
Going concern discount rate (net of investment expenses; gross of administrative expenses)	6.00%
Provision for adverse deviations ("PfAD")	16.04%
Going concern annual special payments payable in 2021 from prior valuation	$ 200,000
Duration of going concern liabilities (excluding buy-in annuity)	16
Duration of total going concern current service cost	20

Solvency assets (including buy-in annuity before wind-up expenses)	$ 31,400,000
Solvency liabilities	$ 38,800,000
Buy-in annuity value included in solvency assets and liabilities	$ 15,800,000
Solvency annual special payment payable in 2021 from prior valuation	$ 0
Solvency blended discount rate (for calculation of special payments)	3.2%
Provision for wind-up expenses	$ 200,000

There are **no** allowable exclusions from the solvency liabilities (e.g. consent benefits).

(a) (*3 points*) Calculate the minimum required and maximum permissible employer contributions in 2021.

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

You are given the following:

Pension fund assets at December 31, 2021 excluding the value of the buy-in annuity	$ 14,400,000
Benefit payments for portion of liabilities not backed by the buy-in annuity in 2021	$ 200,000
Benefit payments for portion of liabilities backed by the buy-in annuity in 2021	$ 600,000
2021 total going concern current service cost	$ 150,000
Solvency incremental cost excluding buy-in annuity in 2021	$ 250,000
There are no liability gains or losses during the period	
All assumptions remain the same as at December 31, 2020	
The going concern discount rate is net of passive investment expenses of:	0.05%

The target asset allocation is the following:	
Fixed income assets	45%
Non-fixed income assets	55%

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 December 31, 2021 is 2.00%

- The formula to determine the benchmark discount rate that is used in the determination of the PfAD is:

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

(b) (*10 points*) Calculate the minimum required and maximum permissible employer contributions for 2022, rolling forward liabilities and current service costs using extrapolation techniques.

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

RETFRC, Spring 2021, Q9

(*15 points*) You are performing a funding valuation as at December 31, 2020 for a defined benefit pension plan registered in Ontario.
Calculate the one (1)-year Solvency Incremental Cost for the defined pension plan described below.

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

You are given:

Plan Provisions

Normal retirement age	Age 65
Normal retirement benefit	1.5% times 3-year final average earnings (FAE3) times years of credited service
Normal form	Life only; Joint & 60% survivor for participants with a spouse on retirement, actuarially equivalent to Life only
Eligibility for early retirement	Age 55
Early retirement benefit	Reduced by 4% per year from age 65
Termination benefit	Deferred pension starting at age 65 Payable from age 55 on an actuarially equivalent basis
Portability	Participants may choose a lump-sum commuted value in lieu of an immediate or deferred pension at all ages
Cost-of-living adjustments	None

Solvency Valuation Assumptions

Interest rates:	
Lump-sum commuted values	2.50% per year for 10 years; and 2.50% thereafter
Annuity Purchase	2.50% per year
Mortality rates (post-retirement):	
Lump-sum commuted values	CPM2014 Mortality Table (Combined) with mortality improvements in accordance with CPM Improvement Scale B
Annuity purchase	CPM2014 Mortality Table (Combined) with mortality improvements in accordance with CPM Improvement Scale B
Mortality rates (pre-retirement):	
Lump-sum commuted values	None
Annuity purchase	None
Option Election	100% of active participants assumed to elect a lump-sum commuted value

Going Concern Valuation Assumptions

Salary increases	3.00% per year, inclusive of merit and promotion	
Mortality rates (post-retirement)	CPM2014 Mortality Table (Combined) with mortality improvements in accordance with CPM Improvement Scale B	
Mortality rates (pre-retirement)	None	
Retirement Rates	**Age**	**Rate**
	60	15%
	62	15%
	65	100%
	All other ages	0%
Termination Rates	**Age**	**Rate**
	35	3%
	40	2%
	45	1%
	All other ages	0%
Timing of Decrements	Beginning of year	

Projection assumptions required for Solvency Incremental Cost

New entrants	None
Option Election upon Termination or Retirement	100% of active participants assumed to elect a lump-sum commuted value

	The lump-sum commuted value is calculated using solvency valuation assumptions
All other assumptions	In accordance with Going Concern Valuation Assumptions Assume inactive participants survive to the next valuation

