CURATED PAST EXAM ITEMS
- Solutions -

RET 301 – Actuarial Topics for Canadian Retirement Plans

Important Information:

o 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.

o Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.

o 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.

o 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 The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.

o 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.

RET301 Learning Objective 1 Model Solutions

RETFRC, Fall 2020, Q7

Learning Outcomes:
a)   Describe and apply the techniques used in the development of economic assumptions for funding purposes.

b)   Evaluate and recommend appropriate assumptions for funding purposes.

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

CIA Revised Educational Note, December 2015: *Determination of Best Estimate Discount Rates for Going Concern Funding Valuations*

Commentary on Question:
This question was intended to test candidates' knowledge of the approach for setting going concern discount rates for funding valuations, but in the context of a pension plan sponsor that has adopted a glide-path for the investment policy. There are two approaches to setting the best estimate assumption going concern discount rate: based on expected future investment returns on the assets of the pension plan or based on yields of investment grade debt securities. Most candidates sufficiently described the first approach and the "building block" methodology, but were expected to provide more information on how the investment policy (and glide path) should be incorporated. As for the yield curve approach, the majority of candidates failed to mention this as an option and therefore did not receive full marks. Candidates were expected to present this approach as an option and comment that the investment policy (and glide path) would be irrelevant.

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

        Going concern discount rate should be a best estimate assumption modified to incorporate margins for adverse deviations, to the extent, if any, required by law

        Two approaches to setting the best estimate assumption going concern discount rate:

1. <u>Based on expected future investment returns on the assets of the pension plan</u>

One accepted methodology for establishing a best estimate discount rate that reflects expected future investment returns is a building block approach:
- Determine best estimate long-term return for each asset class;
- Combine best estimate long term returns for each asset class reflecting the plan's asset allocation under the investment policy (with consideration for effect of diversification);
- Consider inclusion of an allowance for additional return from active management, where appropriate; and
- Make appropriate provision for expenses.

The discount rate should be based on a best estimate of the expected future investment return on the plan's assets over a relevant time frame. Typically, this will be a long-term horizon such as 20–30 years but a shorter-term perspective may be needed for very mature plans.

Since this pension plan employs a glide-path investment strategy, the actuary would make a judgement to reflect the anticipated timing and effect of the asset mix changes on the expected future investment returns on the plan's assets. In this case, the actuary must make an assumption for how the solvency funded position is expected to evolve by taking into account:
- Expected returns of each asset class
- Expected growth in liabilities
- Regulatory funding requirements
- Plan's funding policy

The going concern discount rate is then set reflecting that the asset mix is gradually shifted to the end-point of the glide path over X number of years.

2. <u>Based on the yields of investment grade debt securities, considering the expected future benefit payments of the pension plan</u>

The plan's current target asset mix and glide-path are irrelevant under this approach.

The yields of investment grade debt securities would reasonably match the projected benefit cash flows or have a duration comparable to that of the projected benefit cash flows. Take into account appropriate allowance for future plan expenses that are expected to be paid from the pension fund.

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

If the discount rate is based on the yields of investment grade debt securities, considering the expected future benefit payments of the pension plan, then the funding policy has no impact on the going concern discount rate.

Under the approach of using expected investment returns on the assets of the pension plan to determine the going concern discount rate, the incorporation of the glide path must also consider the funding policy. In years 1-4, the expected return on assets will decrease gradually, reducing the discount rate. The expected return from year 5 should be based on the allocation of the ultimate step in the glide-path (90% fixed income).

RETFRC, Spring 2021, Q10

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes

Sources:
Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates between December 31, 2018, and December 30, 2019 (NOT CURRENT VERSION ON THE SYLLABUS)

CIA Standards of Practice – Pension – Section 3200 Advice on the Funded Status or Funding of a Pension Plan and Section 3500 Pension

Commentary on Question:
The question was testing the candidate's ability to describe the process and considerations relevant to setting assumptions for a Solvency valuation as well as considerations for the assumptions required to calculate Solvency Incremental Costs.

Overall this question was done poorly by candidates as they either did not include enough descriptions to award full points or did not focus on considerations related to Solvency assumptions.

Solution:
(a)   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

Commentary on Question:
Full credit was given to candidates who appropriately described how the requested assumptions were impacted by use in a solvency valuation and describing the considerations for each assumption as it relates to a solvency valuation. Candidates who described assumption considerations with regards to the going concern basis or not correctly relating to the solvency basis received no credit.

(i) **Mortality Assumption**
- Commuted Value Basis
  - o The mortality table is promulgated for the computation of pension commuted values.
  - o The table is the 2014 Combined Canadian Pensioners' Mortality Table (CPM2014) with the CPM Improvement Scale B (CPM-B)
  - o There is to be no adjustments considered to reflect sub- or super-standard mortality for determination of the commuted values for solvency valuation purposes
  - o If required by legislation or the terms of the plan, commuted values would be calculated on a unisex basis. The methodology to determine the relative proportions of males versus females can be determined in multiple ways. It is important that the unisex basis should be appropriate for the particular plan.
- Annuity Purchase Basis
  - o The mortality table is not promulgated and in the case of an actual annuity purchase would be set based on the selected annuity purchase provider's mortality assumptions.
  - o The CIA produces guidance on the mortality table to use for annuity purchase.
  - o The actuary should consider making an adjustment to the regular annuity purchase assumptions where there is demonstrated substandard or super-standard mortality or where an insurer might be expected to assume so. In such cases, the actuary would be expected to make an adjustment to the mortality assumption in a manner consistent with the underlying annuity purchase basis
  - o Given the uncertainty, surrounding the actual mortality basis that would be typical of a group annuity purchase, it is reasonable to assume that there is a range of bases that can be expected not to be materially different from the actual mortality basis. Therefore, an adjustment to the regular annuity purchase assumptions would be warranted when the plan's assumed basis falls outside that range.

(ii) **Portion electing a commuted value**
  – Upon plan wind-up, members are given options for the method of settling their benefit entitlements. The options vary by eligibility and by province of employment, but in general, involve either a lump sum transfer or an immediate or deferred pension, the actuary must consider the specifics of the plan, member demographics and legislative requirements when making an assumption regard the portion of members electing a commuted value.
  – The actuary should ensure alignment with settlement assumptions used for Going Concern valuations, unless specific reason not to.
  – Plan experience should be considered while taking into account the credibility of the data when determining any adjustments.
  – The actuary must consider the relevant plan terms and provisions around commuted values and their various circumstances.

(iii) **Wind-up expenses**
  – When considering the level of wind-up expenses to hold in the solvency balance sheet the actuary would assume that the pension plan has neither a surplus nor a deficit.
  – The expected length of the wind-up process (typical range of 18 to 24 months) should be considered.
  – Wind-up expenses related to the resolution of surplus or deficit issues, including if the terms of a wind-up are contested, need not be considered.
  – The actuary should consider and make an assumption as to the solvency of the Plan Sponsor and ensure the assumption with respect to the payment of expenses and the assumption with respect to the solvency of the employer would be consistent.
  – An actuary would consider expenses payable from the Plan's assets in respect of actuarial and administration expenses that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan when setting the wind-up expenses
  – Additional consideration should be given on whether to include provisions for:
    o transaction fees related to the liquidation of the Plan's assets;
    o Expenses that may reasonably be expected to be paid by the pension fund under the postulated scenario between the wind-up date and the settlement date.

(iv) **Increase in average wage index**
- The actuary should consider whether an assumption regarding the average wage index is required for the valuation. It is often used to project YMPE or ITA maximum pension limits beyond the valuation date.
- If the plan terms require YMPE projections or the ITA maximum pension limits to be determined at the date of commencement, then using an average wage index assumption for the solvency assumption should be included.
- The increase in the average wage index is prescribed to increase at rates that are one percentage point higher than the rates of increase in the Consumer Price Index, which is also a prescribed rate on a solvency basis.

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

Commentary on Question:
Full credit was given to candidates who appropriately described the considerations for assumptions used for the solvency incremental cost and included at least six considerations. Many candidates simply did not include enough considerations to receive full points.

The main considerations are as follows:
- The financial assumptions would be consistent with the solvency valuation at time 0.
- The demographic assumptions are typically set consistent to Going Concern Assumptions at time 0. Alternatively, if the actuary considers such experience to be different from the longer term expected experience assumed for a going concern valuation, one may reflect expected experience between time 0 and time t.
- Consider the demographic assumptions to be used for each of the following experience items:
  o *Expected Benefits Payments during the following year* – Lump sum and pension payments
  o *Decrements* – expected withdrawals, deaths, disabilities and retirements during the year
  o *Service Accruals* – expectation of service accrual for the year for each active member
  o *Projected changes in benefits and/or pensionable earnings* - depends on plan type
- If the plan is open, consideration must be given to new entrants during the year and how much additional liability to include in the incremental cost for them. Assumptions must be made to the number and demographics of the new entrants over the period. If the plan is closed, no assumption for future entrants are required.

Additional things to consider in setting the solvency incremental cost assumptions
- If there are any pending amendments to the pension plan, the impact should be included in the incremental cost, as per Standards of Practice.

- The incremental cost would allow for the expected changes in benefits due to factors such as members becoming eligible for early retirement "grow-in" benefits, or members becoming eligible for unreduced or subsidized early retirement benefits, where such factors would result in a significant increase in the hypothetical wind-up or solvency liability between time 0 and time t.
- Where the interest rate(s) that would be used to value the projected or solvency liability for a particular member at time t would be different from the interest rate(s) used at time 0 (e.g., because the probability of method of settlement is expected to be different at time t than it was at time 0, or because smoothed interest rates are being used), the actuary would account for the change in interest rates.
- If Smoothing is used, it would be appropriate to assume that the unsmoothed interest rates at time t remain at the same levels applicable at time 0.

RETFRC, Fall 2021, Q8

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, CIA Educational Note, Dec 2015 (NO LONGER THE VERSION ON THE SYLLABUS)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Describe the considerations for setting the best estimate going concern discount rate.

Commentary on Question:
Generally, most candidates were able to provide information on the most common approaches used to determine a best estimate going concern discount rate.

There are two typical approaches to setting a best estimate going concern discount rate:
1. Building block approach
    a. Determine the best estimate of long-term, expected future investment returns for various asset classes
    b. Combining best estimate long-term, expected future investment returns for different asset classes to reflect a plan's investment policy
    c. With consideration for effects of diversification and rebalancing
    d. Considering inclusion of an allowance for additional return due to active vs passive management
    e. Making appropriate provision for expenses
2. Based on fixed income yields
    a. Where an immunized portfolio is established to match projected cash flows, appropriate to base the discount rate assumption on the yield of the immunized portfolio
    b. The asset mix has no impact on the setting of the discount rate in this approach

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

Commentary on Question:
The candidates who did well on this question clearly stated a recommendation of how to establish a margin, and provided details on its development. Many candidates did not provide either a clear recommendation and/or enough information on how it would be developed.

There are a number of approaches on how to establish a margin on the going concern discount rate. Three potential approaches are outlined below but there may be other ways that could be considered a reasonable answer if enough detail is provided.

Sample Approach 1
- Recommendation: Incorporate PfAD in accordance with ON pension legislation (or similar)
- Determine whether closed or open plan and apply associated amount (with ON pension legislation or other reasonable amount provided)
- Determine proportion of fixed income and non-fixed income assets based on investment policy and regulations, apply associated amount (with ON pension legislation or other reasonable amount provided)
- If discount rate exceeds benchmark, apply associated amount (with ON pension legislation benchmark or other reasonable amount provided)

Sample Approach 2
- Recommendation: Using a building block approach incorporating margins within the components of a going concern discount rate
- Determine a risk-free rate using historical 10 year GoC bond yields
- Equity risk premium, start with best estimate and adjust downwards based on maturity of plan with larger margin for mature plans
- Incorporate margin for fixed-income risk premium
- Diversification & rebalancing: best estimate of 0.5% and reduced for margin
- Assume no added return from active management

Sample Approach 3
- Recommendation: Incorporate explicit margin based on plan characteristics
- Plan's Investment policy: margin is higher for plans that adopt a riskier investment policy. The higher the proportion of pension fund invested in nonfixed income assets, the higher the discount rate margin required
- Plan maturity: margin higher for mature plans than for less mature plans
- Current level of long-term interest rates: it moves with long-term interest rates that fall within a specified range—a higher (lower) margin is applied when interest rates move up (down)

RETFRC, Spring 2022, Q6

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes

Sources:
Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, CIA Educational Note, Dec 2015

Commentary on Question:
Most candidates performed well on this question, using the building block approach to recommend a discount rate assumption. The candidates who received maximum points provided explanations for how the various components were developed and applied a cap to the risk premium on global equities as it was high. Successful candidates also noted how the best estimate may need to incorporate a margin.

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

Use the building block approach to determine the discount rate based on expected future investment returns.

As this is not a very mature plan, a time frame of 20 years is appropriate. The risk premium for Global Equities is capped at 5% since 8.5% is likely excessive.

Using the asset allocation and the 20-year risk premia given, the weighted average risk premium is calculated to be:
(5% * -1.0% + 40% * 0.3% + 30% * 4.1% + 25% * 5.0%) = 2.55% *(or 3.425% if the full risk premium of 8.5% is used for global equities)*

Add weighted risk premium to the expected return on long-term government of Canada bonds, the estimated return of the plan's portfolio is 2.2% + 2.55% = 4.75% *(or 2.2% + 3.425% = 5.625%)*

For this target asset mix, it is appropriate to add 0.4% per annum for the benefits of the diversification effect to get to 5.15% *(or 6.025%; anything between 0.3% and 0.5% is reasonable)*

Investment expense and active management: the outperformance in the past three years alone is not sufficient to support any assumption regarding future added value returns from active investment management in excess of the associated additional investment management fees. Therefore, should assume no more than 0.35% (0.60% - 0.25%) of additional returns for active management.

Since the additional return and the associated fees for active management offset each other, essentially, we just need to deduct an allowance of 0.25% (reflecting only passive investment management costs) from the discount rate to get to 4.9% *(or 5.775%)*.

Estimating the administrative expenses based on the average rate over the last three years, deduct another 0.8% to get to 4.1% *(or 4.975%; some candidates noted using an explicit expense allowance in the normal cost which was also acceptable)*.

Therefore, recommend a discount rate of 4.1% *(or 5.0%)*

Note that this best estimate assumption may need to be modified to incorporate margins for adverse deviations to the extent, if any, required by law or by the terms of an appropriate engagement.

RETFRC, Spring 2022, Q10

Learning Outcomes:
c) Evaluate actual experience, including comparisons to assumptions

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE
SYLLABUS

RET301-102-25: CAPSA Guidance Solvency or hypothetical wind-up liabilities based on
actual life insurance company annuity quotation

CIA Educational note for selection of mortality assumptions for pension plan actuarial
valuations (ASSUMED KNOWLEDGE FROM RET 201)

Commentary on Question:
*This question is to test candidate's understanding regarding selection of actuarial
assumptions for funding purposes based on actual experience (i.e., an annuity quote was
provided for the plan).*

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

        Commentary on Question:
        *Candidates are not required to list all bullets below to get full points. Many
        candidates did not attempt this question. For those who did, they listed
        considerations for setting assumptions in general, without considering the fact
        that annuity quotation was received for this plan.*

        [Source: CAPSA Guidance]
        - The assumptions used for actual and hypothetical wind-up valuations should
          reflect single premium annuity rates in respect of benefit entitlements that are
          assumed to be settled by purchase of annuities, unless the establishment of a
          replicating portfolio is assumed.
        - Although not required to do so, a life insurance company may provide a
          quotation for all or a portion of the pension benefits that are assumed to be
          settled through the purchase of an annuity.
        - Note that the CAPSA guidance is applicable to solvency or hypothetical wind-
          up valuations and may not be appropriate for actual wind-up valuations.
        - It is expected that the actuary would consider the quotation in determining the
          pension plan's liabilities, irrespective of whether the premium amount in the
          quotation is lower or higher than the solvency or hypothetical wind-up
          liabilities produced by CIA guidance.

- The approach taken to establish the solvency or hypothetical wind-up liabilities should be applied in a consistent manner.
- The date of quotation should coincide with the valuation date.
- If the quotation date is not the same as the valuation date, the quotation would be considered valid if the quotation date is within six (6) months before or after the valuation date. If this is the case, the solvency or hypothetical wind-up liabilities should be adjusted using the methodology described under "Adjustment to quotation" in the CAPSA guidance note. (e.g. reflect the change in the CIA annuity proxy liability from the date of quotation to the date of the valuation).
- The use of an annuity quotation may not be acceptable if circumstances have changed significantly between the valuation date and the quotation date such that the quote is not representative of financial or market conditions existing at the valuation date.

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

Commentary on Question:
See above

- Must consider the date of quotation. Specifically:
  o   The date should coincide with the valuation date, which it does not.
  o   If the date does not coincide, it should be within six (6) months before or after the valuation date. The previous annuity quote as at September 30, 2020 is no longer valid, given it is over 6 months old.
- Must consider if circumstances have changed significantly between the valuation date and the quotation date.

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

Commentary on Question:
See above

- Annuity Proxy recommends using the CPM2014 base mortality table. For the annuity proxy assumption setting, the actuary could consider changing the base mortality table assumption from CPM2014 to a table that reflects the experience of the plan and judgment.
- The actuary may consider certain factors when determining adjustments to the standard mortality table assumption. Specifically:
  o   the credibility of experience,
  o   the experience of similar plans,
  o   published mortality studies, and
  o   possible adjustments based on characteristics such as collar type, industry, and pension size.

RETFRC, Fall 2022, Q2

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes
c) Evaluate actual experience, including comparisons to assumptions

Sources:
Selection of Mortality Assumptions for Pension Plan Actuarial Valuations, CIA Educational Note, Dec 2017 (ASSUMED KNOWLEDGE FROM RET 201)

Guidance on Selection and Disclosure of Plausible Adverse Scenarios, CIA Educational Note, Feb 2019

Commentary on Question:
The question was to test candidates' understanding when a plan may require adjustment to the mortality assumption for a going concern valuation to reflect pension plan membership characteristics.

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

Commentary on Question:
Many candidates discussed the credibility of data without mentioning the specific adjustments listed. Further, candidates were expected to provide brief commentary on each adjustment factor listed to get full marks. The illustrative solutions list key factors and adjustments identified from the source materials but other appropriate considerations for adjusting the mortality assumption will also receive points.
Important factors to consider in establishing a mortality assumption include:

1. **Nature of Employment**

- Private/Public Sector Workers

  Relying solely on public or private sector employment as a determinant for mortality table selection without considering the underlying industry has practical limitations. Judgment would be applied in selecting among tables based on sector.

- Collar Type (blue collar vs. white collar workers)

  Mortality experience analysis by collar type in broad-based experience studies may be restricted by the quality of the data available and the ability to classify it into collar types.

  The actuary would exercise care in combining collar experience in one study with overall experience in another as combining such experience may not yield satisfactory results due to underlying differences in the demographic profiles studied.

- Industry - demographic and occupational factors

  Mortality experience by industry may also be analyzed in conjunction with the preparation of broad-based experience studies. However, to date, industry analysis has not proven to be conclusive.

  Industry information would be used with caution.

  - An adjustment may be considered for a plan covering members in an industry which exhibits credible mortality experience that is significantly higher or lower than average.

  - Larger, more homogeneous groups, such as university professors or teachers, will likely have more credible results in an industry experience study than smaller, diverse industries

2. Relative amount of pension payments

- Pension Size

  The use of size adjustments is a practice which may be considered where actual plan experience is not fully credible and industry adjustments are not available or are otherwise deemed inappropriate.

  - An adjustment would typically be considered when a plan has pension amounts or active members' earnings levels which are significantly higher or lower than the corresponding amounts underlying the base table for a selected published mortality study.

  - Use of pension size is a proxy for socio-economic status. The relationship between pension size and life expectancy is likely one of correlation rather than cause.

  - Examples of other factors which may correlate with socio-economic status include, but are not limited to, place of residence (i.e., postal code) and level of education

- o If size adjustments are used, a satisfactory approach may be to determine a single weighted size adjustment factor for each gender using the average size adjustment factor weighted by pension amount. The actuary would then select the associated published mortality table, differing by age and gender, with a percentage adjustment to mortality rates to approximate the effect of applying size adjustments

- o Size adjustments would typically not be revised annually. Typically, the same adjustments for pension size used for retirees would be applied to survivors. If no major shift in demographics has occurred or is anticipated, it is generally reasonable to also apply the same adjustments to active and deferred members as for retirees

- Pension amount indexed or not

  If and when pension size bands are adjusted for increases in wages, a fully indexed plan would have to adjust only for changes in the spread between the increase in average industrial wages and the level of indexation provided by the plan. For a non-indexed plan, it would often be appropriate to compare the pension payable to the pension size bands at time of retirement.

3. Other

- Combinations of Adjustments for Plan Membership Characteristics

  Caution would be used in deriving adjustments for variations in more than one plan characteristic (collar, industry, sector type, pension amount, and/or other socioeconomic indicators) at the same time, as the combined effect may overstate or understate the actual relationship.

  A reasonable approach would be to consider adjustments to the published mortality table based on each characteristic separately. The alternative adjustments derived by considering each characteristic separately may be helpful in narrowing down a reasonable range and selecting a final assumption.

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

Commentary on Question:
Candidates generally did well on part b of the question.

Longevity riskis the risk that pension plan members will live longer than expected. In selecting the plausible adverse scenario, the actuary would consider plan-specific factors affecting potential longevity experience.

Two possible approaches to measuring the sensitivity of the disclosure item to changes to the mortality assumption are:

- The impact of the life expectancy of members being one year higher than assumed. An age setback could be used to estimate the effect of increased life expectancy.
- The impact of a percentage adjustment to mortality rates. For example, the effect of decreasing mortality rates at all ages by 10 percent may be disclosed.

RETFRC, Fall 2022, Q5

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes
c) Evaluate actual experience, including comparisons to assumptions

Sources:
Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, Selection of Mortality Assumptions for Pension Plan Actuarial Valuations (ASSUMED KNOWLEDGE FROM RET 201), Expenses in Funding Valuations for Pension Plans, Reflecting Increasing Maximum Pensions Under the Income Tax Act in Solvency, Hypothetical Wind-up and Wind-up Valuations, Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 Ch. 15

Commentary on Question:
Candidates are expected to identify general differences in the purpose of the valuation and valuation methods between going concern and hypothetical wind-up valuations. Candidates are also expected to describe detailed differences in economic and demographic assumptions, identifying differences applicable to specific assumptions. Most candidates did well regarding parts i) and ii), but many failed to provide sufficient detail describing the differences of specific assumptions.
Some candidates incorrectly described the purpose, methods and assumptions used in an actual wind-up valuation instead of a hypothetical wind-up valuation.

Solution:
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.

> i & ii) Purpose of the valuation and valuation methods
> Going Concern:
>> • Estimates plan's obligations on a long-term, going concern basis, using best estimate assumptions recommended by the actuary, and methods and margins consistent with the sponsor's funding policies and the guidelines and constraints established by the regulators.

- Carried out primarily to for the purpose of establishing an appropriate level of contributions to the plan acceptable to the Registered Plans Directorate and the minimum pension standards regulator
- Employ a valuation cost method that results in the orderly accumulation and investment of pension plan assets in order to fund future obligations
- Asset value other than market value can be used for assets in going concern valuation

Hypothetical Wind-up:
- Hypothetical wind-up valuation prepared in conjunction with a funding valuation, but as if the plan had been terminated and all obligations settled as of the valuation date. Hypothetical wind-up valuations are required by minimum standards legislation, but not the Income Tax Act (Canada);
- Attempt to measure what it would cost to settle all the guaranteed benefits of a pension plan at a given point in time. The wind-up liabilities should include contingent benefits (such as grow-in)
- Because a going-concern funding valuation employs a long-term approach – as long as the plan sponsor continues in business and remains prepared to fund any deficits that arise - the exact balance between assets and going concern liabilities may not be very important to plan members and regulators. Full funding of benefit obligations only becomes a real issue when a plan sponsor goes out of business and the plan is fully wound up. For this reason, actuarial standards require actuaries to include an estimate of the hypothetical wind-up liability in any plan prepared for funding purposes.
- Obligations are assumed to be settled either through commuted value (typically for those not yet retirement eligible), or annuity purchase (for pensioners and other retirement eligible members).

iii) Economic Assumptions:

Discount Rate
    Going Concern:
- Used to develop a long-term compounded annualized expected rate of return on the plan's invested assets. An acceptable approach to developing a going concern discount rate is the building block approach. Typically, a single effective discount rate would be produced/reflected
- Should reflect the plan's specific asset allocation on the valuation date, as well as any future anticipated changes in asset allocation, based on any glidepath strategy or investment policy that may have been formally adopted/implemented. Should be developed using the expected rate of return on the various asset categories, weighted by the plan's target asset allocation. Plus, an additional return related to rebalancing and diversification.

- An alternative approach to the building block approach is to use the yields on high quality fixed income investments, considering expected future benefit payments from the pension plan. The resulting discount rate in this case would be independent of the plan's invested assets.

Hypothetical Wind-up:
- The discount rates to be used are prescribed by the CIA actuarial standards and by provincial legislation, based on the valuation date.
- Discount rates are based on a marked to market approach – reflecting current bond yields
- For benefits assumed to be settled by commuted value, the discount rates (select (applicable for the first 10 years) and ultimate (applicable for all years thereafter) rates) are prescribed by the CIA's commuted value standards applicable at the valuation date. For benefits assumed to be settled by group annuity purchase, the discount rate is to be determined by reference to the group annuity purchase proxy guidance issued quarterly by the CIA. The group annuity purchase discount rate per the guidance would vary depending on the profile (i.e. duration) of the group. The group annuity purchase guidance is developed by the CIA on a quarterly basis, based on actual quotes received from the various insurers on various blocks of hypothetical group annuities.

Inflation

Going Concern:
- Applicable for plans that provide inflation protection by providing cost of living adjustments. Should reflect long-term expectations of inflation.
- Typically, a singular rate is developed, however a select and ultimate rate can be used in situations of transitory higher or lower inflation environments.
- The inflation assumption could be used as a building block component in the development of the wage growth, salary scale, and discount rate assumptions.

Hypothetical Wind-up:
- Similar to discount rates, based on a marked to market approach – reflecting current real return bond yields.
- For benefits assumed to be settled by commuted value, the inflation rates are prescribed by the CIA's commuted value standards applicable at the valuation date (can be reflected explicitly using separate discount rates and inflation rates, or implicitly using a net discount rate). For benefits assumed to be settled by group annuity purchase, inflation is reflected as part of a net discount rate determined by reference to the group annuity purchase proxy guidance issued by the CIA.

Average Wage Growth

    Going Concern:

- Applicable to determine income tax act maximums, as well as increases in social security limits for plans with benefit formulas that are integrated with government social security programs, Should reflect long-term expectations of economic growth for the broad economy. The average wage growth assumption would be used as a building block component in the development of a salary scale assumption.

    Hypothetical Wind-up:

- Average wage growth can be reflected to project future increases in income tax act maximums for plans that determine maximums based on limits applicable at pension commencement date, as opposed to termination date.

Salary Scale

    Going Concern:

- Salary scale assumption should reflect the long-term annualized rate of salary increase expected for the plan population.
- Should be developed taking into account historical plan experience and management's expectations for the future
- Should be developed using a building block approach, based on underlying expectation for inflation, general economic growth, and merit/promotion.
- Can use a single effective rate, or have a table of rates varying by age and/or service
- Can develop different increase assumptions for different cohorts/classes of employees.

    Hypothetical Wind-up:

- Salary scale is not applicable since the plan is assumed to be terminated on the valuation date.

Plan Expenses

    Going Concern:

- Should reflect expectation of ongoing future expenses payable from the plan, taking into account what expenses are paid from the plan vs. directly by the employer. Can be reflected as explicit provision for expenses (in normal cost), or implicitly (net out in discount rate)

    Hypothetical Wind-up:

- Allowance for normal administrative, actuarial, legal, and other costs that would be incurred if the plan were to be wound up, deducted from the plan assets / funded status in determining financial position

iv) Demographic Assumptions:

Retirement

Going Concern:
- Retirement assumption should reflect plan specific provisions that may influence individual timing of retirement and pension commencement, and commencement dates of social security programs
- Should reflect characteristics of the group / industry of employer / employer-specific or job-related factors
- Should be developed taking into account historical plan experience and management's expectations for the future
- Can use a single retirement age or have a table of rates varying by age and/or service.

Hypothetical Wind-up:
- Based on the CIA actuarial standards and by provincial legislation
- For benefits assumed to be settled by group annuity purchase, typically the age that maximizes the value of benefits (optimal age), for benefits assumed to be settled by commuted value, a 50% weight assigned to age that maximizes the value of benefits (optimal age), and 50% weight assigned to earliest unreduced age

Termination

Going Concern:
- Should reflect plan specific provisions that may affect turnover characteristics of the group / industry of employer / employer-specific or job-related factors
- Should be developed taking into account historical plan experience and management's expectations for the future
- Should use a table of rates

Hypothetical Wind-up:
- The plan is assumed to be terminated on the valuation date – therefore all employees are assumed to terminate employment on the valuation date

Disability and Recovery from Disability

Going Concern:
- Should reflect plan specific provisions including definition of disability, that may affect likelihood of disability approval, characteristics of the group / industry of employer / employer-specific or job-related factors, historical plan experience and management's expectations for the future and should consider materiality, including size of plan in assessing whether an assumption should be incorporated

Hypothetical Wind-up:

- The plan is assumed to be terminated on the valuation date, therefore all employees are assumed to terminate employment on the valuation date, and future disability/recovery is not applicable

Mortality and Mortality Improvement

Going Concern:
- Should reflect best estimate mortality assumption for plan population, reflect actual experience, credibility of experience, experience of similar plans, and published mortality tables
- Should also take into account plan specific or employer specific characteristics (blue collar vs white collar), and other characteristics such as pension size as a proxy for socio-economic status
- Future mortality improvement considerations should take into account short-term rate based on recently observed improvement rates, ultimate long-term improvement rate, which is highly uncertain, and transition from short-term to the ultimate improvement rates over certain period. Should give consideration to emerging mortality improvement trends and studies on a regular basis.

Hypothetical Wind-up:
- For benefits assumed to be settled by commuted value, prescribed by the CIA's commuted value standards applicable at the valuation date; For benefits assumed to be settled by annuity purchase, CIA proxy guidance recommends using the CPM2014 base mortality table with improvement scale CPM-B
- Insurers are increasingly considering occupational and demographic factors in establishing mortality assumptions for the pricing basis of specific group annuities, taking into account credibility of experience, experience of similar plans, published mortality studies, plan provisions that expose the group to anti-selection or tail risk, and possible adjustments based on characteristics such as collar type, industry, and pension size.
- An adjustment to regular annuity purchase assumptions would be expected where an insurer might be expected to assume significantly shorter or longer-than-average pension plan longevity

Marital Status

Going Concern:
- Should reflect a married assumption if plan provisions provide different benefits and/or subsidies depending on marital status. Should be developed taking into account historical plan experience and management's expectations for the future. Should also reflect male/female population of plan

Hypothetical Wind-up:
- For benefits assumed to be settled by commuted value, should reflect a married assumption if plan provisions provide different benefits and/or subsidies depending on marital status. For benefits assumed to be settled by annuity purchase, would typically reflect the most valuable option form (i.e. reflect 100% married if plan provides a subsidy to married members)
- Similar to going concern, should be developed taking into account historical plan experience and management's expectations for the future. Should also reflect male/female population of plan

RETFRC, Fall 2022, Q9

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes

Sources:
Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, CIA Educational Note, Dec 2015

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Calculate the best-estimate going concern discount rate using the building block approach.

Commentary on question
Most candidates performed relatively well on this question. The majority of those who did not perform well did not reflect the expenses correctly.

Both solutions below are appropriate:

Possible Solution 1: Assuming Passive Management with no extra expense from active management

Risk-free rate	0.96%
Risk premia	2.28%
Value added returns from active management	0.00%
Equity management expenses (passive) fees	-0.10%
Fixed-income management fees	-0.24%
Additional Fees due to active management	0.00%
Diversification and rebalancing	0.20%
Total	**3.10%**

Possible Solution 2: Assuming Active Management with extra expense from active management

Risk-free rate	0.96%
Risk premia	2.28%
Value added returns from active management	0.23%
Equity management expenses (active) fees	-0.10%
Fixed-income management fees	-0.24%
Additional Fees due to active management	-0.03%
Diversification and rebalancing	0.20%
Total	**3.30%**

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

Commentary on question
Most candidates performed poorly on this question. The majority mentioned that additional returns would have to make up for the additional expenses but that was not sufficient to score points.

The actuary will have to justify, with supporting data, that active return in excess of additional expenses can be consistently and reliably earned over the long term:

- Take into account both historical and future considerations. In order to avoid biases, the actuary would consider periods of both positive and negative incremental returns due to active management. Consider historic performance over different stages of the economic cycle.
- Detailed analysis of a particular manager's organization, people, and investment processes and an assessment of the extent to which past performance and expected future performance can be attributed to these factors.
- Consider the plan's governance processes for hiring, monitoring, and replacement of investment managers.
- Monitor value added at each future valuations and modify or remove the allowance for value added as appropriate.

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

Commentary on question
Most candidates performed relatively well on this question. Majority of candidates were able to describe at a high level what the bond yield approach is.

- The fixed-income approach reflects the yields on Government og Canada or high-quality bonds that reasonably matches the plan's projected cash flows or duration.
- Consider allowance for reinvestment and changes in interest rates if fixed-income instruments mature prior to benefit payments.
- Appropriate allowance for expenses should also be made.
- This approach works well for plan whose assets are invested in an immunized portfolio made up of fixed-income instruments that match projected cash flows.

RETFRC, Fall 2023, Q7

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes

Sources:
Determination of best estimate disount rates for GC valuations, CSOP 3100 - 3500

Commentary on Question:
This question was testing knowledge of components of different valuation assumptions and their interaction in a high inflation rate environment. Part a) was answered well by candidates with most candidates correctly identifying different approaches to calculate going concern discount rates. Some candidates lost points on expenses by not identifying expense assumptions can be explicit or implicit. Candidates struggled in part b). Most did not recognize the impact of high inflation on the going concern/wind-up discount rates. Most candidates also did not identify the higher expense assumption projection due to inflation, or the change in retirement behavior leading to delayed retirement.

Solution:
(a)   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

All assumptions developed should be internally consistent within a plan and also throughout the various plans of ABC Company (e.g. there should be a singular view of the future levels of inflation).

Discount Rate

- A long-term compounded annualized expected rate of return on the plan's invested assets, typically a single effective discount rate. An acceptable approach is the building block approach which should reflect the plan's specific asset allocation on the valuation date as well as any future anticipated changes in asset allocation. The rate development should use the expected rate of return on the various asset categories, weighted by the plan's target asset allocation, plus an additional return related to rebalancing and diversification.

- An alternative approach to the building block approach is to use the yields on high quality fixed income investments, considering expected future benefit payments from the pension plan. The resulting discount rate in this case would be independent of the plan's invested assets.

- Consideration:
    - Building block should consider inflation consistent with long-term inflation assumption. Care should be taken in setting asset return assumptions for inflation linked assets that may be more volatile in a high inflation environment.

Inflation Rate

- Should reflect long-term expectations, typically through a singular rate. A select and ultimate rate should be considered in the current high inflation environments.

- The inflation assumption could be used as a building block component in the development of the wage growth, salary scale, and discount rate assumptions.

- Considerations:
    - Inflation assumption to be used as basis of pension indexation linked to CPI escalations.
    - Should consider a select / ultimate rate to avoid large experience losses in short-term during high inflation environment.

Average Industrial Wage Growth

- Applicable to determine Income Tax Act (ITA) maximums, Years' Maximum Pensionable Earnings (YMPE). Reflect long-term expectations of economic growth for the broad economy.

- Consideration: Assumption to be consistent with development of inflation assumption.

Salary Scale
- Salary scale assumption should reflect the long-term annualized rate of salary increase expected for the plan population. Should be developed using a building block approach, based on underlying expectation for inflation, average wage growth assumption and merit/promotion, as a single effective rate or table of rates varying by age and/or service.
- Should be developed taking into account historical plan experience and management's expectations for the future for the plan population.
- Consideration:
    - Include assumption for bonus payout level where a company has historically paid below / above 100%.

Plan Expenses
- Should reflect expectation of ongoing future expenses payable from the plan, taking into account what expenses are paid from the plan vs. directly by the employer. Can be reflected as explicit provision for expenses (in normal cost), or implicitly (net out in discount rate).
- During periods of high inflation, expense assumptions should be updated to reflect the likely increase in expenses, in particular explicit assumptions.

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

Impact on going concern liabilities:
- High inflation environment can impact the going-concern discount rate (bond yields, equities return assumption, return on inflation linked assets) – it may result in a higher going-concern discount rate which decreased going concern liabilities
- High inflation environment may results in higher inflation assumption or use of select / ultimate inflation rates, where select rate being higher reflecting current higher inflation. For indexed benefits linked to CPI increase, the impact is an increase in going concern liabilities
- High inflation environment can increase the AIW increase, ITA limit increase and salary scale assumptions (building blocks to inflation assumption) which in turn increases going concern liabilities
- High inflation environment can increase the YMPE increase assumption (building blocks to inflation assumption). For benefit formulas linked to YMPE with lower accrual rate below YMPE, it would decrease going concern liabilities
- High inflation environment may increase implicit plan expenses assumption which may in turn decrease going-concern discount rate and increase going concern liabilities

- High inflation environment may delay retirement decision. Delayed retirement may result in higher service accrual offset by lost in early retirement subsidies. If the retirement assumption is no changed, the impact can be an experience gain or loss in going concern liabilities at the next valuation

Impact on hypothetical wind-up liabilities:

- High inflation can impact the hypothetical wind-up/ solvency discount rates (CV discount rates and annuity proxy rates which are based on nominal and real return bond yields) – it may result in a higher discount rates which decreases hypothetical wind-up/ solvency liabilities

- High inflation environment may results in higher implied inflation in real return bond yields. For indexed benefits, the impact is an increase in hypothetical wind-up liabilities (given future indexation can only be excluded from solvency liabilities)

- High inflation can increase the AIW / ITA limit / YMPE / salary increase experience, however will only increase or decrease hypothetical wind-up liabilities when experience is reflected at next valuation

- High inflation may increase explicit plan termination expenses assumption used in determining hypothetical wind-up funded position, but no impact of hypothetical wind-up liabilities

- High inflation may delay retirement decision. Delayed retirement may result in higher service accrual offset by lost in early retirement subsidies. The impact can be an increase or decrease in hypothetical wind-up liabilities when experience is reflected at next valuation

RETFRC, Spring 2024, Q3

Learning Outcomes:
a) Describe and apply appropriate techniques used in the development of assumptions for funding purposes
b) Evaluate and recommend appropriate assumptions for funding purposes

Sources:
Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, CIA Educational Note

CIA Consolidated Standards of Practice, sections 3100-3500

R.R.O. 1990, Reg 909: General Regulations under Ontario Pension Benefits Act

Commentary on Question:
This question first asked candidates to determine a going concern discount rate and then introduced a de-risking glide-path investment strategy. Candidates who did well understood how the strategy could impact the determination of a going concern discount rate and that it would not impact the determination of the PfAD for the current valuation.