Participant Data at December 31, 2020

Member ID	Status	Sex	Age	Earnings in 2020	Earnings in 2019	Earnings in 2018	Monthly Pension	Credited Service
12001	Active	Male	33	$65,000	$63,000	$62,500	N/A	10.0
12004	Active	Male	40	$72,000	$71,500	$70,400	N/A	16.0
14052	Active	Male	59	$82,500	$81,000	$80,000	N/A	20.0
30001	Retired - life only	Male	70	N/A	N/A	N/A	$2,000	N/A

Annuity Factors

Age	# of years of deferral	Annuity Factor	
		December 31, 2020	December 31, 2021
33	22	12.78	12.79
33	23	12.24	12.26
33	24	11.72	11.73
33	25	11.21	11.23
33	26	10.72	10.74
33	27	10.24	10.26
33	28	9.78	9.79
33	29	9.33	9.34
33	30	8.88	8.90
33	31	8.46	8.47
33	32	8.04	8.05
34	21	13.08	13.10
34	22	12.53	12.55
34	23	12.00	12.01
34	24	11.48	11.49
34	25	10.98	10.99
34	26	10.49	10.50
34	27	10.01	10.02
34	28	9.55	9.56
34	29	9.09	9.11
34	30	8.65	8.67
34	31	8.23	8.24
40	15	15.07	15.09
40	16	14.43	14.45
40	17	13.81	13.83
40	18	13.22	13.23
40	19	12.63	12.65
40	20	12.07	12.08
40	21	11.52	11.53
40	22	10.98	11.00
40	23	10.46	10.47
40	24	9.95	9.96
40	25	9.45	9.47
41	14	15.43	15.45
41	15	14.78	14.79

Annuity Factors

Age	# of years of deferral	Annuity Factors	
		December 31, 2020	December 31, 2021
41	16	14.14	14.16
41	17	13.53	13.55
41	18	12.93	12.95
41	19	12.35	12.37
41	20	11.79	11.80
41	21	11.24	11.26
41	22	10.70	10.72
41	23	10.18	10.20
41	24	9.66	9.68
59	0	19.67	19.70
59	1	18.78	18.81
59	2	17.92	17.95
59	3	17.07	17.10
59	4	16.25	16.28
59	5	15.45	15.48
59	6	14.67	14.70
60	0	19.22	19.25
60	1	18.33	18.37
60	2	17.47	17.50
60	3	16.63	16.66
60	4	15.81	15.84
60	5	15.01	15.04
70	0	14.22	14.26
71	0	13.68	13.72

RETDAC, Fall 2021, Q6

(*9 points*) Company XYZ sponsors a non-registered defined contribution Supplemental Executive Retirement Plan (SERP) for one of its executives. Contributions to the SERP are 18% of each year's pensionable earnings.

The company is considering two options to secure the SERP:

Option 1: Funded retirement compensation arrangement (RCA)

Option 2: Securing the notional account value with a letter of credit

(a) (*3 points*) Describe the advantages and disadvantages of the two funding options from the perspective of Company XYZ.

ANSWER:

You are given the following:

Year	1	2	3	4
Pensionable Earnings	$200,000	$220,000	$230,000	$250,000
Rate of Return (per annum)	4.0%	6.0%	-2.0%	5.0%

The cost of the letter of credit is 1.75% of the notional account value at the end of each year.

Assume contributions are made in the middle of the year, all returns are fully realized in the year earned, and there are no disbursements from the plan.

(b) (*6 points*) Calculate the balance of the RCA and refundable tax account at the end of Year 4 under each of the following:

(i) Option 1

(ii) Option 2

Show all work.

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

RETFRC, Fall 2021, Q3

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

Plan Provisions:

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**:

Actuarial Assumptions and Methods:

Going Concern Assumptions:

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%

Solvency Assumptions:

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

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

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.

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
$_{d\|}\ddot{a}_{x}^{(12)}$	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
$_{20\|}\ddot{a}_{45}^{(12)}$		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.

(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.

RETFRC, Spring 2022, Q4

(*32 points*) Your client sponsors a non-contributory defined benefit pension plan registered in Ontario. As the actuary of the plan, you are responsible for determining the funded status of the plan and the contribution requirements. A full actuarial valuation for funding purposes is required to be performed as at December 31, 2020.