Solution:
(a)   Calculate the best estimate going concern discount rate using the building block approach.

Commentary on Question:
Most candidates properly adjusted the discount rate for expenses, however many candidates incorrectly added the weighted average real return to the long-term bond yield, rather than the long term expected inflation. It was also acceptable to increase the discount rate for a reasonable effect of diversification and rebalancing.

Nominal rate = real rate + inflation rate

Assumed investment return (real)
= 40% x 2.5% + 25% x 4.8% + 25% x 5.0% + 10% x 4.5%
= 3.9%

Long-term expected inflation	2.20%
Assumed investment return (real)	3.90%
Additional returns for active management	0.30%
Active investment management expenses	-0.30%
Passive investment management expenses	-0.20%
Non-investment management expenses	-0.40%
Net discount rate	**5.50%**

(b)   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.

Commentary on Question:
Candidates who did not perform as well provided general considerations for going concern discount rate determination, not specific considerations relating to a de-risking glide-path investment strategy.

The actuary should give consideration to the implications of any investment policy with an asset mix that is expected to evolve over time, such as a glide-path, on the expected future investment returns on the plan's assets.

Future changes to the investment policy after the valuation date due to the glide-path investment strategy are not required, but still permitted to be reflected in expected investment return assumption.

If the actuary chooses to reflect the glide-path, they could determine the expected timing of changes in asset mix taking into account all relevant factors including the glide-path triggers, expected asset return, expected solvency liability growth, regulatory funding requirements, and the plan's funding policy.

Alternatively, regardless of the glide-path, the actuary may use a discount rate based on the yields of investment grade debt securities which would reasonably match projected benefit cash flows, with an appropriately low level of risk.

(c)   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.

Commentary on Question:
Generally this part of the question was done well except that many candidates did not reflect that only 75% of the allocation to long-term bonds met the minimum credit rating.

A = 5% since the plan is closed

Fixed income assets
= Fixed income component + 50% x alternative investment component
= 75% x 40% + 50% x (25% x 40% + 10%) since only 75% meets the minimum credit rating in the regulations
= 40%

B = 7% based on 60% allocation to non-fixed income for a closed plan

Benchmark discount rate
= 0.5% + long term bond yield + 5% x allocation to non-fixed income + 1.5% x allocation to fixed income
= 0.5% + 3% + 5% x 60% + 1.5% x 40%
= 7.1%

C = 0% since the gross discount rate of 6.1% (net of active management expenses only) from part (a) is less than the BDR = 7.1%

PfAD = A + B + C = 5% + 7% + 0% = 12%

RETFRC, Spring 2024, Q7

Learning Outcomes:
b) Evaluate and recommend appropriate assumptions for funding purposes

Commentary on Question:
This question was testing the candidates' ability to assess how different pension plans with different demographics impact mortality assumptions. Candidates were to describe the considerations for three distinct types of pension plans. While general commentary on considerations of mortality assumption setting were considered in the grading, full marks were given for specific considerations for the three plan types.
Most candidates were able to identify the more basic differences between the plans however more considerations and a holistic view of the mortality assumption (base table and mortality improvements) were needed by candidates to get full marks. Most candidates only listed considerations for the base table, without addressing the mortality improvements.

Solution:
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

The Mortality Table and Improvement scale assumptions to be looked at separately for each of the three plan types.

      (i)   Considerations specific to a private sector pension plan for a small group of physicians
- Consider the size of the retiree group - given the number is small, their mortality experience would not be credible.
- Consider the actual mortality gains and losses over the last few valuations. Look for trends or validity of current assumptions.
- Look at any industry specific mortality studies published that may have a table specific for physicians.
- Adjustments for plan characteristics not preferable as there is not credible experience.
- For mortality improvement scale since the data is not credible consider using a published improvement scale.
  - Consider using the 2D generational mortality improvement scale.

(ii)   Considerations specific to a Large Public Sector Plan for firefighters
- Given the description that the plan is large, there may be fully or at least partially credible experience.
- Consider creating their own mortality table or adjusting a published table with partial credibility.
- Prepare experience studies to validate experience and make adjustments.
- Given the job nature of firefighters, mortality is likely to be very different from published tables for the general retiree population.
- If enough experience, possible adjustment may be applied to the base mortality table to allow for the plan membership characteristics.
- For mortality improvement scale consider whether the plan's experience is credible and over long enough period of time.
  - Consider using published tables for the improvement scale if not enough experience to justify an adjustment.

(iii)   Considerations specific to the Canada Pension Plan
- There should be a lot of mortality experience at least more than 10,000 retiree lives.
- The data would be very credible as social security plans would be considered a very large plan.
  - Create a customized mortality table.
  - Weight the table by pension amount or liability as it is more appropriate than using number of lives.
  - Must adjust base year to counteract Base Year effect.
- There are likely frequent experience studies done, consider using the results from the experience studies to determine past gains and losses and whether mortality is tracking to the current assumptions.
- For the morality improvement scale, if data over long periods of time is available consider creating their own mortality improvement scale.

RET301 Learning Objective 2 Model Solutions

RETDAC, Spring 2021, Q8

Learning Outcomes:
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

CIA Consolidated Standards of Practice, sections 3100-3500

Commentary on Question:
Commentary listed underneath question component.

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

Commentary on Question:
The following solution illustrates an answer that would receive full credit. It is not an exhaustive list of considerations; other correct answers were also awarded credit.

- Should be calculated as of the date of the medical certificate specifying that the former member has life expectancy less than two years
- The commuted value should be adjusted for interest and benefits paid to the date of payment.
- If the former member is entitled to a commuted value transfer based on plan provisions or legislation that is not conditional on reduced life expectancy, the amount payable should be the greater of the amount calculated in accordance with the reduced life expectancy guidelines and without regard to shortened life expectancy.
- The commuted value would reflect the plan member's full benefit entitlement as a deferred or immediate pensioner.

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

Commentary on Question:
Successful candidates were able to thoroughly describe the required disclosure items pertaining to communicating pension commuted values. Some candidates only went through the assumptions they would use. Other communication items are also required to be disclosed. The following solution illustrates an answer

that would receive full credit. It is not an exhaustive list; other correct answers were also awarded credit.

- A description of the benefit entitlements involved.
- A description of the actuarial assumptions used in determining the commuted value and the rate of interest to be credited between the valuation date and the date of payment.
- A statement of the period for which the commuted value applies before re-computation is required.
- A statement as to whether the commuted value has been computed in accordance with these standards of practice.

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

(i)   Commuted value for a terminated employee

(ii)   Defined Benefit Obligation under International Accounting Standards IAS 19, Rev 2011

Commentary on Question:
Most of the candidates that answered this question did well, particularly for the interest rate and mortality assumptions. The following solution illustrates an answer that would receive full credit.

	(i) Commuted Value	(ii) DBO
Interest Rate	Not acceptable. Should be: • Two interest rates, one for first 10 years after valuation date (select period) and second applicable for years thereafter (ultimate period) • Based on prescribed CANSIM (bond) series and prescribed formulas	May be acceptable. • May be a single rate or a series of rates, such as a yield curve.
Pre and Post-Retirement Mortality	Not acceptable. Should be: • CPM-2014 • Based on prescribed table in CIA standards.	Not acceptable. Should be: CPM-2014 or another mortality table if the plan has enough credibility to

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		defend the selection of that table/adjustment.
Age difference	Actual age of spouse should be used if available.	May be acceptable. This assumption should be reviewed periodically to ensure that it is representative of historical and current demographic data.

RETFRC, Spring 2021, Q5

Learning Outcomes:
a) Differentiate between various purposes for valuing pension plans, including:
• Going concern funding
• Solvency and hypothetical wind-up
• Termination/wind-up
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes
d) Prepare valuation results for special purposes, including plan terminations, plan
       mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
Reference – CIA Ed note guidance on selection and disclosure of plausible adverse
scenarios, CSOP – 1000-1700, CIA Consolidated Standards of practice – 3100-3500

Commentary on Question:
*This question was testing a candidate's knowledge of required content in funding
valuation reports including detailed knowledge of the Plausible Adverse Scenarios and
their related disclosure requirements. Candidates generally did well on part a, however
a common theme was not including enough list points to receive full credit. Part b was
done poorly as many candidates did not provide the disclosure requirements or how the
scenarios would impacts the required elements.*

Solution:
(a)   List the disclosure requirements for the actuarial valuation report according to the
     Standards of Practice.

The actuarial valuation report for an Ontario registered pension plan must include the
following items that should be disclosed:
- Statement of Opinion regarding the following four valuation items:
    - membership data is sufficient and reliable
    - methods are appropriate
    - assumptions are appropriate
    - prepared in accordance with accepted actuarial standards in Canada

- The calculation date, report date and next calculation date
- Disclose whether or not there any subsequent events and describe their treatment if applicable.
- The significant terms of engagement should be described
- The client name and users of the report and the purpose of the work
- Summary of:
  - plan provisions – reference amendments, if any;
  - Source of membership data, reconciliation since last valuation, membership statistics, tests applied and description on any limitation to the data;
  - Source of asset information, reconciliation since last valuation, summary of assets by major category;
  - Assumptions for all valuation bases, which assumptions are required on what bases and rationale as required, whether any provision for adverse deviation or margin for adverse deviations is used, describe any changes since the previous valuation, limitation on any assumptions
  - Actuarial Methodology for each basis
- Explanation of the difference between Solvency and hypothetical WU valuations and the assumptions used for each. Noting the differences if any. Ontario allows smoothing of assets and liabilities. This must also be disclosed.
- Description of the valuation types included i.e. Going Concern, Solvency, Wind-up
- All required disclosures for each type of valuation:
  - Going Concern: Normal cost, liabilities, funded status, PfAD on liabilities and normal cost, sensitivity analysis including Plausible Adverse scenarios, gain & loss reconciliation, actuarial surplus if any, any special payment requirements
  - Solvency: Liabilities, funded status, solvency ratio, termination expense, excluded liabilities from wind-up if any
  - Wind-up: Liabilities, funded status, transfer ratio, termination expense
- Prior Year Credit Balance, if any
- Contribution requirements for Employee and Employers:
  - until next valuation
  - Minimum amounts as required by the Ontario Pension Benefits Act
  - Maximum allowable as permitted by the Income Tax Act

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

- Plausible Adverse Scenarios are those that represent a non-trivial probability of occurring within the short term. To meet this threshold, the adverse scenario would generally be consistent with the likelihood of between 1 in 10 and 1 in 20, based on the opinion of the actuary. In all cases, they may be based on deterministic or stochastic approaches.
- For each scenario the following disclosures should be included:
    - Qualitative description of the selected plausible adverse scenario
    - Sufficient description of any assumptions used for purposes of reporting the results under the plausible adverse scenario
    - description of any cross effects, reflection of risks in combination
    - One may also consider compensating adjustments, such as a reduction in implicit margin in the discount rate that may have an impact on the results.
- Scenario #1 – Testing Interest Rate Risk
    - A decrease in the interest rate will have an increase on the liabilities and an opposite impact on the fixed income portion of the fund assets.
    - Must disclosure the effect on the funded status
    - The impact on the liabilities and the service cost/rule for calculating service cost must be disclosed
    - The assumptions should be disclosed including the description of assumed # pts decrease in interest rates on fixed income, the impact on return expectations for Plan's assets classes, and the ultimate impact on discount rate
- Scenario #2 – Deterioration of Asset Value
    - Apply a shock at the valuation date to the market value of assets
    - Must disclosure the effect on the funded status
    - Will have no impact on the liabilities or service cost.
    - The assumptions should be disclosed including the description of the assumed percentage drop in asset value and what portion of the portfolio is impacted (i.e. non-fixed income only or all)
- Scenario #3 – Longevity Risk
    - An increase in longevity is an adverse scenario that will impact the liabilities and normal cost.
    - The impact on the liabilities and the service cost/rule for calculating service cost must be disclosed
    - There is no impact on the market value of assets
    - A description of assumed increase in life expectancy should be included

RETFRC, Spring 2021, Q8

Learning Outcomes:
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
Section 3500 of the Canadian Institute of Actuaries' Standards of Practice

Commentary on Question:
Commentary listed underneath question component.

Solution:

(a)   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.

Commentary on Question:
Overall, candidates struggled with the details of the calculation and most candidates failed to receive full marks due to one or more of the following:

- *Failing to annualize the semi-annual published rates*
- *Failing to recognize the one-month lag required by the standard*
- *Incorrectly calculating the spread on provincial and federal bonds – in many cases a spread was not calculated, and the candidate used one of the provincial or federal bond rates in place of the spread*
- *Final rates were not rounded*

- Annualize published figures: $(1+i/2)^2-1$

Month	i7	iL	rL	Mid-Term Provincial Bond Index	Mid-Term Corporate Bond Index	Long-Term Provincial Bond Index	Long-Term Corporate Bond Index	Mid-Term Federal Non-Agency Bond Index	Long-Term Federal Non-Agency Bond Index
Dec-20	1.64%	1.68%	0.32%	2.25%	3.01%	2.56%	3.42%	1.72%	1.77%

- Calculate midterm real rate: 0.31%

- Calculate Spread components:

PS1-10 = (Canada Mid-term provincial bond index yield, annualized) – (Canada Mid-term
federal non-agency bond index yield, annualized) = 2.25%-1.72% = 0.54%

CS1-10 = (Canada Mid-term corporate bond index yield, annualized) – (Canada Mid-term
federal non-agency bond index yield, annualized) = 3.01% - 1.72% = 1.31%

PS10+ = (Canada Long-term provincial bond index yield, annualized) – (Canada Longterm federal non-agency bond index yield, annualized) = 2.56% - 1.77% = 0.79%

CS10+ = (Canada Long-term corporate bond index yield, annualized) – (Canada Longterm federal non-agency bond index yield, annualized) = 3.42% - 1.77% = 1.65%

- Calculate the spreads:

s_{1-10} = (0.667 * PS1-10) + (0.333 * CS1-10) = 0.667*0.54%+1.31%*0.333) = 0.79%
s_{10+} = (0.667 * PS10+) + (0.333 * CS10+) = 0.667*0.79%+1.65%*0.333) = 1.08%

- Calculate the non-indexed rates:

i_{1-10} = i7 + s1-10 = 1.64% + 0.79% = 2.43% (rounded to 2.40%)
i_{10+} = iL + 0.5 * (iL – i7) + s10+ = 1.68% + 0.5*(1.68%- 1.64%) + 1.08% = 2.78% (2.80% rounded)

- Calculate the implied inflation:

c_{1-10} = (1+i7) / (1+r7) – 1 = 1.32%
c_{10+} = (1+iL + 0.5 * (iL – i7)) /(1+rL + 0.5 * (rL – r7)) – 1 = 1.37%

- Calculate the indexed rates:

$i_{50\%(1-10)}$ = (1+ i1-10)/(1+ 0.5*c1-10)-1 = 1.80% (rounded)
$i_{50\%(10+)}$ = (1+ i10+)/(1+ 0.5*c10+)-1 = 2.10% (rounded)

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

(i)   Voluntarily; and

(ii)   Involuntarily.

Commentary on Question:
Candidates either did well on Part B or they scored poorly as they failed to calculate the CV under the CV standard effective December 1, 2020 or did not understand how grow-in impacted the CV calculation under the involuntary termination situation

	Annuity Factor	Grow-In (Involuntary Term)			No Grow-In		
		Points	Reduction	Reduced Factor	Points	Reduction	Reduced Factor
Immediate	23.9	66	0.8	19.1	66	0.8	19.1
Deferred to 56	22.9	68	0.82	18.8	67	0.82	18.8
Deferred to 62	17.4	80	1	17.4	73	0.94	16.4
Deferred to 65	14.9	86	1	14.9	76	1	14.9

	Grow In (Involuntary Term)	No-Grow-In
Best Age	55	55
EURA	62	65
CV	(0.5*19.12+0.5*17.40)*25000 = 456,500	(0.5*19.12+0.5*14.90)*25000 = 425,250

RETFRC, Fall 2021, Q2

Learning Outcomes:
a) Differentiate between various purposes for valuing pension plans, including:
• Going concern funding
• Solvency and hypothetical wind-up
• Termination/wind-up
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
CIA Consolidated Standards of Practice, sections 3100-3500

Educational Note: Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values (Subsection 3570) - see attached

Educational Note: Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values (other than Subsection 3570) - see attached

Commentary on Question:
Commentary listed underneath question component.

Solution:
(i)   Calculate the discount rates applicable to commuted value calculations for terminations in January 2022.

   Commentary on Question:
   Most candidates performed well on this question. Many candidates failed to receive full marks due to one or more of the following.
   - *Failing to annualize the semi-annual published rates*
   - *Failing to recognize the one-month lag required by the standard*
   - *Incorrectly calculating the spread on provincial and federal bonds – in many cases a spread was not calculated, and the candidate used one of the provincial or federal bond rates in place of the spread*
   - *Final rates were not rounded*

Candidate is expected to show the following to get full points:

- Annualize published figures (from December rates): $(1+i/2)^2-1$

i_7 (annualized)	0.48058%
i_L (annualized)	1.24384%
Mid-Term Provincial Bond Index (annualized)	1.10705%
Long-Term Provincial Bond Index (annualized)	2.02010%
Mid-Term Corporate Bond Index (annualized)	1.85149%
Long-Term Corporate Bond Index (annualized)	2.89871%
Mid-Term Federal Non-Agency Bond Index (annualized)	0.61494%
Long-Term Federal Non-Agency Bond Index (annualized)	1.12716%

- Calculate spread components:

  PS_{1-10} = (FTSE Canada Mid-term Provincial bond index yield, annualized - FTSE Canada Mid-term Federal non-agency bond index yield, annualized) = 0.49210%

  CS_{1-10} = (FTSE Canada Mid-term Corporate bond index yield, annualized - FTSE Canada Mid-term Federal non-agency bond index yield, annualized) = 1.23655%

  PS_{10+} = (FTSE Canada Long-term Provincial bond index yield, annualized - FTSE Canada Long-term Federal non-agency bond index yield, annualized) = 0.89294%

  CS_{10+} = (FTSE Canada Long-term Corporate bond index yield, annualized - FTSE Canada Long-term Federal non-agency bond index yield, annualized) = 1.77155%

- Calculate spreads:

  S_{1-10} = 0,667 * PS_{1-10} + 0,333 * CS_{1-10} = 0.74000%

  S_{10+} = 0,667 * PS_{10+} + 0,333 * CS_{10+} = 1.18552%

- Calculate the discount rates:

  i_{1-10} = i_7 + S_{1-10} = 1.22058% (1.20% rounded)

  i_{10+} = i_L + 0,5 * (i_L - i_7) + S_{10+} = 2.81100% (2.80% rounded)

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

Commentary on Question:
Most candidates performed well on this question, recognizing that members 1 and 2 are not eligible for grow-in (voluntary termination) or bridge benefits, and the result of the CV retirement assumption is age 65.

Member	1	2
FAE	= ($85,000 + $79,000 + $75,000) / 3 = $79,666.67	= ($102,000 + $100,000 + $97,500) / 3 = $99,833.33
Benefit	= 1.25% x FAS x Years of service = 1.25% x 79,666,67 x 9 years = $8,962.50	= 1.25% x FAS x Years of service = 1.25% x 99,833,33 x 11 years = $13,727.08
Best Age	65	65
EURA	65	65
Factor	8.7	11.3
CV	= (8.7 x $8,962.50 x 1.0) = $77,973.75	= (11.3 x $13,727.08 x 1.0) = $155,116.04

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

Commentary on Question:
Most candidates performed well on this question, recognizing that member 1 did not meet grow-in eligibility and member 2 did meet the 55 point grow-in eligibility requirement.

Determining grow-in eligibility: Age + service greater than 55 points
- Member 1: 35 + 9 = 44 (not eligible for grow-in)
- Member 2: 45 + 11 = 56 (eligible for grow-in)

Member 1 CV is same as Part A.

Member 2:

Age	Factor (pension)	Factor (bridge)	Reduction (pension)	Commuted value
55	18.5	0	0.85	215,858.39 $
56	17.6	0	0.88	212,605.07 $
57	16.9	0	0.91	211,108.81 $
58	16.1	0	0.94	207,745.68 $
59	15.3	0	0.97	203,723.64 $
60	14.6	0	1	200,415.42 $
61	13.9	0	1	190,806.46 $
62	13.3	2.1	1	201,050.21 $
63	12.6	1.4	1	185,281.25 $
64	12	0.7	1	170,885.00 $
65	11.3	0	1	155,116.04 $

Member 2 retirement assumption:
- 50% at age of highest commuted value (age 55) = $215,858.39
- 50% at age of unreduced pension (age 60) = $200,415.42

Member 2 CV = 0.5 x $215,858.39 + 0.5 x $200,415.42 = 208,136.90

(iv)   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.

Commentary on Question:
Candidates did not perform as well in this section of the question. In particular, many candidates could only identify some points related to CV calculations differences under a target benefit plan.

- CVs are calculated using the same going concern assumptions as used in the latest actuarial valuation report or cost certificate filed with applicable pension legislator.
- Going concern assumptions used for the CV calculations would not include any margins or provisions for adverse deviations unless required by applicable legislation or terms of the plan.
- Discount rate would be net of any adjustment for investment expenses.
- Discount rate would be net of any adjustment for non-investment expenses expected to be paid from plan's assets if required by applicable legislation or terms of the plan.

- Mortality assumption appropriate for overall plan membership and would not vary for different subsets of plan population (other than age and gender).
- When calculating the CV of a deferred pension, assumptions used would be assumptions that are appropriate for purposes of performing actuarial valuation only for deferred pensioners of the plan (e.g., assumed retirement age of deferreds).
- May be adjusted to reflect funded status of the pension plan only as required by applicable legislation or by the terms of the plan.

RETFRC, Spring 2022, Q8

Learning Outcomes:
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
Section 3500 of the Canadian Institute of Actuaries' Standards of Practice

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Calculate the commuted value interest rates under Section 3500 of the Canadian Institute of Actuaries' Standards of Practice as at the date of termination.

Commentary on Question:
The majority of candidates were able to determine the non-indexed commuted value interest rates, but only a few properly determined the interest rates applicable for benefits indexed at CPI minus 1%. Candidates received the same points if the indexed rates were determined using the February 2022 CV standard.

- Annualize published figures for December 2022 (one-month lag)

Month	i7	iL	rL
Dec-22	0.48%	1.24%	-0.24%

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
Dec-22	1.11%	2.02%	1.85%	2.90%	0.61%	1.13%

- Calculate midterm real rate: $r_7 = i_7 \times r_L / i_L = 0.48\% \times -0.24 / 1.24 = -0.09\%$

- Calculate Spread components:
    - PS_{1-10} = (Canada Mid-term provincial bond index yield, annualized) – (Canada Mid-term federal non-agency bond index yield, annualized) = 1.11% - 0.61% = 0.50%
    - CS_{1-10} = (Canada Mid-term corporate bond index yield, annualized) – (Canada Mid-term federal non-agency bond index yield, annualized) = 1.85% - 0.61% = 1.24%

- PS_{10+} = (Canada Long-term provincial bond index yield, annualized) – (Canada Long-term federal non-agency bond index yield, annualized) = 2.02% - 1.13% = 0.89%
- CS_{10+} = (Canada Long-term corporate bond index yield, annualized) – (Canada Long-term federal non-agency bond index yield, annualized) = 2.90% - 1.13% = 1.77%

- Calculate the spreads:
  - s_{1-10} = Min[1,5%;(0.667 * PS_{1-10}) + (0.333 * CS_{1-10})] = Min[1,5%;0.667*0.49%+1.24%*0.333] = 0.74%
  - s_{10+} = Min[1,5%;(0.667 * PS_{10+}) + (0.333 * CS_{10+})] = Min[1,5%;0.667*0.89%+1.77%*0.333] = 1.19%

- Calculate the non-indexed rates:
  - i_{1-10} = i_7 + s_{1-10} = 0.48% + 0.74% = 1.22% (rounded to 1.20%)
  - i_{10+} = i_L + 0.5 * (i_L – i_7) + s_{10+} = 1.24% + 0.5*(1.24%- 0.48%) + 1.19% = 2.81% (2.80% rounded)

- Calculate the implied inflation:
  - c_{1-10} = (1+i_7) / (1+r_7) – 1 = (1 + 0.48%) / (1 + -0.24%) = 0.57% (0.60% rounded)
  - c_{10+} = (1+i_L + 0.5 * (i_L – i_7)) /(1+r_L + 0.5 * (r_L – r_7)) – 1 = (1 + 1.24% + 0.5 * (1,24% - 0.48%)) / (1 + -0.24% + 0.5 (-0.24% - -0.09%)) - 1 = 1.95% (1.90% rounded)

- Calculate the indexed rates:
  - $i_{-1\%(1-10)}$ = (1+ i_{1-10})/(1+ Max[0;100%*c_{1-10} - 1%])-1 = (1 + 1.20%) / (1 + Max[0;100% * 0.57% - 1%]) - 1 = 1.20% (rounded)
  - $i_{-1\%(10+)}$ = (1+ i_{10+})/(1+ Max[0 ; 100%*c_{10+} - 1%])-1 = (1 + 2.80%) / (1 + Max[0;100% * 1.95% - 1%]) - 1 = 1.80% (rounded)

(b) Calculate the commuted value at the members' date of termination assuming the members terminated:

(iii) Voluntarily; and

(iv) Involuntarily.

Commentary on Question:
Overall, candidates struggled with the details of the calculation and failed to receive full marks due to one or more of the following:
- *Failing to apply pre-retirement indexing*
- *Taking the final average rather than best average of Member B earnings*
- *Not calculating the CV at various ages*

	Member A	Member B
BAE	= ($161,000 + $167,000 + $172,000)/3 = $166,667	= ($70,500 + $71,500 + $71,500)/3 = $71,167
Benefit	= 2.0% * BAE3 * Service = 2.0$ * $166,667 * 4 = $13,333	= 2.0% * BAE3 * Service = 2.0$ * $71,167 * 10.5 = $14,945
Grow-in	55 points at termination so grow-in applies	35 + 10.5 = 45.5 points < 55 points at termination so no grow-in

Estimate AWI to determine the maximum pension at pension commencement:

- $AWI_{1-10} = CPI + 1\% = 0.6\% (c_{1-10}) + 1\% = 1.60\%$
- $AWI_{1+0} = CPI + 1\% = 1.90\% (c_{1-10}) + 1\% = 2.90\%$

Member A

					Voluntary		**Involuntary**	
Age	Pre-ret index benefit	ITA pension at retirement	Pension	Factor	ERR	CV	ERR	CV
55	$14,152.77	$14,809.99	$14,152.77	23.2	60%	$ 196,668.30	79%	$258,946.59
56	$14,322.60	$15,046.95	$14,322.60	22.3	64%	$204,407.13	82%	$261,896.64
57	$14,494.47	$15,287.70	$14,494.47	21.5	68%	$211,454.25	85%	$264,317.81
58	$14,668.40	$15,532.30	$14,668.40	20.6	72%	$217,803.51	88%	$266,204.29
59	$14,844.42	$15,780.82	$14,844.42	19.8	76%	$223,444.56	91%	$267,545.46
60	$15,022.56	$16,033.31	$15,022.56	19.0	80%	$228,361.45	94%	$268,324.70
61	$15,292.96	$16,498.28	$15,292.96	18.0	84%	$231,666.60	97%	$267,519.77
62	$15,568.24	$16,976.73	$15,568.24	17.1	88%	$234,254.71	100%	$266,198.53
63	$15,848.46	$17,469.05	$15,848.46	16.2	92%	$236,123.66	100%	$256,656.16
64	$16,133.74	$17,975.65	$16,133.74	15.3	96%	$237,282.98	100%	$247,169.77
65	$16,424.14	$18,496.95	$16,424.14	14.5	100%	$237,743.34	100%	$237,743.34

50% * Best Age + 50% * EURA	$237,743.34	$237,743.34

Member B   **Involuntary/Voluntary**

Age	Pre-ret index benefit	ITA pension at retirement	Pension	Factor	ERR	CV
55	$20,126.99	$56,015.24	$20,126.99	16.4	60%	$198,492.99
56	$20,489.28	$57,639.69	$20,489.28	15.7	64%	$205,388.44
57	$20,858.08	$59,311.24	$20,858.08	14.9	68%	$211,567.64
58	$21,233.53	$61,031.26	$21,233.53	14.2	72%	$217,041.12
59	$21,615.73	$62,801.17	$21,615.73	13.5	76%	$221,815.42
60	$22,004.81	$64,622.40	$22,004.81	12.8	80%	$225,892.74
61	$22,400.90	$66,496.45	$22,400.90	12.2	84%	$229,270.93
62	$22,804.12	$68,424.85	$22,804.12	11.6	88%	$231,948.02
63	$23,214.59	$70,409.17	$23,214.59	11.0	92%	$233,922.71
64	$23,632.45	$72,451.04	$23,632.45	10.4	96%	$235,203.87
65	$24,057.84	$74,552.12	$24,057.84	9.8	100%	$235,801.37

50% * Best Age + 50% * EURA $235,801.37

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

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

Commentary on Question:
Most candidates successfully determined that the PARs are zero for both members, however many candidates missed reflecting the half year of service in the 2012 PA for Member B.

PA = 9 * Service * Min[Max Pension, 2% * Salary] - $600
PAR = Max[0, Total PAs + PSPA - Settlement Payout]

<u>Member A</u> - Total PA = $112,650
2019 PA = 9 * 1 * Min($3,025.56, 2% * 158,000) - 600 = $26,630
2020 PA = 9 * 1 * Min($3,092.22, 2% * 161,000) - 600 = $27,230
2021 PA = 9 * 1 * Min($3,245.56 , 2% * 167,000) - 600 = $28,610
2022 PA = 9 * 1 * Min($3,420.00, 2% * 172,000) - 600 = $20,180
PAR = Max[0, $112,650 + 0 - $237,734] = 0

<u>Member B</u> - Total PA = $116,430
2012 PA = 9 * 0.5 * Min($2,646.67, 2% * $28,000) - 600 = $1,920
2013 PA = 9 * 1 * Min($2,696.67, 2% * $61,000) - 600 = $10,380
2014 PA = 9 * 1 * Min($2,770.00, 2% * $62,000) - 600 = $10,560
2015 PA = 9 * 1 * Min($2,818.89, 2% * $64,000) - 600 = $10,920
2016 PA = 9 * 1 * Min($2,890.00, 2% * $64,500) - 600 = $11,010
2017 PA = 9 * 1 * Min($2,914.44, 2% * $67,000) - 600 = $11,460

2018 PA = 9 * 1 * Min($2,944.44, 2% * $68,000) - 600 = $11,640
2019 PA = 9 * 1 * Min($3,025.56, 2% * $70,500) - 600 = $12,090
2020 PA = 9 * 1 * Min($3,092.22, 2% * $69,500) - 600 = $11,910
2021 PA = 9 * 1 * Min($3,245.56 , 2% * $71,500) - 600 = $12,270
2022 PA = 9 * 1 * Min($3,420.00, 2% * $71,500) - 600 = $12,270
PAR = Max[0, $116,430 + 0 - $235,801] = 0

RETFRC, Fall 2022, Q3

Learning Outcomes:
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 Ch. 15 (excluding Section 1525)

Morneau Shepell Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 3 and 6 (excluding pp. 176-183) (ASSUMED BACKGROUND KNOWLEDGE FROM RET 201)

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006 Ch. 1-4 and 7 (ASSUMED BACKGROUND KNOWLEDGE FROM RET 201)

Commentary on Question:
Candidates were asked to calculate the funded status of the plan on a going concern, solvency, and hypothetical wind-up basis, and calculate contributions and perform a gain and loss analysis. While candidates were able to
successfully complete some portions of the question, candidates struggled with other portions. Minor calculation errors were tracked through and resulted in minimal deductions if the rest of the calculations were done correctly.

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

Commentary on Question:
Most candidates were able to calculate the liabilities for the deferred pensioners and pensioners correctly, with candidates struggling with calculating the liability for the active members correctly. Some candidates did not calculate the PfAD with non-indexed liabilities.

Asset Value	1,287,780
Going concern funding target	
Going concern liabilities:	
Active members	293,593
Deferred pensioners	313,261
Pensioners	1,241,200
Subtotal	
PfAD	184,479
Total	**2,032,533**
Funding excess (shortfall)	**(744,753)**

Member ID	ID1		2019	49,000								
Current age	43		2020	50,000								
Service	12.00		2021	65,000								
	Age	Years to Decrement	Projected earnings	Projected pension	ERF	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Termination	43	0	54,667	13,120	100%	5%	0%	1.0000	5.3	4.4	3,498	2,893
Termination	44	1	60,758	14,582	100%	5%	0%	0.9048	5.6	4.6	3,694	3,054
EURA	62	19	120,784	28,988	100%	0%	60%	0.3571	16.9	13.7	104,981	85,103
NRD	65	22	133,916	32,140	100%	0%	100%	0.1234	15.6	12.9	61,874	51,165
											174,047	**142,216**

Projected earnings calculation:
- 54,667=AVERAGE(49000,50000,65000)
- 60,758=AVERAGE(65000*1.035^1,65000*1.035^0,50000)
- 120,784=AVERAGE(65000*1.035^19,65000*1.035^(19-1),65000*1.035^(19-2))
- 133,916=AVERAGE(65000*(1+0.035)^22,65000*(1+0.035)^(22-1),65000*(1+0.035)^(22-2))

tPxV calculation:
- 0.9048=((1-0.05)*(1-0))/(1+0.05)^1
- 0.3571= ((1-0.05)*(1-0)*(1-0.05)*(1-0))/(1+0.05)^19
- 0.1234= ((1-0.05)*(1-0)*(1-0.05)*(1-0)*(1-0)*(1-0.6))/(1+0.05)^22

Member ID	ID2			2019	78,000
Current age	60			2020	78,000
Service	5.00			2021	83,000

	Age	Years to retirement	Projected earnings	Projected pension	ERF	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Age 62	62	2	85,939	8,594	92%	0%	60%	0.9070	16.9	13.7	72,960	59,145
NRD	65	5	95,282	9,528	100%	0%	100%	0.3134	15.6	12.9	46,585	38,522
											119,546	97,668

Projected earnings calculation:
- 85,939=AVERAGE(83000*1.035^2,83000*1.035^(2-1),83000*1.035^(2-2))
- 95,282=AVERAGE(83000*1.035^5,83000*1.035^(5-1),83000*1.035^(5-2))

tPxV calculation:
- 0.9070=1/(1+0.05)^2
- 0.3134= (1-0-0.6)/(1+0.05)^5

Deferred:	Indexed AL		Non-indexed AL	
	ID3	ID4	ID3	ID4
Age	58	35	58	35
Lifetime pension	25,000	10,000	25,000	10,000
EURA	65	65	65	65
Lifetime factor	15.60	15.60	12.90	12.90
AL	277,166	36,095	229,195	29,848

Pensioner:	Indexed AL		Non-indexed AL	
	ID5	ID6	ID5	ID6
Age	72	68	72	68
Spouse Age	70	n/a	70.00	n/a
Lifetime pension	50,000	36,000	50,000	36,000
Lifetime factor	14.60	14.20	12.20	11.90
AL	730,000	511,200	610,000	428,400

Determine PfAD			
1) 5.0% for a closed plan			5.00%
2) Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets			7.00%
3) BDR > GC DR			0.00%
PfAD			12.00%

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

Commentary on Question:
Candidates generally performed well in this question and were able to calculate the liabilities correctly for the inactive members. Some candidates did not calculate the active liabilities correctly for Member ID1, some common mistakes were using the wrong early retirement factor, using the wrong annuity factors, and not taking the average of their optimal value and earliest unreduced commuted value.

Solvency assets	**1,187,780**
Present value of accrued benefits for:	
Active members	256,163
Deferred pensioners	408,500
Pensioners	1,310,000
Total solvency liability	**1,974,663**
Solvency excess (shortfall)	**(786,883)**
Hypothetical wind-up assets	**1,187,780**
Present value of accrued benefits for:	
Active members	334,699
Deferred pensioners	515,000
Pensioners	1,628,200
Total hypothetical wind-up liability	**2,477,899**
Hypothetical wind-up excess (shortfall)	**(1,290,119)**

Member ID		ID1	2019	49,000	Optimal Value		207,821	150,093
Current age		43	2020	50,000	Earliest Unreduced		173,184	131,200
Service		12.00	2021	65,000	**Liability**		**190,502**	**140,646**
	55 points at Valuation Date - Grow In							
20 years of service at		51						
				Reduced	Indexed LS	Non-Indexed LS		
Member ID		FAE3	Reduction	Accrued pension	Factor	Factor	AL Indexed	AL Non-Indexed
55		54,667	20%	10,496	19.80	14.30	207,821	150,093
56		54,667	18%	10,758	18.70	13.70	201,182	147,390
57		54,667	16%	11,021	17.70	13.00	195,068	143,270
58		54,667	14%	11,283	16.70	12.40	188,429	139,912
59		54,667	12%	11,546	15.80	11.70	182,420	135,084
60		54,667	10%	11,808	14.90	11.10	175,939	131,069
61		54,667	8%	12,070	14.00	10.60	168,986	127,946
62		54,667	0%	13,120	13.20	10.00	173,184	131,200
63		54,667	0%	13,120	12.40	9.50	162,688	124,640
64		54,667	0%	13,120	11.60	9.00	152,192	118,080
65		54,667	0%	13,120	10.90	8.50	143,008	111,520

Member ID		ID2	2019	78,000	Optimal Value		144,197	115,517
Current age		60	2020	78,000	Earliest Unreduced		144,197	115,517
Service		5	2021	83,000	**Liability**		**144,197**	**115,517**
20 years of service at	55 points at Valuation Date - Grow In							
	75							
				Reduced	Indexed LS	Non-Indexed LS		
Member ID		FAE3	Reduction	Accrued pension	Factor	Factor	AL Indexed	AL Non-Indexed
60		79,667	24%	6,059	23.80	18.80	144,197	115,517
61		79,667	20%	6,380	22.60	17.90	144,197	115,517
62		79,667	15%	6,738	21.40	17.00	144,197	115,517
63		79,667	11%	7,103	20.30	16.10	144,197	115,517
64		79,667	6%	7,510	19.20	15.30	144,197	115,517
65		79,667	0%	7,967	18.10	14.50	144,197	115,517

Deferred:	Wind-up AL		Solvency AL	
	ID3	ID4	ID3	ID4
Age	58	35	58	35
Lifetime pension	25,000	10,000	25,000	10,000
Optimal Age = NRD = EURA	65	65	65	65
Reduction	0%	0%	0%	0%
Lifetime factor LS	17.2	8.5	13.7	6.6
AL	430,000	85,000	342,500	66,000

Pensioner:	Wind-up AL		Solvency AL	
	ID5	ID6	ID5	ID6
Age	72	68	72	68
Spouse Age	70.00	n/a	70.00	n/a
Lifetime pension	50,000	36,000	50,000	36,000
Lifetime factor AP	19.1	18.70	15.4	15.00
AL	955,000	673,200	770,000	540,000

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

Commentary on Question:
Many candidates did not net the employee contributions from the employer current service cost contributions or failed to include the expense allowance with PfAD. Some candidates did not calculate the normal cost correctly or did not apply the PfAD calculation to their non-indexed normal cost calculation.