The plan provisions are as follows:

Retirement benefit:	1.75% of Final 3-year Average Earnings
Member Contribution requirements:	None required or permitted
Normal retirement age (NRA):	Age 65
Earliest retirement age:	Age 55
Unreduced early retirement age (UERA):	Age 60, with 20 or more years of service
Early retirement reduction:	*With 20 or more years of service:* 3% per year prior to age 60
	Otherwise: Actuarial equivalent to NRA
Termination benefits:	Pension deferred to NRA
	Early commencement with actuarial equivalent benefit
Form of payment:	Life only. Optional forms available on an actuarial-equivalent basis
Pre-retirement cost of living adjustment:	None
Post-retirement cost of living adjustment:	Pensions in payment are increased annually at 100% of inflation

The following information is as at December 31, 2020:

Actuarial Assumptions and Methods:

Going concern assumptions:		
Discount rate:	4.90% per year	
Inflation:	2.00% per year	
Salary increases:	3.00% per year	
Explicit expense allowance:	$45,000	
Pre-retirement mortality:	None	
Actuarial Cost Method:	Projected Unit Credit	
Retirement age (actives):	**Age**	**Rate per year**
	UERA	50.0%
	65	100.0%
Retirement age (deferred):	Assume retirement at UERA	
Termination rates:	**Age**	**Rate per year**
	under age 50	3.0%
	50 and over	0.0%
Form of benefit elected:	100% of eligible members receive a pension from the plan	
Termination Assumption:	Assume 100% of terminations and retirements are involuntary	
Assets:	Actuarial value of assets - realized and unrealized capital gains (losses) arising during a given year are spread on a straight-line basis over 3 years	

Information for calculation of the provision for adverse deviations (PfAD):

Plan Type (Closed):	5.0%
Non-Fixed Income Percentage is 60% with related PfAD Component:	7.0%
Benchmark discount rate (BDR):	4.9%

Solvency assumptions:

Solvency basis:	Solvency liabilities are set to equal wind-up liabilities
Form of benefit settlement elected by member	
- Active and Deferred Members:	100% elect lump sum
Basis for benefits assumed to be settled through a lump sum	
- Solvency discount rate:	1.40% for 10 years, 2.90% thereafter
- Inflation:	0.60% for 10 years, 1.90% thereafter
Basis for benefits assumed to be settled through the purchase of an annuity	
- Interest rate:	2.5%
- Inflation rate:	3.3%
Termination expenses:	$150,000
Retirement age:	50% at UERA and 50% at best age

Amortization Schedules from previous valuation:

Type	Monthly amortization payment	Date established	Start date	Date of last payment
Going concern one	4,000	2019-12-31	2020-01-01	2020-12-31
Going concern two	1,500	2019-12-31	2021-01-01	2030-12-31
Solvency one	1,200	2016-12-31	2017-01-01	2021-12-31
Solvency two	1,400	2019-12-31	2021-01-01	2025-12-31

Membership information:

Active Members:	**ID1**	**ID2**
Age:	49	54
Earnings for 2018:	55,000	68,000
Earnings for 2019:	58,000	72,000
Earnings for 2020:	61,000	74,000
Years of service:	4.0	12.0
Status:	Full-time	Full-time
Deferred Members:	**ID3**	**ID4**
Terminated involuntarily:	Yes	Yes
Age:	39	60
Age at termination:	35	50
Service at termination:	5.0	20.5
Annual deferred pension:	8,600	12,000
Pensioners:	**ID5**	**ID6**
Age:	63	68
Spouse's age:	n/a	64
Retirement date:	2014-07-01	2003-01-01
Annual pension:	12,100	9,900
Form of pension:	Life only	J&S60%

Asset Information (in $):

	2018	**2019**	**2020**
January 1 market value of assets:	895,000	1,064,440	1,027,320
Company Current Service Cost, Expense Allowance and PfAD	105,000	107,000	109,000
Company special payments	0	60,000	108,000
Pension paid	-20,740	-21,150	-21,570
Lump sums paid	0	0	0
Administration and investment fees	-65,120	-66,470	-69,430
Investment income	50,000	-16,500	-65,400
Gains (losses) – realized or unrealized	100,300	-100,000	28,900
December 31 market value of assets:	1,064,440	1,027,320	1,116,820

There are no in-transit amounts as at December 31, 2020 or December 31, 2021.

Investment Policy:

Fixed Income Component (L) (Investment Grade)	40%
Alternative Investment Component (M)	0%
Non-Fixed Income Component	60%

Annuity Factors (Life only factors except where noted otherwise):

Going Concern Annuity factors (indexed):
Provided in Excel.

Going Concern Annuity factors (non-indexed):
Provided in Excel

Solvency Annuity factors:
Provided in Excel

(a) (*15 points*) You are asked to perform the actuarial valuation as at December 31, 2020.

(i) Calculate the funded status of the plan on a going concern basis.