		Alternative Solution	
2022 Employer Minimum Contribution Requirements		Option 1	Option 2
Employer current service cost contributions		90,779	90,779
Special payments		33,000	40,000
Minimum required employer contributions for 2022		123,779	130,779
Maximum permissible employer contributions for 2022		1,380,898	1,380,898
2023 Estimated minimum required employer contributions			
Employer current service cost contributions		92,629	92,629
Special payments		109,860	121,860
Minimum required contributions for 2023		202,489	214,489

Member ID	ID1			
Current age	43			
Service	12.00			
	Age	Projected pension (NC)	NC (indexed)	NC (non-indexed)
Termination	43	14,213	292	241
Termination	44	15,797	308	255
EURA	62	31,404	8,748	7,092
NRD	65	34,818	5,156	4,264
			14,504	**11,851**

Member ID	ID2			
Current age	60			
Service	5.00			
	Age	Projected pension (NC)	NC (indexed)	NC (non-indexed)
Age 62	62	10,313	14,592	11,829
NRD	65	11,434	9,317	7,704
			23,909	**19,534**

Part (c) - Minimum Required Contributions	2022	2023
Total Normal Cost	38,413	40,334
PfAD on Non-Indexed CSC	3,766	3,954
Total Current Service Cost	**42,179**	**44,288**
Employee Contributions	**7,400**	**7,659**
Employer Portion of Normal Cost	**34,779**	**36,629**
Explicit Expense Allowance	50,000	50,000
PfAD on explicit expense allowance	6,000	6,000
Total Expense Allowance	56,000	56,000
Total Employer Current Service Cost Contributions	**90,779**	**92,629**

Maximum Contribution Calculations		
Normal Cost (ER Portion)		90,779
Wind-up Deficit		1,290,119
Total		**1,380,898**

Discount rates	going concern		5.00%			
	solvency		2.57%			
Going Concern excess/(shortfall)	(744,753)					
Solvency excess/(shortfall)	(786,883)					
Reduced Solvency excess/(shortfall)	(490,684)					
Existing Special Payments Schedule (from previous valuation schedule)						
				Remaining		
Type	Start	End	Monthly Amount	Months	GC PV	Solvency PV (5 years)
GC One	1/1/2021	12/31/2021	5,500	-		
GC Two	1/1/2022	1/1/2032	750	120	$71,074	$42,222
Solvency One	1/1/2018	12/31/2022	1,000	12		$11,837
Solvency Two	1/1/2022	12/31/2026	2,000	60		$112,593
					$71,074	$166,652
New Special Payment Schedule - Option 1						
				Remaining		
Type	Start	End	Monthly Amount	Months	GC PV	Solvency PV (6 years)
GC exisiting	1/1/2022	12/31/2022	750	12	$8,766	$8,878
GC (new)	1/1/2023	12/31/2032	8,155	120	$736,013	$447,615
					$744,779	$456,492
Solvency One	1/1/2018	12/31/2022	-	12		$0
Solvency Two	1/1/2022	6/30/2023	2,000	18		$35,287
						$491,780
Special payment Requirement - Option 1	**2022**	**2023**				
Going Concern	9,000	97,860				
Solvency	24,000	12,000				
Total	**33,000**	**109,860**				
New Special Payment Schedule - Option 2						
				Remaining		
Type	Start	End	Monthly Amount	Months	GC PV	Solvency PV (5 years)
GC exisiting	1/1/2022	12/31/2022	750	12	$8,766	$8,878
GC (new)	1/1/2023	12/31/2032	8,155	120	$736,013	$362,569
					$744,779	$371,446
Solvency One	1/1/2018	7/31/2022	1,000	7		$6,941
Solvency Two	1/1/2022	12/31/2026	2,000	60		$112,593
						$490,981
Special payment Requirement	**2022**	**2023**				
Going Concern	9,000	97,860				
Solvency	31,000	24,000				
Total	**40,000**	**121,860**				

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

Commentary on Question:
Candidates calculated the funded status using the same methodology as part (a), generally making the same mistakes. Some candidates did not reflect the new information provided as at December 31, 2022.

Asset Value	914,980

Going concern funding target

Going concern liabilities:

Active members	149,336
Deferred pensioners	317,362
Pensioners	390,000
Subtotal	856,698
PfAD	86,418
Total	**943,116**

Funding excess (shortfall)	**(28,136)**

Member ID	ID2		2020	78,000								
Current age	61		2021	83,000								
Service	6		2022	87,150								
	Age	Years to retirement	Projected earnings	Projected pension	ERF	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Age 62	62	1	86,856	10,423	93%	0%	60%	0.9506	16.5	13.5	90,951	74,415
NRD	65	4	97,371	11,684	100%	0%	100%	0.3266	15.3	12.7	58,385	48,463
											149,336	122,878

Projected earnings calculation:
- 86,856=AVERAGE(83000,87150,87150*(1+0.0375))
- 97,371=AVERAGE(87150*(1+0.0375)^2,87150*(1+0.0375)^3,87150*(1+0.0375)^4)

tPxV calculation:
- 0.9506= 1/(1+0.052)^1
- 0.3266= (1-0-0.6)/(1+0.052)^4

Deferred:	Indexed AL		Indexed AL = Non Indexed	
	ID3	ID4	ID3	ID4
Age	59	36	59	36
Lifetime pension	25,000	10,000	25,000	10,000
EURA	65	65	65	65
Lifetime factor	15.30	15.30	12.70	12.70
AL	282,187	35,175	234,234	29,198

Pensioner:	Indexed AL		Non-indexed AL	
	ID5 (Spousal)	ID6	ID5 (Spousal)	ID6
Age	71		71	
Spouse Age				
Lifetime pension	31,200		31,200	
Lifetime factor	12.5		10.7	
AL	390,000	0	333,840	0

Determine PfAD			
1) 5.0% for a closed plan			5.00%
2) Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets			7.00%
3) BDR > GC DR			0.00%
PfAD			**12.00%**

(e) Calculate the sources of gain/(loss) of the going concern funded status from December 31, 2021 to December 31, 2022.

Commentary on Question:
Some candidates did not attempt this question and other candidates generally did not perform well.

Funding excess (shortfall) at December 31, 2021	**(744,753)**
PfAD at December 31, 2021	184,479
Funding excess (shortfall) before PfAD	**(560,274)**
Interest on the excess/deficit	(28,014)
Special Payments to fund the deficit with interest	51,235
PfAD contributions with interest	10,007
Net experience gains (losses)	
Investment return	(291,049)
Contributions in excess of accrual	7,247
Salary	(1,754)
Indexation	(7,620)
Mortality	860,331
Termination	(17,021)
Expense experience	14,346
Miscellaneous	5,339
Total experience gains (losses)	**569,819**
Assumption Changes	
Discount Rate	16,022
Salary Scale	(514)
Total assumption change gains (losses)	**15,509**
Funding excess (shortfall) at December 31, 2022 before PfAD	**58,282**
PfAD at December 31, 2022	86,418
Funding excess (shortfall) at December 31, 2022	**(28,136)**

RETFRC, Fall 2022, Q7

Learning Outcomes:
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
CIA Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values (Subsection 3570)

Commentary on Question:
Overall the question was generally well answered, with most candidates demonstrating knowledge of section 3500 of the CIA ASOP and the ability to determine commuted value interest rates and commuted values.

Solution:
(a)   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.

Commentary on Question:
Candidates had a good understanding of determining non-indexed rates under the new standard. However, most did not correctly calculate the mid-duration real return rate, which resulted in incorrect indexed rates. That issue aside, the question was generally well answered.

See Excel solution

(b)   Calculate the commuted values for Member A and Member B at their date of termination assuming the members terminated:

(i)   Voluntarily; and

(ii)   Involuntarily.

Commentary on Question:
Candidates had good knowledge of grow-in and the retirement assumptions under the new standard. Some candidate had confusion around how the indexation was applied or did not correctly apply the early retirement subsidies in their calculations

See Excel solution

RETFRC, Fall 2023, Q6

Learning Outcomes:
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes

Sources:
Guidance for Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates on or after December 31, 2022, and no later than June 29, 2024, CIA Educational Note Supplement, Mar 2023 (REPLACED ON SYLLABUS WITH NEWER VERSION)

Calculation of Incremental Cost on a Hypothetical Wind-Up or Solvency Basis, CIA Educational Note, Apr 2023

Commentary on Question:
This question tests the candidate's ability to calculate Solvency Incremental Cost (SIC) and to describe the considerations in setting the SIC projection assumptions.

Candidates in general performed better in part (a) than in part (b). For part (a), some candidates did not perform the Age/Service test and Optimal Retirement Age test to receive full points. Most candidates were not able to discount liabilities at different discount rates for the two members from Time 1 to Time 0. For part (b), most candidates did not come up with enough aspects and details to receive full points.

Solution:
(a)   Calculate the 2023 solvency incremental cost (SIC).

 Member A (Age 49, Service 5)

 Time 0 (January 1, 2023) Calculations

   Points = Age + Service
   Age   49
   Service   5
   Points   54
   No grow-in as less than 55 points
   Actuarially reduced from age 65 (assume Member A retires at age 65)

   FAE3 (2020-2022) = ($70,000 + $73,000 + $75,000) / 3 = $72,667

   Accrued Pension = 2% x $72,667 x 5 = $7,267

   Solvency Liability at Time 0 (January 1, 2023)
   = Accrued Pension x Annuity Factor (age 49 deferred for 16 years, at 5%)

= $7,267 x 5.78 = $42,001

Time 1 (January 1, 2024) Calculations

Points = Age + Service
Age   50
Service   6
Points   56
Grow-in to Early Retirement Subsidies because > 55 points

FAE3 (2021-2023) = ($73,000 + $75,000 + ($75,000 x 1.03)) / 3 = $75,083

Accrued Pension = 2% x $75,083 x 6 = $9,010

Optimal retirement age test required (ages 55-65)
Maximum Value = Age 55 = $87,001
Unreduced Age = Age 60 = $78,117
$87,001*.5 + $78,117 *.5 = $82,559

Age	Deferral	Ret Age	A. Reduction (4%/yr from 60)	B. Factor (5%)	C. Accrued Pension	Solvency Liability [(1-A) x C x B]
50	5	55	20%	12.07	9,010	87,001
50	6	56	16%	11.32	9,010	85,674
50	7	57	12%	10.60	9,010	84,045
50	8	58	8%	9.92	9,010	82,229
50	9	59	4%	9.23	9,010	79,836
50	10	60	0%	8.67	9,010	78,117
50	11	61	0%	8.09	9,010	72,891
50	12	62	0%	7.54	9,010	67,935
50	13	63	0%	7.02	9,010	63,250
50	14	64	0%	6.53	9,010	58,835
50	15	65	0%	6.06	9,010	54,601

Discount Liability at Time 1 (January 1, 2024) back by 5%
= $82,559 / 1.05 = $78,627

Solvency Incremental Cost at Time 0 (January 1, 2023)
= $78,627 – $42,001 = $36,626

Member B (Age 60, Service 30)

Time 0 (January 1, 2023) Calculations

Points = Age + Service
Age   60
Service   30
Points   90
Grow-in to Early Retirement Subsidies because > 55 points

Accrued Pension = 2% x FAE3 x Credited Service
= 2% x (($90,000 + $95,000 + $98,000) / 3) x 30 = $56,600

Optimal retirement age test required (ages 60-65)
Maximum Value = Unreduced Age = Age 60 = $912,392

Age	Deferral	Ret Age	A. Reduction (4%/yr from 60)	B. Factor (4%)	C. Accrued Pension	Solvency Liability [(1-A) x C x B]
60	0	60	0%	16.12	56,600	912,392
60	1	61	0%	15.14	56,600	856,924
60	2	62	0%	14.20	56,600	803,720
60	3	63	0%	13.30	56,600	752,780
60	4	64	0%	12.45	56,600	704,670
60	5	65	0%	11.63	56,600	658,258

Time 1 (January 1, 2024) Calculations

Optimal retirement age test required (ages 61-65)
Maximum Value = Unreduced Age = Age 61 = $959,812

Age	Deferral	Ret Age	A. Reduction (4%/yr from 60)	B. Factor (4%)	C. Accrued Pension	Solvency Liability [(1-A) x C x B]
61	0	61	0%	15.80	60,748	959,812
61	1	62	0%	14.82	60,748	900,279
61	2	63	0%	13.89	60,748	843,784
61	3	64	0%	12.99	60,748	789,111
61	4	65	0%	12.14	60,748	737,476

Solvency Incremental Cost at Time 0 (January 1, 2023)
= $959,812 / 1.04 – $912,392 = $10,504

Total SIC

Total Solvency Incremental Cost at Time 0 (January 1, 2023) for Members A & B
= $36,626 + $10,504 = $47,130

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

Benefit payments: The assumptions for the expected benefit payments in the first element and decrement probabilities, service accruals, and projected changes in benefits and/or pensionable earnings in the second element would be consistent with the assumptions used in the pension plan's going concern valuation between time 0 and time t, if such a valuation were to be conducted as of time 0. Alternatively, if the actuary considers such experience to be different from the longer term expected experience assumed for a going concern valuation, he/she may reflect expected experience between time 0 and time t.

Discount rate: The interest rate to be used to discount from time t to time 0 for both the first and second elements would be the interest rate used to determine the hypothetical wind-up or solvency liability at time 0. However, if this rate is a real interest rate (net of inflation), use of a corresponding nominal interest rate would be appropriate. Where there is more than one interest rate used for the hypothetical wind-up or solvency liability of a member at time 0 (e.g., because there are probabilities assigned to the method of settlement), the projected liability would be split into these same components and discounted to time 0 using the interest rate inherent in each component.

Decrementing: Active and inactive plan members as of time 0 and assumed new entrants over the period between time 0 and time t would generally be considered in calculating the incremental cost. For active members, projected hypothetical wind-up or solvency benefits at time t would reflect the value of a deferred or immediate pension to which a member is expected to be entitled based on the assumed probabilities of termination or retirement between time 0 and time t.

Assumptions used at time 0 and t: The assumptions used to calculate the projected liability at time t in the second element would generally be consistent with the assumptions for the hypothetical wind-up or solvency liability at time 0, assuming that interest rates remain at the levels applicable at time 0, that the select period is reset at time t for interest rate assumptions that are select and ultimate (e.g., at time t the select period would be reset to 10 years for interest rates established in accordance with the Standards of Practice for the calculation of commuted values), and that the Standards of Practice for the calculation of commuted values and the guidance for estimated annuity purchase costs in effect at time 0 remain in effect at time t.

Benefit improvements (scheduled increases): In certain circumstances, a non-zero incremental cost could be generated for inactive plan members. For example, an expected change between time 0 and time t in the benefits provided to inactive members that is not reflected in the liability at time 0 (e.g., a scheduled increase in the monthly pensions of retired members) would generally result in a non-zero incremental cost for the inactive plan members.

Benefit improvements (pending amendment): The incremental cost would include the effect of a pending amendment to the pension plan, consistent with paragraph 3210.19 of the Standards of Practice.

Approximations: Considering materiality and subsection 1510 of the Standards of Practice, approximations may be used, among others, in respect of

- if the method of settlement is expected to be different at time t than it was at time 0, the projected hypothetical wind-up or solvency liability for a member could be valued based on the settlement method at time 0, with discounting of the liability using the corresponding interest rate(s),

- if the solvency basis includes smoothing of interest rates, the projected solvency liability could be valued using the same smoothed interest rates applicable at time 0,

- decrements and/or assumed new entrants between time 0 and time t could be ignored, and

- the projected hypothetical wind-up or solvency liability at time t, discounted to time 0, could be calculated at time 0, but using the data expected at time t.

RETFRC, Spring 2024, Q1

Learning Outcomes:
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes

Sources:
Events Occurring After the Calculation Date of an Actuarial Opinion for a Pension Plan, CIA Revised Educational Note, Jan 2015 (REPLACED ON SYLLABUS WITH MORE RECENT VERSION)

CIA Consolidated Standards of Practice, sections 1420-1430

Commentary on Question:
In order to obtain full marks on this question, candidates were expected to reference the relevant Standards of Practice and lay out the different implications including impact on assumptions, plan funding, contribution requirements and reporting.

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

   Commentary on Question:
   While most candidates were able to indicate how to apply the Standards of Practice to this situation and the impact on discount rate, generally, candidates did not describe the effects on plan funding and contribution requirements. Some candidates did not correctly indicate that this was a definitive subsequent event.

   When an actuary provides an opinion about the funding or funded status of a plan as at a certain calculation date, he or she would comply with all aspects of the Standards of Practice. This includes, among other things, ensuring that the assumptions are appropriate at that calculation date.
   Based on the Standards of Practice, if an event is definitive (like this one) before the report date, it is a subsequent event and it should be taken into account in the calculations and should be described in the report.

In this situation, the discount rate used in the going concern valuation is not accurate anymore. The actuary needs to reflect this subsequent event in the valuation because it will increase the actuarial present value of the projected benefits at the calculation date.

The actuary should provide an opinion on the funding of the plan (going concern basis) as at the calculation date by valuing all benefits using the new discount rate as at the calculation date. Subject to regulatory and legislative considerations, the change in normal cost and special going concern payments associated with the event could either:

- Commence at the calculation date, even if the effective date of the event falls at a later date; or
- Commence at the effective date of the event. The assumptions used to determine the updated normal cost and special going concern payments would be appropriate as at the calculation date, not the effective date of the event.

(b)   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.

Commentary on Question:
Most candidates correctly indicated that the actuary would need to use their judgement to determine the appropriate course of action, but did not clearly describe how the various financial impacts affect that determination, and how they should be disclosed.

If an actuary becomes aware of an event that becomes definitive (like this one) after the report date, then the actuary may need to withdraw or amend the report. The actuary must use his professional judgement to determine if it should be withdrawn or amended.

Since the purpose of the work is to report on the entity as it was at the calculation date, and because the change in the asset mix has a material impact on the financial results of the valuation as it makes the plan's financial position different as at the valuation date, the report must be amended (withdrawn and refiled) to recognize the updated discount rate and plan's financial position.

It must include a description of the subsequent event and the impact it has on the financial results of the valuation (going concern position and required contributions).

RETFRC, Spring 2024, Q2

Learning Outcomes:
a) Differentiate between various purposes for valuing pension plans, including:
• Going concern funding
• Solvency and hypothetical wind-up
• Termination/wind-up
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes
d) Prepare valuation results for special purposes, including plan terminations, plan
   mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
RET201-103-25: Actuarial Equivalence Calculations (ASSUMED BACKGROUND FROM RET 201)

ASOP 4: Measuring Pension Obligations and Determining Pension Plan Costs or Contributions, Dec 2021 (ASSUMED BACKGROUND FROM RET 201)

Calculation of Incremental Cost on a Hypothetical Wind-Up or Solvency Basis, CIA Educational Note, Apr 2023

CIA Consolidated Standards of Practice, sections 3100-3500

Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values (Subsection 3570), CIA Educational Note, May 2023

Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values (other than Subsection 3570), CIA Educational Note, May 2023

Commentary on Question:
This question was meant to test the candidate's knowledge of valuation of liabilities, funding requirements in Ontario and measurement of gains/losses. Overall, candidates were well prepared for this question.

Solution:

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

        Commentary on Question:
        *Candidates performed relatively well on this question. One common mistake was
        the incorrect use of the appropriate annuity factor (wrong age or wrong rate).
        Some candidates calculated only the non-indexed liabilities.*

        Please see Excel spreadsheet for solution.

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

Commentary on Question:
Candidates did not calculate the minimum funding requirements correctly due to following reasons:
- *Including the special payment*
- *Missing offset of employee contribution*
- *Applying PFAD on indexed normal cost*
- *Missing expense*
- *Missing offset of actuarial available surplus*

Please see Excel spreadsheet for solution.

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

Commentary on Question:
Candidates performed relatively well on this question. One common mistake was the incorrect use of the appropriate annuity factor (wrong age or wrong rate). Some candidates calculated only the non-indexed liabilities.

Please see Excel spreadsheet for solution.

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

Commentary on Question:
Candidates performed relatively well on this question. Most candidates received points for the demographic and expense gains/losses however the gain/loss due to PFAD was incorrect in most cases.

Please see Excel spreadsheet for solution.

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

Commentary on Question:
This question was poorly answered as candidates limited their comments to the financial situation of the plan (which they got points for) but did not consider other factors.

Please see Excel spreadsheet for solution.

RETFRC, Spring 2024, Q4

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
     regulation pertaining to:
• Plan design
• Members' rights
• Contributions and benefits
• Plan termination/wind-up

Sources:
CIA Section 3500 of the Practice-Specific Standards for Pension Plans – Pension
Commuted Values (Subsection 3570)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   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.

    Commentary on Question:
    Most candidates did well on this part of the question and calculated the rates
    correctly. Some candidates did not round their final rates.

    Non-Indexed$_{1-10}$ = 4.10%
    Non-Indexed$_{10+}$ = 4.50%

    The calculation can be found in the Excel spreadsheet.

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

Commentary on Question:
Same commentary as part (a)

$C_{1-10} = 1.70\%$
$C_{10+} = 1.70\%$

The calculation can be found in the Excel spreadsheet.

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

(i)   Voluntarily; and

(ii)   Involuntarily

Commentary on Question:
Generally, candidates struggled with calculating the commuted value for Member A. Candidates failed to correctly calculate the ITA reduction, the maximum bridge and applying the combined maximum pension. Most candidates did not increase the maximum lifetime pension by CPI+1%. Candidates did better on the calculation of Member B recognizing that the member was not eligible for grow-in benefits and the commuted value was the same under both scenarios. Most candidates failed to calculate the 50% rule refund for Member B.

The calculation can be found in the Excel spreadsheet.

RETFRC, Fall 2024, Q3

Learning Outcomes:
a) Differentiate between various purposes for valuing pension plans, including:
• Going concern funding
• Solvency and hypothetical wind-up
• Termination/wind-up
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 Ch. 15

Morneau Shepell Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 3 and 6 (ASSUMED BACKGROUND KNOWLEDGE FROM RET 101 AND RET 201)

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006 Ch. 1, 2, 3, 4, 7 (ASSUMED BACKGROUND KNOWLEDGE FROM RET 201)

RET301-103-25: R.R.O. 1990, Reg 909: General Regulations under Ontario Pension Benefits Act

RET301-104-25: R.S.O. 1990, Ch. P.8 under Ontario Pension Benefits Act

Commentary on Question:
This question was designed to test the candidate's knowledge of valuation of liabilities on different bases and the funding requirements in Ontario. See comments on each part below for further details.

Solution:
(a)   Calculate the funded status of the plan on going concern, solvency, and hypothetical wind-up bases.

Commentary on Question:
Most candidates performed well on this part with some common errors:
- *Member ID2 is not eligible to receive early retirement subsidy from the plan due to member's service.*
- *Calculated actuarial reduction and/or the present value factor incorrectly*
- *Missed to calculate non-indexed liabilities*
- *PfAD should be calculated based on non-indexed liabilities*
- *Solvency and transfer ratios were calculated using wrong assets (termination expense should not be included).*

Please see Excel spreadsheet for solution.

(b)   Calculate the available actuarial surplus and minimum required and maximum permissible employer contributions for 2024.

Commentary on Question:
Many candidates did not well understand the definition of available actuarial surplus. Common errors include:
- *The available surplus is determined based on the minimum of going concern excess and assets in excess of 105% of windup liabilities (not on solvency liabilities).*
- *Many candidates did not get that the maximum is determined based on assets in excess of 125% of going concern liabilities.*
- *Candidates must show all work to get full points.*

Please see Excel spreadsheet for solution.

(c)   Describe the regulatory requirements and process for determining the minimum required and maximum permissible funding requirements in 2025.

Commentary on Question:
The question asked about the <u>process</u> for determining the minimum and maximum funding requirement. However, many candidates misinterpreted the question and described the thresholds rather than the process in determining the minimum and maximum funding requirement.

Since the plan has an available actuarial surplus in 2024, in order to determine if the plan continues to have excess surplus and whether contributions are permitted in 2025, the plan is required to file an actuarial cost certificate.

Such actuarial cost certificate is determined based on extrapolation of liabilities from the last filed valuation using the applicable assumptions in effect at the date of determination and asset information as of the date of determination.

The actuarial cost certificate must be filed with the regulator (FSRA) within 90 days of the plan's fiscal year end.

(d)   Calculate the extrapolated going concern and hypothetical wind-up funded positions as at December 31, 2024.

Commentary on Question:
Many candidates performed relatively well on this part. Common errors include:
- *Candidates did not calculate the roll forward of non-indexed liabilities for the PfAD calculation.*
- *The blended discount rate for wind-up liability calculations was not calculated properly or many candidates did not calculate the blended rate.*
- *Some candidates did not factor in the incremental cost in the wind-up liability roll forward calculation.*

Please see Excel spreadsheet for solution.

(e)   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.

Commentary on Question:
Same as (b)

Please see Excel spreadsheet for solution.

RETFRC, Fall 2024, Q5

Learning Outcomes:
a) Differentiate between various purposes for valuing pension plans, including:
• Going concern funding
• Solvency and hypothetical wind-up
• Termination/wind-up
d) Prepare valuation results for special purposes, including plan terminations, plan
  mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
ASOP 4: Measuring Pension Obligations and Determining Pension Plan Costs or
Contributions (ASSUMED BACKGROUND KNOWLEDGE FROM RET 201)

CIA Consolidated Standards of Practice, section 1400

CIA Consolidated Standards of Practice, sections 3100-3500

CIA Section 3500 of the Practice-Specific Standards for Pension Plans – Pension
Commuted Values (Subsection 3570)

CIA Section 3500 of the Practice-Specific Standards for Pension Plans – Pension
Commuted Values (other than Subsection 3570)

RET301-104-25: R.S.O. 1990, Ch. P.8 under Ontario Pension Benefits Act

RET301-105-25: Regulation 310/13 Asset Transfers under Ontario Pension Benefits Act

RET301-108-25: FSRA - Limitations on Commuted Value Transfers and Annuity
Purchases (DB Pension Plans)

Commentary on Question:
Commentary listed underneath question component.

Solution:
Please see Excel spreadsheet for solution.

(a) Calculate the wind-up funded status of the plan as at December 31, 2024 and the
   contribution requirements for 2025.

   Commentary on Question:
   During the grading process, an issue was identified with the Excel file used by the
   candidates. The participant data in the Word file is at December 31, 2024, while
   in the Excel file, it is dated January 1, 2024.

Some candidates noticed this discrepancy and adjusted the credited service by adding one year. Since this discrepancy was an oversight, we have decided to accept both approaches: those that increased the credited service and those that did not. The final rubric reflects the December 31, 2024, valuation without increasing the credited service.

Overall, candidates performed well in calculating the pension benefits for both members and determined the funded position.

For Member A, candidates know to calculate member's liability and apply the right blending assumption to determine the winding up liability.

For Member B, to determine the windup liability, some candidates applied the blending percentage on member's CV and AP liability at each age from 58 to 65 instead of applying the blending at the final CV and AP liability.
Some candidates incorrectly calculated the AP liability by applying 50% to AP liability at EURD and 50% at optimal age.

Most candidates correctly stated that the deficit needs to be funded for windup. However, the plan is also restricted from paying out commuted values or purchasing annuities until the deficit is fully funded, a point mentioned by only two candidates.

(b) Describe the regulatory wind-up process in Ontario.

Commentary on Question:
Most Candidates answered well regarding the implementation and completion of the windup reports well, including sending notice, optional statements, and outlining the details on preparing the windup report and benefit distribution after approval. However, many candidates overlooked the requirements for deficit funding and FSRA approval.

Only a few candidates mentioned key aspects such as de-registration of the plan after the windup is completed, the adoption of a formal resolution for the windup and the surplus notice and distribution.

RETFRC, Fall 2024, Q7

Learning Outcomes:
c) Prepare valuation results for ongoing plans appropriate for regulatory purposes
d) Prepare valuation results for special purposes, including plan terminations, plan mergers or spin-off, actuarial equivalence calculations and asset transfers

Sources:
CIA Consolidated Standards of Practice, sections 1000 – 1700 and 3100 – 3500

Commentary on Question:
The question was designed to test candidates' ability to assess completeness of information provided by an actuary and whether or not, and how, it met CIA Standards of Practice.

Solution:
(a)   Describe areas of non-compliance with Canadian actuarial professional standards.

Commentary on Question:
For part(a), providing the majority of the items below would result in full points. Most candidates were able to identify the items needed in the communication, however, several candidates missed providing the four statements of opinion to be included in an external user report.

- The communication should include any standard reporting language applicable to the work.
- The communication includes mention of purpose for the work but not that the work was done in accordance with accepted actuarial practice.
- The communication should describe the users of the information to avoid unintended use of the work.
- The communication should disclose any deviation from accepted actuarial practice.
- The communication is missing disclosures on:
  - The actuarial assumptions;
  - Subsequent events;
  - A description of the membership data and any limitations of the data;
  - Any tests applied to the data and any assumptions for insufficient or unreliable data;

- Sources of the membership data, plan provisions (including any pending or virtually definitive amendments), and the pension assets and the dates at which they were compiled;
- A description of the assets, the asset valuation method, and a summary of the assets by major category;
- A description of the terms of the engagement, and any significant terms that are material to the actuary's advice; and
- A description of the actuarial cost method.
- The communication is not sufficiently detailed to enable another actuary to examine the reasonableness of the valuation.

An external user report should provide the following four statements of opinion, all in the same section of the report:

1) Membership data statement, which should usually be, "In my opinion, the membership data on which the valuation is based are sufficient and reliable for the purpose of the valuation."
2) Assumptions statement, which should usually be, "In my opinion, the assumptions are appropriate for the purpose(s) of the valuation(s)."
3) Methods statement, which should usually be, "In my opinion, the methods employed in the valuation are appropriate for the purpose(s) of the valuation(s)."
4) Confirmation statement, which should be, "This report has been prepared, and my opinions given, in accordance with accepted actuarial practice in Canada."

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

- Due to the actuary's adjustment of assumptions used in the analysis without context or rationale, that indicates potentially trying to inappropriately lowering costs, it may be appropriate to follow the CIA Rule of Professional Conduct standards (Rule 13). There is also significant missing information in the actuary's communication.

- Intended for "material" and intentionally misleading cases, which may apply to this situation.

- A potential remediation plan may include the following steps:
  - After becoming aware of the potential material noncompliance, the first course of action would be to reach out to the prior actuary to resolve the situation
  - After this initial conversation, if it is determined that there is rationale for their actions (for example, there is a supporting document with the missing information and the assumptions used are reasonable), no further action is necessary.
  - If the prior actuary admits to the noncompliance and rectifies the problem, the affected work must be corrected, users of the work must be notified, and the consequences of that notification must be resolved.
  - The noncompliance is not resolved if any of the following takes place:
    - The prior actuary in apparent noncompliance did not agree to a discussion;
    - The discussion did not result in an agreement as to whether a noncompliance has taken place; or
    - There was agreement that noncompliance has taken place, but no corrective action was taken as a result.
  - If there is no resolution, the member is obliged to report the noncompliance to the Canadian Institute of Actuaries Committee on Professional Conduct (CPC).
  - A member of the CIA can ask questions to a member of the CIA in confidence if the interpretation or application of the standards is not immediately clear

RET301 Learning Objective 3 Model Solutions

RETFRC, Fall 2020, Q6

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax regulation pertaining to:
• Plan design

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017

Commentary on Question:
The question was intended to test candidates' knowledge of Income Tax Act maximum pension limits (lifetime, bridge, combined). Candidates did very well overall. Note that candidates were not penalized for an incorrect calculation in any one component of the question that would otherwise flow through to other parts.

Specific commentary on each part is provided separately.

Solution:
(a)   Calculate the lifetime and bridge pensions payable to Member A.

Show all work.

Commentary on Question:
Candidates did every well on part (a). Some minor errors were noticed in some candidates' papers, for example:
- *For the "30, 60, 80" ITA reduction, some candidates used credited service to calculate the date when 30 years is reached, but this should be based on continuous service*
- *For the maximum bridge calculation, some candidates missed the 10 years of credited service adjustment or forgot the reduction for pre-age 60*

However, these were relatively small errors and candidates were not penalized for subsequent calculations that relied on these intermediate calculations.

Pension payable Member A

Life-time Retirement Benefit (LRB):

LRB no cap = 1.5% * FAE3 * credited service * Plan ERF = 1.5% * (240,000+250,000+230,000)/3 * 8 * (1-.04*3) = $25,344 per annum or $2,112 per month

Age when 80 points = 59 + (80 – (59+11))/2 = 64

Age when 30 years of service = 59 + [30-11] = 78

Minimum ITA reduction from Age min (age 60, 30 years credited service, 80 points) = 60

Maximum ITA LRB = $3,130.22 * 8 * (1-.03*(60-59)) = \$24,290.51$ or $2,024.21 per month

Life only pension payable to Member A is minimum (LRB no cap, Max ITA LRB) = $2,024.21 per month

Bridge Benefit:

Plan Bridge Payable = 0.5% * FAE3 * Credited Service = $0.50\% * 240,000 * 8 = \$9,600$ per annum or $800 per month

ITA maximum Bridge ERF = .25% per month from age 60 * min(1,credited service/10)
$$= (1 - 0.25\% * 12 * (60-59)) * (8/10)$$
$$= 0.776$$

ITA Bridge Maximum = (CPP + OAS) * 12 * ITA ERF = $(1,175.83 + 613.53) * 12 * .776$
$$= 16,662.52 \text{ per annum or } \$1,388.54 \text{ per month}$$

Combined Maximum = ITA max * credited service + 25% * YMPE3 * (credited service/35)
$$= \$3,130.22 * 8 + .25 * 57,300 * (8/35)$$
$$= \$28,316.05 \text{ per annum or } \$2,359.67 \text{ per month}$$

Member A Bridge = min(plan bridge payable, ITA Bridge Maximum, Bridge from Combined ITA maximum)
$$= \min (\$9,600, \$16,662.52, \$28,316.05 - \$24,290.51)$$
$$= \$4,025.54 \text{ or } \$335.46 \text{ per month}$$

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

Show all work.

Commentary on Question:
The new wrinkle to this question compared to part (a) is that Member B elected a Joint and Survivor 100% form of payment. Most candidates were able to perform similar calculations as they did in part (a), but some did not mention that the ITA maximum pension limits are based on Joint & Survivor 66.67% Guaranteed 5 Years form of payment and did not perform the required calculations/ adjustments to the resulting maximum pensions payable. However, that was the minority of candidates and overall this question was also done very well.

Pension payable Member B

Life-time Retirement Benefit (LRB):

LRB no cap = 1.5% * FAE3 * credited service * Plan ERF = $1.5\% * (300,000+275,000+260,000)/3 * 29 * (1-.04*3) = \$106,546$ per annum or $8,878.83 per month

LRB payable in JS100% before ITA maximum = 8,873.83 * Life Only Factor / JS100% Factor
$$= 8,873.83 * 15.170 / 17.851$$
$$= \$7,541.09$$

Total Points = 59 + 29 = 88 points

ITA Reduction = 0, member is unreduced as he has attained 80 points

Maximum ITA LRB = \$3,130.22 * 29 = \$90,776.38 or \$7,564.70 per month

Maximum Form of Pension payable under ITA is JS66.67% guaranteed 5 years

Maximum Value of Pension under ITA = ITA Max * Maximum Form of Pension = \$3,130.22 * 29 * 16.981 = \$1,541,473.

ITA Max pension payable under JS100% = Maximum Value Pension Payable under ITA/JS100% Factor = \$1,541,473.71/17.851 = \$86,352.23 per annum or \$7,196.02 per month

LRB payable to member B is \$7,196.02 per month

<u>Bridge Benefit:</u>

Plan Bridge Payable = 0.5% * FAE3 * Credited Service = 0.50% * 278,333.33 * 29 = \$40,358.33 per annum or \$3,363.19 per month

ITA maximum Bridge ERF = .25% per month from age 60 * min(1,credited service/10)
$$= (1 - 0.25\% * 12 * (60-59))$$
$$= 0.97$$

ITA bridge Maximum = (CPP + OAS) * 12 * ITA ERF = (1,175.83 + 613.53) * 12 * 0.97
$$= \$20,828.15 \text{ per annum or } \$1,735.68 \text{ per month}$$

Combined Maximum = ITA max * credited service + 25% * YMPE3 * (credited service/35)
$$= 3,130.22 * 29 + .25 * 57,300 * (29/35)$$
$$= 102,645.67 \text{ per annum or } \$8,553.81 \text{ per month}$$

Bridge Payable = min(plan bridge payable, ITA Bridge Maximum, Bridge from Combined ITA maximum)
$$= \min(40,358.33, 20,828.15, \$102,645.67 – \$86,352.23)$$
$$= \$16,293.44 \text{ or } \$1,357.79 \text{ per month}$$

RETFRC, Fall 2020, Q10

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
  regulation pertaining to:
• Contributions and benefits
• Plan termination/wind-up

Sources:
CIA CSOP 3100-3500
Ontario PBA

Commentary on Question:
In general, this question was well answered by candidates.
*A few candidates applied the new CIA commuted value standards effective December 1,
2020. However, since the question asked for the commuted value at January 1, 2020,
candidates were not given full points if they calculated the commuted value as 50% at the
optimal age + 50% at the earliest unreduced age.*

Solution:
(a)   Calculate the solvency liabilities for the two active members as at January 1,
   2020.