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

(ii) Calculate the funded status of the plan on a solvency basis.

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

(iii) Calculate the minimum contribution requirements for 2021 and 2022 based on the December 31, 2020 valuation.

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

(b) (*14 points*) The next required valuation date is December 31, 2021. You are asked to complete the actuarial valuation as at December 31, 2021 based on the information provided below:

Member ID	**Status at December 31, 2021**
ID1	Active
ID2	Active
ID3	Paid Out on March 31, 2021 - $122,500
ID4	Deferred
ID5	Pensioner
ID6	Pensioner died in August 2021. Spouse received spousal pension effective September 1, 2021

Other Data Experience:

	ID1	**ID2**
Earnings for 2021:	70,000	76,220

Going Concern Assumptions:

Discount rate:	3.60%	(per year)
Benchmark discount rate (BDR):	4.50%	(per year)

All other assumptions are the same as at December 31, 2020.

Asset information (in $):

December 31, 2020 market value:	1,116,820
Company Current Service Cost, Expense Allowance and PfAD	85,000
Company special payments	50,000
Pension paid	-20,680
Lump sums paid	-122,500
Administration and investment fees	-45,300
Investment income	1,560
Gains (losses) – realized or unrealized	260,000
December 31, 2021 market value:	1,324,900

(i) Calculate the funded status of the plan on a going concern basis.

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

(ii) Calculate the sources of gain/(loss) of the going concern liabilities from December 31, 2020 to December 31, 2021.

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

(c) (*3 points*) Calculate the funded position on a going concern basis including PfAD, under the following two Plausible Adverse Scenarios. Use duration to estimate the change in liabilities.

The going concern liability durations are:	Indexed	Non-indexed
	17.5	16.1

(i) Interest Rate Shock: 90 bps drop in discount rate and 7% increase in fixed income portion of assets.

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

(ii) Equity Market Shock: Discount rate shift of 0% and 15% drop in equity market.

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

RETDAC, Fall 2022, Q6

(*9 points*)

(a) (*4 points*) Describe how the following SERP plan provisions can be designed to improve executive recruitment and retention:

(i) Eligibility

(ii) Vesting

(iii) Benefit formula

(iv) Service

ANSWER:

Company ABC has decided to implement a defined contribution (DC) SERP effective January 1, 2023 with the following provisions:

Granted past service contributions are paid in full to the retirement compensation arrangement (RCA) on January 1, 2023	$250,000
Contribution for current service cost on January 1, 2023	$25,000
Contribution for current service cost on January 1, 2024	$30,000

You are given the following executive scenario:

- The plan is fully funded.
- A refundable taxable account (RTA) has been set up for the DC SERP.
- Contributions to the RTA are made at the same time as the above contributions to the RCA.
- The executive's account earns 5% annually.
- Assume all income is realized in the year it is earned.
- The executive retires on December 1, 2024 with an initial withdrawal of $50,000.
- The executive withdraws $100,000 on July 1, 2025.
- Account transfers are assumed to occur on December 31 each year.

(b) (*4 points*) Calculate the January 1, 2026 account balances in the following:

(i) RCA

(ii) RTA

Show all work.

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

(c) (*1 point*) Describe the steps to implement a letter of credit funding arrangement.

ANSWER:

RETFRC, Fall 2023, Q2

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

Plan provisions:

Normal retirement age (NRA):	Age 65
Normal retirement benefit:	1.8% of Final 3-year Average Earnings (FAE3) multiplied by years of service
Early retirement reduction:	10 or more years of service: benefit is reduced 3% per year from age 62 Less than 10 years of service: benefit is reduced 5% per year from NRA
Termination benefit:	Deferred pension starting at age 65 Early commencement from age 55 on an actuarially equivalent basis
Post-retirement cost of living adjustments:	100% of the increase in the Consumer Price Index (CPI)

Other information:

- On January 1, 2019, a buy-in group annuity was purchased for pensioners ID5 and ID6
- Your client wants to contribute the minimum allowable under the Pension Benefits Act (Ontario)

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

Going concern assumptions:

Discount rate:	5.7% per year	
Inflation rate:	1.8% per year	
Asset valuation method (excluding the value of the buy-in annuity contract):	Asset gains and losses, determined with reference to the going concern discount rate, smoothed over a 3-year period. Cashflow assumed to occur in the middle of the year	
Salary increase rate:	2.5% per year	
Pre-retirement mortality:	None	
Actuarial cost method:	Projected Unit Credit prorated on service	
Retirement age:	**Age**	**Rate**
	62	50%
	65	100%
Termination rates (assume 100% of terminations are involuntary):	**Age**	**Rate**
	45	5%
	50	2%
	Other ages	0%
Timing of decrements:	Beginning of year (BOY)	
Form of payment:	Life only. Optional forms available on an actuarial-equivalent basis	
Provision for Adverse Deviation (PfAD):	9.0%	