   Show all work.

   Commentary on Question:
   *The majority of candidates identified that grow-in benefits apply, correctly
   identified the optimal age and calculated the commuted value correctly.*

   Member A
   - FAE3= $69,667
   - Formula pension= FAE3*1.75%*Svc = $69,667*1.75%*16 = $19,506.7
   - Age+Svc= 40+16 = 56
     • Age+Svc with 56 points, Member A entitled to grow-in benefit of an
      earliest retirement age of 60, as he already has 10+ years of service,
      reduction is 3% before age 60
     • Earliest unreduced age: 60
     • Optimal age: 55
     • CV for Member A= $230,471

Age	Reduction	Formula Pension	Factor v n x äx(12)	Value	Probability	CV	Age	Continuing service
55	85%	$16,580.67	13.9	$230,471.28	100%	$230,471.28	55	31
56	88%	$17,165.87	13.2	$226,589.45	0%	$0.00	56	32
57	91%	$17,751.07	12.6	$223,663.45	0%	$0.00	57	33

58	94%	$18,336.27	12	$220,035.21	0%	$0.00	58	34
59	97%	$18,921.47	11.4	$215,704.73	0%	$0.00	59	35
60	100%	$19,506.67	10.9	$212,622.68	0%	$0.00	60	36
					CV for Member A	**$230,471**		

Member B
- FAE3= $85,000
- Formula pension= FAE3*1.75%*Svc = $85,000*1.75%*5 = $7,437.50
- Age+Svc= 60+5 = 65
  • Age+Svc with 65 points, Member B already entitled to early retirement subsidy of 3% before 65. Member B does not have 10+ years of service, so he won't be eligible for the additional grow-in benefit (i.e., the 3% before 60), reduction is 3% before age 65
  • Earliest unreduced age: 60
  • Optimal age: 60
  • CV for Member B= $123,909

Age	Reduction	Formula Pension	Factor v n x äx(12)	Value	Probability	CV	Age	Continuing service
60	85%	$6,321.88	19.6	$123,908.75	100%	$123,908.75	60	5
61	88%	$6,545.00	18.6	$121,737.00	0%	$0.00	61	6
62	91%	$6,768.13	17.6	$119,119.00	0%	$0.00	62	7
63	94%	$6,991.25	16.7	$116,753.88	0%	$0.00	63	8
64	97%	$7,214.38	15.7	$113,265.69	0%	$0.00	64	9
65	100%	$7,437.50	14.9	$110,818.75	0%	$0.00	65	10
					CV for Member B	**$123,909**		

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

Show all work.

Commentary on Question:
Most candidates correctly responded to this part of the question. However, for Member A, a few candidates incorrectly assumed that the optimal age was at age 55. For Member B, a few candidates incorrectly assumed that the optimal age was at age 65.

Both members are not entitled to grow-in benefits as they voluntarily terminated employment.

Member A
-   FAE3= $69,667
-   Formula pension= FAE3*1.75%*Svc = $69,667*1.75%*16 = $19,506.7
-   The member is not eligible for early retirement subsidies
-   The member is entitled to the termination benefits (i.e. an actuarially reduced pension to normal retirement age)
-   Optimal age: 65

    - CV for Member A= pension* $_{25|}\ddot{a}_{40}^{(12)}$ =19,506.7*8.4=$163,856

Member B
-   FAE3= $85,000
-   Formula pension= FAE3*1.75%*Svc = $85,000*1.75%*5 = $7,437.50
-   Reduction is 3% before age 65, since member is over age 55 but has less than 10 years of service
-   Earliest unreduced age: 65
-   Optimal age: 60

    - CV for Member B= pension*reduction* $_{5|}\ddot{a}_{60}^{(12)}$ =7,437.50*(1-3%*5)*19.6=$123,909

RETFRC, Fall 2020, Q11

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
    regulation pertaining to:
• Plan termination/wind-up
• Reporting requirements
• Individual savings plans

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE
SYLLABUS

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition,
2017, Chapters 4, 7 and 17 (Based on 4th Edition)

Commentary on Question:
*A well-prepared candidate will be able to determine Pension Adjustments, maximum
transfer values, available RRSP room and maximum contributions to the different types
of registered plans.*

Solution:
(a)   Calculate the 2020 Pension Adjustment for each member.

        Show all work.

        Commentary on Question:
        *Quite a few candidates performed well calculating pension adjustments.
        However, a number of candidates neglected to annualize the earnings and/or
        prorate the service in the calculation, while some others did not apply the
        maximum pension limit.*

        General Formula = (9 x benefit entitlement) - $600
        Benefit Entitlement = Accrued Pension as plan is a career average earnings
        Must annualize earnings:
        S^A_{2020} = $104,000 /0.75 = $138,667
        S^B_{2020} = $128,000 /0.75 = $170,667
        AP^A_{2020} = 0.75x Min[$3,092.22; 0.015 x $58,700 + 0.02 x ($138,667-$58,700)]
                = 0.75x Min[$3,092.22; $2,479.84] = $1,859.88
        AP^B_{2020} = 0.75 x Min [$3,092.22; 0.015 x $58,700 + 0.02 x ($170,667 - $58,700)]
                = 0.75 x Min [$3,092.22 ; $3,119.84] = $2,319.17
        PA^A_{2020} = (9 x $1,859.88) - $600 = $16,139

$PA^B_{2020} = (9 \times \$2,319.17) - \$600 = \$20,272$
No need to verify against prorated Pension Adjustment limit since Accrued pension was limited to the prorated maximum defined benefit limit.

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

Show all work.

Commentary on Question:
Candidates generally knew how to calculate the maximum transfer value, but most had some difficulty identifying the correct factor to be applied.

1. Calculate the accrued pension (AP) in 2020
From a) above
   $AP^A_{2020} = \$1,859.88$
   $AP^B_{2020} = \$2,319.17$
2. Calculate the total accrued pension as of September 30, 2020
$AP^A_{Tot} = \$1,859.88 + \$72,405 = \$74,264.88$
$AP^B_{Tot} = \$2,319.17 + \$59,455 = \$61,774.17$
3. Calculate transfer factor
$Factor^A = 12.0$;   Since based on individual's attained age
$Factor^B = 12.0 \times 0.20 + 12.2 \times 0.80 = 12.16$;   Interpolated based on exact age
4. Calculate maximum transfer value
$MTV^A = 12.0 \times \$74,264.88 = \$891,178.56$
$MTV^B = 12.16 \times \$61,774.17 = \$751,173.85$

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

Show all work.

Commentary on Question:
Candidates performed reasonably well in identifying the components of the calculation of available RRSP contribution room. The most common problems encountered were in applying the proper maximum to the earned income and using the correct PAs in the calculation.

9

	Member	A	B
1	RRSP Deduction Limit for 2020	$6,400	$8,600
2	**Minus:** Allowable RRSP Contributions Deduction for 2020[2]	$2,000	$0
3	**Plus:** 18% of 2020 Earned Income up to a Maximum of $27,830[3]	$25,380	$27,830
4	**Minus:** 2020 Pension Adjustment	$16,139	$20,272
5	**Minus:** 2020 Net Past Service Pension Adjustment	$0	$0
6	**Plus:** 2020 Pension Adjustment Reversal	$0	$0
7	**2021 RRSP Deduction Limit**	**$13,641**	**$16,158**

3: 2020 RRSP limit calculated to be 9 times the 2020 defined benefit limit
$$= 9 \times \$3,092.22 = \$27,830$$
A: 2020 earnings $= 37,000 + 104,000 = 141,000$
$$\Rightarrow \text{Min } (\$27,830 ; \$141,000 \times 18\%) = \$25,380$$
B: 2020 earnings $= 46,000 + 128,000 = 174,000$
$$\Rightarrow \text{Min } (\$27,830 ; \$174,000 \times 18\%) = \$27,830$$

5: Assumed to be $0

6: Assumed to be $0 since members aged 62 and 66 PAR would normally be NIL. Younger members would have been subject to a PAR. If Plan was underfunded and benefits were reduced, it would also have triggered a PAR.

7: $7 = 1 - 2 + 3 - 4 - 5 - 6$
A: $RRSP^A_{2021} = \$6,400 - \$2,000 + \$25,380 - \$16,139 - \$0 - \$0 = \$13,641$
B: $RRSP^B_{2021} = \$8,600 - \$0 + \$27,830 - \$20,272 - \$0 - \$0 = \$16,158$

(d)   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.

Commentary on Question:
Most candidates had difficulty calculating the maximum contributions that could be made to the different types of registered plans. Many candidates did not apply the correct Money Purchase limits and very few recognized that Group RRSP limits are based on the previous years' salary and limits.

(i)   Under a DC plan, contributions are limited to 18% of salary, subject to the *ITA* yearly Money Purchase Limit.

      2021 Money Purchase Limit = \$3,170.00 x 9 = \$28,530
      A: Min (\$28,530 ; 18% x 144,000) = **\$25,920**
      B: Min (\$28,530 ; 18% x 177,000) = **\$28,530**

(ii) Contributions to a Group RRSP are limited by the previous year salary, pension adjustment and the *ITA* yearly Money Purchase Limit of the previous year. Since it's the first year and employees were previously part of a defined benefit plan, contributions would be limited in 2021. Contributions are voluntary under a Group RRSP so it is the employee's responsibility to ensure contributions don't exceed his RRSP room.

      2021 RRSP Limit = \$3,092.22 x 9 = \$27,830
      A: Min (\$27,830 ; \$13,641) = **\$13,641**
      B: Min (\$27,830 ; \$16,158) = **\$16,158**

(iii) Under a DPSP plan, employee contributions are not allowed, so contributions are limited to 9% of salary, subject to half of the *ITA* yearly Money Purchase Limit.

      2021 Money Purchase Limit = \$3,170.00 x 9 = \$28,530
      2021 DPSP Limit = ½ x \$28,530 = \$14,265
      A: Min (\$14,265 ; 9% x 144,000) = **\$12,960**
      B: Min (\$14,265 ; 9% x 177,000) = **\$14,265**

RETDAC, Spring 2021, Q7

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax regulation

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Morneau Shepell Handbook of Canadian Pension and Benefit Plans, 16th Edition, Ch 14

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017
o   Ch. 1 (sections 120-145)
o   Ch. 16 (sections 1615-1619 &1680)
o   Ch. 17 (section 1790)
o   Ch. 18 (sections 1825-1835)
o   Ch. 23

Commentary on Question:
This question requires candidates to demonstrate understanding of plan design by comparing the RRSP and TFSA arrangements. Successful candidates were able to compare the design features of the plans and perform calculations that reflect the impact of taxes, contributions, etc. to annual income after retirement.

Solution:
(a)   Compare and contrast the design features of each option with respect to generating retirement savings.

        No calculations required.

Type of Arrangement: RRSP vs. TFSA

RRSP
Generally, RRSP is more suitable than TFSA to generate retirement savings
- Withdrawals are taxed as income
- Withdrawals affect eligibility to federal income-tested benefits and tax credits

TFSA
Suitable as a retirement savings vehicle, but can also be used for other purposes
- Best option depends on income level, pre- and post- income tax rate
- Bank account interest could be insufficient to generate adequate savings
- Withdrawals are not taxed as income

Eligibility
TFSA will be more advantageous than RRSP due to immediate eligibility and not having to wait one year

Annual Employee Contribution

RRSP
Allow up to 50% of maximum contributions (lesser of 18% of income and an annual dollar limit), so greater potential to generate savings than under TFSA
Unused contributions are carried over
Contributions are tax deductible to the employee

TFSA
Lower contribution limit and excess contributions earn low return, so less potential to generate retirement savings
Contributions are after tax
Maximum contributions not related to income, so not as much potential for high

Contributions in Excess of Maximum Allowable Amount under the ITA

While TFSA maximum is lower than RRSP, contributions in excess of maximum are available to employees, so this TFSA could better generate savings for high earners
RRSP contributions limited by dollar maximum, which could hurt savings potential for high earners

Employer Matching Contribution

RRSP provides greater match than TFSA (100% vs. 75%); this feature will allow participants in the RRSP more potential to generate retirement savings

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

Show all work.

Commentary on Question:
The 1 year eligibility period in the RRSP was interpreted differently by different candidates. The model solution shown assumes that no contributions are made to the plan until the end of the second year. Credit was also provided if candidates assumed that the employees would be eligible to make the full first year contribution at the end of year 1.

The model solution for this part is in the Excel spreadsheet.

RETFRC, Spring 2021, Q6

Learning Outcomes:
Describe and apply Canadian pension legislation, regulatory policies and tax regulation
       pertaining to:
• Contributions and benefits.

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE
SYLLABUS

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 16th Edition, 2016
– Chapter 8: Registration of Pension Plans Under the Income Tax Act and Taxation of
Retirement Savings

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Calculate the 2020 Pension Adjustment for Members X and Y.

        Commentary on Question:
        Many candidates did not recognize the use of a reasonable estimate of earnings
        for member X (i.e., use 3.0% salary scale and no bonus payable). Most candidates
        correctly applied the ITA Max for Member Y.

        2020 PA formula = (9 x 2020 DB accrual) – 600
        2020 DB accrual = min(Pension Plan Accrual, ITA Maximum Accrual) = min
        (1.8% x 2020 Salary Rate x 2020 credited service, ITA limit x 2020 credited
        service)

        <u>Member X</u>
        Pension Plan Accrual = 1.8% x \$90,000 x 1.03 x 1.0 = \$1,668.60
        ITA Maximum Accrual = \$3,092.22 x 1.0 = \$3,092.22
        2020 PA formula = 9 x min (\$3,092.22, \$1,668.60) – 600 = \$14,417.40

        <u>Member Y</u>
        Pension Plan Accrual = 1.8% x \$180,000 x 1.01 x 1.20 x 1.0 = \$3,926.88
        ITA Maximum Accrual = \$3,092.22 x 1.0 = \$3,092.22
        2020 PA formula = 9 x min (\$3,092.22, \$3,926.88) – 600 = \$27,229.98

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

Commentary on Question:
Candidates did not perform as well in this section of the question. In particular, many candidates could only identify some points related to improvement in ancillary benefits and excluded benefits.

- Improvement in ancillary benefits (e.g. survivor benefits, bridging benefits (even if paid), a change in an early retirement reduction, even if it applies to a member who retired during the year, pension deferral past age 65)

- adjustments required as a result of increases in earnings under an earnings-related plan (e.g., any indexation of earnings to reflect the increase in average wages and salaries between the year the earnings were paid and the year in which benefits are determined)

- an increase in a pension credit resulting from the indexation automatically factored into the maximum permissible lifetime retirement benefit.

- after 2003 the plan is amended on a yearly basis to increase the DB limit from the prior year's DB limit to the DB limit for the current year.

- a nil PSPA results if the increase in benefits qualifies as an "excluded benefit." (e.g., cost-of-living increases to pensions in payment, cost-of-living increases before pension starts (in a deferral period))

- a nil PSPA results if the member is not entitled to the increase in plan benefits retroactively because the member's past service benefits were capped by a legislative limit.

- adjustments to a member's pension income that depend on whether the member is totally and permanently disabled when pension payments start.

- additional benefits provided under a plan because a member has contributed more than 50% of the value of his or her pension (as required by most provincial pension legislation). This applies to all members if the plan covers members in a jurisdiction requiring such additional benefits.

RETFRC, Fall 2021, Q5

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax regulation pertaining to:
• Members' rights
• Contributions and benefits
• Plan amendment

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson – Chpt. 17

Commentary on Question:
Part A was generally not well answered. It was apparent most candidates had not read this particular study not as they were not able to describe the requirements under the CRA for a special downsizing program or the additional benefits that may be granted under such a program.

Candidates did much better on part b, and generally understood what ancillary benefits could be changed, and to what extent under the ITA, to improve the value of benefits without generating a PSPA.

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

CRA's special downsizing program requirements :
• Program must result in a net reduction of the greater of 50 employees or 10% of employees

• Reduction must be met within 2 years (i.e. program cannot span more than 2 years)
• Benefits under the program must commence within two years of program approval
• The program must me non-discriminatory -> benefit improvements cannot favor high-paid employees
• Targeted group may consist of no more than 35% in top earnings quartile
• No employees within the targeted group may continue to provide services to the company

- Any additional benefit under the downsizing program must not be paid as a lump-sum

Additional benefit that can be offered under a downsizing program:
- Eligibility: Members aged 55 and over at termination
- Additional service: lesser of 7 years number of years from termination date to age 65
- Accrual Rate: **for additional service described** above, lesser of the maximum pension under the Income Tax Act (ITA) in the year of termination and 2% of the member's Final 3-year Average Earnings
- Indexation: additional benefit as determined above indexed at 100% of CPI
- Unreduced benefits at the lesser of 25 years of service; or age 55; or 75 points, and reduced 3% per year to the above

(b)   Recommend changes to the provisions that meet the client's goals but do not require the approval of a special downsizing program.

Current provisions can be amended to enhance benefits which do not create a PSPA and do not require qualifying for a special downsizing program are:
- Enhancing the early retirement reduction– unreduced retirement at earlier of age 60, 30 years of service or 80 points
- Enhance the Plan's FAE to FAE3
- Provide post retirement indexation of up to 100% of CPI
- Enhance the normal form of payment
  o   Single: life and guaranteed for 180 payments
  o   Married: Joint and survivor 66 and 2/3 guarantee for 5 year
- Offer a bridge benefit– up to CPP plus OAS

RETFRC, Fall 2021, Q9

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax regulation pertaining to:
• Plan design
• Members' rights

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 - Chpt 22

Commentary on Question:
The question was answered well by most of the candidates. However, some students did not apply the correct PA formula when dealing with two benefit periods/employers.

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

Show all work.

Member A

2021 PA formula = (9 x 2021 DB accrual) – 600

PA calculation for January 1st to June 30th

Service = 0.5 year.

Pension Plan Accrual = [1.0% x $61,600 + 1.5% ($250,000-$61,600)] x 0.5

$\qquad$ = [$616 + $2,826] x 0.5 = $1,721

ITA Maximum Accrual = $3,245.56 x 0.5 = $1,622.78

PA (January 1 to June 30) = 9 x min ($1,721, $1,622.78) – 600 = **$14,005**

PA calculation for September 30th to December 31st

Service = 0.25 year.

2021 Pension Plan Accrual = [1.0% x $61,600 + 1.5% ($250,000-$61,600)] x 0.25

$\qquad$ = [$616 + $2,826] x 0.25 = $860.50

ITA Maximum Accrual = $3,245.56 x 0.25 = $811.39

PA (September 30th to December 31st) = 9 x min ($860.50, $811.39) – 600 = **$6,703**

Total 2021 PA = $14,005 + $6,703 = $20,708

Member B

2021 PA formula = (9 x 2021 DB accrual) – 600

2021 service = 1 year. Since member accrued service while disabled, a full year service used for PA.