Solvency Assumptions:

Annuity purchase discount rate:	3.0% per year
Transfer value discount rates:	2.10% per year for 10 years; 3.10% per year thereafter
Percentage of active members receiving settlement by commuted value transfer:	Under age 55: 100% Over age 55: 0%
Solvency asset valuation:	Market value of assets
Pre-retirement mortality:	None
Excludable benefits:	Cost of living adjustments are excluded
Plan termination expenses:	$100,000
Retirement age:	In accordance with the Standards of Practice

Membership information (as at January 1, 2022):

Active Members	**ID1**	**ID2**
Age:	44	62
Earnings 2019:	81,500	117,500
Earnings 2020:	83,000	120,000
Earnings 2021:	85,000	140,000
Years of service:	4.0	29.0
Status:	Full-time	Full-time
Normal Cost (incl. Indexation):	13,000	38,200
Normal Cost (excl. Indexation):	10,000	30,700

Pensioners	ID3	ID4	ID5 (insured annuity)	ID6 (insured annuity)
Age:	60	69	65	68
Retirement date:	January 1, 2020	January 1, 2018	January 1, 2016	January 1, 2016
January 1, 2022 monthly pension:	1,200	2,500	1,800	3,000
Form of pension:	Lifetime only	Lifetime only	Lifetime only	Lifetime only

Asset information (in $):

	2019	2020	2021
January 1 market value of assets*:	1,250,000	1,346,700	1,048,000
Employer normal cost contribution:	16,500	17,000	18,000
Employer special payments:	60,000	70,000	95,000
Benefit payments:	94,000	96,000	98,000
Transfer in from insurer:	54,200	55,300	55,700
Administration expenses:	40,000	45,000	42,000
Investment return*:	100,000	-300,000	30,000
December 31 market value of assets*:	1,346,700	1,048,000	1,106,700

*excluding the buy-in annuity contract

Liability information (as at January 1,2022 in $):

	Going-concern basis (including indexation)	Going-concern basis (excluding indexation)	Solvency basis
Active members	1,198,000	963,000	1,242,100
Non-insured pensioners	663,000	549,400	678,000
Insured pensioners (buy-in)	850,000	707,500	870,000

Amortization schedules effective as at January 1, 2021:

	Monthly amortization payment	Date of first payment	Date of last payment
Going concern	1,800	2021-01-01	12/31/2021
Going concern	1,000	2022-01-01	12/31/2031
Solvency	1,500	2022-01-01	12/31/2026

(a) (*3 points*) Calculate the funded status of the plan on going concern and solvency bases at January 1, 2022.

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

(b) (*2 points*) Calculate the minimum required employer contributions for 2022 and the new amortization payment schedule.

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

You are asked to complete the January 1, 2023 actuarial valuation based on the information provided below. ID6 died and no other decrements occurred in 2022.

Going concern discount rate:	6.5% per year
Annuity purchase discount rate:	4.9% per year
Transfer value discount rates:	4.30% per year for 10 years; 4.70% per year thereafter
Actual CPI increase for 2022:	6.3%

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

Asset information (in $):

	2022
January 1 market value of assets (excluding value of annuity buy-in contract)*:	1,106,700
Total employer contributions:	85,262
Benefit payments:	84,000
Transfer in from insurer:	39,600
Administration expenses:	45,000
Investment return*:	190,000
December 31 market value of assets*:	1,292,562

*excluding the buy-in annuity contract

Demographic information:

Member ID	**Status at December 31, 2022**	**Earnings for 2022**
ID1	Active	85,000
ID2	Active	143,500

Annuity Factors
[Provided in the Excel Worksheet]

(c) (*10 points*) Calculate the funded status of the plan on going concern and solvency bases at January 1, 2023.

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

(d) (*4 points*) Calculate the minimum required employer contributions for 2023 and the special payment schedule resulting from the valuation.

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

(e) (*8 points*) Assess the reasonableness of the gain/(loss) analysis completed by your analyst below:

Source	**Gain/(loss) amount**
Investment return	127,000
Mortality	500,000
Inflation	70,000
Retirement	(130,000)
Salary	(10,000)

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