Since member's service was restated before April 30, 2022, a corrected PA will be filed (not a PSPA)

2021 Pension Plan Accrual = [1.0% x $61,600 + 1.5% ($110,000-$61,600)] x 1

$$=\$616 + \$726 = \$1,342$$

ITA Maximum Accrual = $3,245.56

2021 PA = 9 x min ($1,342, $3,245.56) – 600 = $11,478

Member C

2021 PA formula = (9 x 2021 DB accrual) – 600

PA under first employer

Service: 7/12 = 0.5833

2021 Pension Plan Accrual = [1.0% x $61,600 + 1.5% ($130,000- $61,600)] x 0.5833

$$= [\$616 + \$1,026] \text{ x } 0.5833$$

$$= \$957.78$$

ITA Maximum Accrual = $3,245.56 x 0.5833 = $1,893.14

2021 PA = 9 x min ($957.78, $1,893.14) – 600 = $8,020

PA under second employer

Service: 5/12 = 0.4167

2021 Pension Plan Accrual = [1.0% x $61,600 + 1.5% ($140,000-$61,600)] x 0.4167

$$= [\$616 + \$1,176] \text{ x } 0.4167$$

$$= \$746.73$$

ITA Maximum Accrual = $3,245.56 x 0.4167 = $1,352.42

2021 PA = 9 x min ($746.73, $1,352.42) – 600 = $6,121

Total 2021 PA = $8,020+ $6,121 = $14,141

Member D

2021 PA formula = (9 x 2021 DB accrual) – 600

2021 service = 2/12 = 0.1667

2021 Pension Plan Accrual = [1.0% x 30,000] x 0.1667

$$= [300] \text{ x } 0.1667$$

$$= 50$$

ITA Maximum Accrual = \$3,245.56 x 0.1667= 541.03

2021 PA = 9 x min (\$50, \$541.03) – 600 = -\$150

Since calculated PA is negative, **2021 PA = \$0**

RETFRC, Spring 2022, Q2

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
regulation pertaining to:
• Contributions and benefits

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE
SYLLABUS

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition,
2017 (Ch. 5-8)

Commentary on Question:
*This question is to test candidate's understanding of how maximum contribution under
the defined contribution component is determined when the company is offering both
defined benefit and defined contribution benefits (Combination Plans and Hybrids).*

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

        Commentary on Question:
        *Many candidates were able to determine the maximum total DC contribution, but
        not the maximum allowed Employer DC Contribution.*

        Maximum PA Rule
        = minimum (18%*2022 T4 Earnings, 2022 Money Purchase Limit)
        = minimum (18%*$250,000, $30,780)
        = minimum ($45,000, $30,780) = $30,780

        DB Pension Credit
        = 9 x minimum (2022 DB Limit, 2022 DB provision Benefit earned) – 600
        = 9 x minimum ($3,420, 1.2% x $200,000) – 600
        = 9 x $2,400 – 600 = $21,000

        Maximum Total DC Contribution
        = 2022 Money Purchase Limit – DB Pension Credit
        = $30,780 – $21,000 = $9,780

        DC EE Required contribution = 2% x 200,000 = 4000
        Maximum allowed Employer DC Contribution = 9,780 – 4,000 = 5,780

(b)   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.

Commentary on Question:
Many candidates were trying to calculate the RRSP room, when the maximum contribution to personal RRSP was provided in the question.

Maximum Total DC Contribution
= minimum (2022 Money Purchase Limit – DB Pension Credit, 3% x 2022 pensionable earnings)
= minimum ($30,780 – $21,000, 3% x $200,000)
= minimum ($9,780, $6,000) = 6,000

Maximum contribution to Member A's personal RRSP is $3,500

RETFRC, Fall 2022, Q4

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
   regulation pertaining to:
• Contributions and benefits

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition,
2017, Chapter 5-12

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Calculate the 2021 Pension Adjustments for all members.

      Commentary on Question:
      Most candidates were able to score full marks on this part.

- To calculate the benefit entitlement: 0.8%*MIN(salary, $61,600) +1.4%*MAX(0, salary-$61,600). Note that the maximum benefit cannot exceed $3,245.56.

- To calculate PA: benefit entitlement * 9 - $600

EE	Benefit entitlement 2021	2021 PA
#1	610.40	$4,894
#2	3,245.56	$28,610
#3	1,450.40	$12,454
#4	680.40	$5,524
#5	918.40	$7,666
#6	1,240.40	$10,564

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

      Commentary on Question:
      Some candidates did not annualize the earnings properly before calculating the PA and only received partial points. Many candidates failed to recognize that there would be no PA for #5 since there's only an actuarial increase but no service accrual after 65.

EE	Service	Annualized earnings	Benefit entitlement	PA
#1	0.5	$70,000	295.30	$2,058
#3	0.5	$132,000	729.30	$5,964
#6	0.75	$116,000	925.95	$7,734

EE	Reasons why no PA needs to be reported
#2	reached service cap of 35 years - no service accrual, no PA
#4	died - no need to report PA for year of death
#5	over 65 - no service accrual (actuarial increase only), no PA

(c)   Calculate the Pension Adjustment Reversals for 2022.

Commentary on Question:
Some candidates left this part of the question blank. Points were awarded for those who demonstrated knowledge of the formula for a PAR. Many candidates might be unfamiliar with reciprocal transfer agreements and were not able to identify a Specified Distribution correctly.

PAR = A + B - C - D
A   Sum of PAs reported
B   sum of PSPAs reported
C   Specified Distribution
D   PA transfer amount by employer B

Employee #1: A = 4,894 + 2,058 = 6,952, C = 6,500, PAR = 6,952 - 6,500 = 452
Employee #6: A = 48,000, C = 5,420, D = 42,000, PAR = 48,000 – 5,420 – 42,000 = 580

RETFRC, Fall 2022, Q8

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
     regulation pertaining to:
• Contributions and benefits

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson

Commentary on Question:
Candidates in general did not perform well in this question. Common issues were as follows:
- For Part (a), did not perform the test of 60/30/80 points to receive full marks
- For Part (b), not able to determine the correct actuarial equivalent factor for member A; not able to demonstrate the understanding of the concept of level income option for member B; not able to determine the correct increased postponed retirement pension for member C
- For Part (b), did not perform the benefit test with the ITA limit and did not have the final pension amounts converted to monthly to receive full marks

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

ITA Limit = DB Limit x Credited Service x ERF

ITA ERF = 0.25% per month from the earlier of:

(i) age 60

(ii) 30 years of svc

(iii) 80 points

As all 3 members are currently over age 60, so all are at unreduced ITA Limit.

As all 3 members have 20 years of credited service, so all have the same ITA Limit.

ITA Monthly DB	
Limit	= Annual DB Limit x Credited Service x ERF / 12
	=3420*20*1/12
	5,700.00

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

For Member A
Member terminated under age 55, so will have actuarial equivalent for early retirement reduction.

ERF   = age 61 deferred factor / age 61 immediate factor

         =14.1/17.7

           0.7966

Monthly plan benefit (Normal Form, Life Only)	= 200 x Credited Service x ERF
	=200*20*0.7966
	3,186.40
Monthly plan benefit (Elected Form, Life Only)	= same as normal form
	3,186.40

Benefit test with ITA Limit = min (3,186.40, 5,700)

Monthly plan benefit (Elected Form, Life Only) =   **3,186.40**

For Member B

Calculations below are in monthly

Let the new monthly lifetime benefits be Y

Let the monthly total bridge benefits (C/QPP + OAS) be Z

Z   =1253.59+642.25

Z   =1,895.84

PV of original lifetime benefits (Normal Form, Life only)
= PV of new lifetime benefits + PV of bridge benefits under level income option

Member terminated employment after age 55 and not yet Age 62
so 3% reduction prior to Age 65 for 4 years for early retirement reduction.

Monthly plan benefit (Normal Form, Life Only)	= 200 x Credited Service x ERF
	=200*20*(1-0.03*4)
	3,520.00

PV of original lifetime benefits (Normal Form, Life only)

= Monthly plan benefit x age 61 immediate factor
=3520*17.7
 62,304.00

PV of new lifetime benefits + PV of bridge benefits under level income
option
= Y x age 61 immediate factor + Z x age 61 immediate bridge factor
=Y*17.7+1895.84*3.6
=17.7Y+6825.02

Y   =(62304-6825.02)/17.7
             3,134.41

Therefore, Y, the new monthly lifetime benefits is not capped at ITA Limit of 5,700.
Bridge benefits provided in lieu of lifetime pension benefits
are not counted for purposes of the combined lifetime and bridge benefits.

Bridge benefits are limited to 40% of the YPME in the year of retirement where they are
provided
in lieu of lifetime benefits or 40% x 64,900 /12 = 2,163.33 per month.
Therefore, Z, the monthly total bridge benefits is not capped at limit of
2,163.33.

Therefore, monthly lifetime pension of 3,134.41 is payable
plus a monthly bridge pension of 1,895.84 is payable for the elected Level Income Option.

For Member C
Member terminated over Age 65 and commenced pension 1 year after Age 65 at Age 66,
 so will have 6% increase for one year for 19 years of service accrued before Age 65.

Monthly plan benefit (Normal Form, Life Only)
= 200 x Credited Svc accrued before Age 65 x 1.06 + 200 x Credited Svc accrued after Age 65
=200*19*1.06+200*1
   4,228.00

Monthly plan benefit (Elected Form, Life guaranteed for 10
years)
= Age 66 benefits for Life only x Age 66 immed. factor for Life only / Age 66 immed. factor
for L10
=4228*16.1/16.6
   4,100.65

Therefore, the monthly lifetime benefits is not capped at ITA Limit of 5,700.

Monthly plan benefit (Elected Form, Life guaranteed for 10 years) =   **4,100.65**

RETFRC, Spring 2023, Q1

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
   regulation pertaining to:
• Contributions and benefits

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE
SYLLABUS

Chapters in the WTW book

Commentary on Question:
*The question was trying to test candidate's knowledge of various ITA rules including
determining maximum pension, bridge and combined limits, Pension Adjustments (PAs)
and maximum contribution limits. Overall candidates did well on parts a and b and
struggled with part c.*

Solution:
(a)   Calculate the lifetime and bridge pensions payable to both members.

  Commentary on Question:
  *Candidates did well on this part overall however many lost marks for failing to
  appropriately apply some of the plan provisions. The combined limit was not
  done well by most candidates. Candidates commonly forgot to ensure the plan
  reduction was not more than actuarial equivalence and to also test if the 2% of
  BAE lifetime maximum limit applies. Candidates were given part marks for
  correctly applying the limits even if the limits had a calculation error.*

  <u>Member A</u>
  Best Average Earnings
  = maximum of the average of three consecutive years earnings in the past five
  years
  = MAX (311241.67, 313766.33, 307614)
  = $313,766.33
  Uncapped Lifetime Pension
  = 2% of Best Average Earnings * plan service * max (Plan ERF, ITA ERF)
  = 2% x $313,766.33 * 9 * max (1-6%*(65 – 56), 10.7/18.3)
  = $33,022.62

Uncapped Bridge Pension at Retirement
= \$2,000 * 12 * (1-6% * (65-56))
= \$11,040.00

Maximum lifetime benefit = min (ITA dollar limit in the year of commencement, 2% * three-year highest average indexed compensation) * plan service * ITA early retirement reduction

Maximum lifetime benefit
= min (\$3,420 , 2% * \$313,766.33) * 9 * (1- 3% * (60-56))
= \$3,420 * 9 * (1-3%* 4)
= \$27,086.40

Maximum bridge benefit = 12 * (Maximum CPP + Maximum OAS) * min (1, plan service /10) * early retirement reduction of 3% per year from age 60

Maximum Bridge benefit
= 12 * (\$1,253.59 + \$642.25) * min (1, 9 /10) * (1-3%*(60-56))
= \$18,018.06

Combined maximum lifetime and bridge benefit = ITA dollar limit in the year of commencement * plan service + 25% * AYMPE * min (1, plan service /35)
AYMPE = three year average of YMPE
= Average (\$64900, \$61600, \$58700)
= \$61,733.33

Combined Maximum limit
= \$3,420 * 9 + 25% * \$61,733.33 * min(1,9/35)
= \$34,748.57

Lifetime Pension Payable
= min (Uncapped Lifetime Pension, Maximum lifetime benefit)
= min (\$33,022.62 , \$27,086.40)
= \$27,086.40

Bridge Pension Payable
= min (uncapped Bridge Pension, Maximum bridge benefit, Combined Maximum Limit – maximum lifetime pension payable)
= min (\$11,040, \$18,018.06, \$34,748.57 - \$27,086.40)
= min (\$11,040, \$18,018.06, \$7,662.17)
= \$7,662.17

Member B
Best Average Earnings
= maximum of the average of three consecutive years earnings in the past five
years
= MAX (98052, 96129.33, 94244.67)
= $98,052.00
Uncapped Lifetime Pension
= 2% of Best Average Earnings * plan service * max (Plan ERF, ITA ERF)
= 2% x $98,052 * 31 * max (1,1)
= $60,792.24
Uncapped Bridge Pension at Retirement
= $2,000 * 12
= $24,000

Maximum lifetime benefit = min (ITA dollar limit in the year of commencement, 2% * three-year highest average indexed compensation) * plan service * ITA early retirement reduction

Maximum lifetime benefit
= min ($3,420 , 2% * $98,052) * 31 * 1
= $1,961.04 * 31 * 1
= $60,792.24

Maximum bridge benefit = 12 * (Maximum CPP + Maximum OAS) * min (1, plan service /10) * early retirement reduction of 3% per year from age 60

Maximum Bridge benefit
= 12 * ($1,253.59 + $642.25) * min (1, 31 /10) * (1-3%*(60-59))
= $22,750.08 * 1 * 0.97
= $22,067.58

Combined maximum lifetime and bridge benefit = ITA dollar limit in the year of commencement * plan service + 25% * AYMPE * min (1, plan service /35)
AYMPE = three year average of YMPE
= Average ($64900, $61600, $58700)
= $61,733.33

Combined Maximum limit
= $3,420 * 31 + 25% * $61,733.33 * min(1,31/35)
= $119,689.52

Lifetime Pension Payable
= min (Uncapped Lifetime Pension, Maximum lifetime benefit)
= min ($60,792.24 , $60,792.24)
= $60,792.24

Bridge Pension Payable
= min (uncapped Bridge Pension, Maximum bridge benefit, Combined Maximum Limit – maximum lifetime pension payable)
= min ($24,000, $22,067.58, $119,689.52 - $60,792.24)
= min ($24,000, $22,067.58, $58,897.28)
= **$22,067.58**

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

Commentary on Question:
Candidates did very well on this part of the question overall

2022 DB accrual = min (Plan DB benefit accrual in 2022, ITA dollar limit x Service accrual in 2022)

Member A
2022 DB accrual = min (2% x 1.0000 x $300,000, $3,420 x 1.0000) = $3,420
PA formula = (9 x 2022 DB accrual) – 600 = 9 x 3,420 – 600 = $30,180.00

Member B
2022 DB accrual = min (2% x 0.75 x $100,000, $3,420 x 0.75) = $1,500
PA formula = (9 x 2022 DB accrual) – 600 = 9 x 1,500 – 600 = $12,900

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

Commentary on Question:
All candidates were able to correctly calculate the employee required contributions however majority of candidates did not apply the ITA limit on the contributions correctly or at all

Plan Employee Contributions = 7.5% x $300,000 = $22,500
ITA Max formula
= min (9% of 2022 earnings, $1000 + 70% of PA credit)
= min (9% x $300,000, $1000 + 70% x 30,180 [(*2022 PA for member A from (b)*)])
= min ($27,000 , $22,126) = $22,126
Maximum allowable employee contributions = $22,126

RETFRC, Fall 2024, Q2

Learning Outcomes:
b) Describe and apply Canadian pension legislation, regulatory policies and tax
    regulation pertaining to:
- Plan design
- Plan establishment
- Members' rights
- Contributions and benefits
- Plan amendment
- Plan termination/wind-up
- Plan merger or spin-off
- Reporting requirements

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET301-105-25: Regulation 310/13 Asset Transfers under Ontario Pension Benefits Act

RET301-106-25: Pension Asset Transfers made easier, Pension Benefits and Executive Compensation, February 2014

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Describe the requirements and considerations for merging the Unionized Pension Plan into the Hourly Pension Plan.

Commentary on Question:
Generally, candidates did not perform well on this part of the question. Most candidates did not provide enough answers to obtain full credit.

a. Both pension plans must file valuation reports as of the effective date of the asset transfer where
   i. The successor DB plan has a solvency ratio of 0.85; or
   ii. The solvency ratio of the successor DB plan is not reduced by more than 0.05 below the solvency ratio of each of the original plan and the successor plan before the transfer.

b. Notices must be issued to the impacted parties within 6 months of March 1, 2024.
   i. Union standard notice:
   ii. Current members, former members and retired members of the successor and original pension plan.

c. Preparing and filing amendments to both plans to allow for the merger of the Unionized plan provisions into the Hourly Pension Plan.

d. Submitting application to FSRA within 9 months of the effective date
    i. Application Summary signed by the plan administration, including certified copies of the notices distributed
    ii. Actuary's Certification signed by the plan actuary

(b) Calculate the contribution that must be made in order to satisfy the asset transfer funding conditions.

Commentary on Question:
Candidates performed well on this part of the question. Most candidates were able to calculate the solvency ratios for all plans, but only some candidates correctly calculated the contribution.

As at March 1, 2024	Hourly Pension Plan	Unionized Pension Plan	Merged Pension Plan
Solvency Assets	800,000	90,000	890,000
Solvency Liabilities	1,000,000	100,000	1,100,000
Solvency Ratio	0.80	0.90	0.81

The merged plan must have a solvency ratio of at least 85% (applicable for asset transfers upon the sale of a business) or no more than 5% less than the solvency ratio of each plan pre-merger [max (90%, 80%) -5%].
Therefore, contributions as follows will be required to be remitted to the merged plan as a result of the merger: 1,100,000 *0.85 – 890,000 = $45,000

(c) 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.

Commentary on Question:
Many candidates struggled with this part of the question, specifically failing to identify the question relates to the period during which the application is pending approval.

While application is pending review, original and successor plans must continue to operate as separate plans, including:

a. Funding on a separate basis: Hourly Plan special payments required is under 85% funded. Solvency special payments not required for the Unionized plan. Merged plan under 85% funded at the merger date and special payments does not apply until merger is approved.

b. Make all separate required filings (including filings, fees, assessments for fiscal year if after the deadline)

RET301 Learning Objective 4 Model Solutions

RETDAC, Fall 2020, Q10

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

RET301-111-25: Personal Tax Planning – A Fresh Look at Retirement Compensation Arrangements: A Flexible Vehicle for Retirement Planning

Morneau Shepell Handbook of Canadian Pension and Benefit Plans, Shepell, Morneau, Whiston, Bethune and Clooney, J. Gregory, 17th Edition, 2020, Chapter 13

Commentary on Question:
This question tested the candidates' knowledge of Retirement Compensation Arrangements and included a calculation part to determine if candidates fully understood how these arrangements worked in practice.

Solution:
(a)   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

Commentary on Question:
Most candidates did well on part a. Most knew that 50% of the tax was refundable. Credit was also given for relevant answers not listed below.

      (i)   Contributions
- Employer contributions are not taxable to the employee
- Contributions by the employer to the trust will be 100% deductible by the employer in the year the contributions are made
- No taxable benefit will accrue to the employee
- Contributions in an RCA attract a 50% refundable tax
- Employee contributions are deductible provided they are mandatory and are matched by the employer

      (ii)   Investment Returns
- Investment income earned by an RCA attracts a 50% refundable tax
- Refundable tax does not earn interest

2

- Net effect is that only half of the monies contributed to an RCA generate investment returns
- Capital gains and dividends do not retain their preferential tax treatment in an RCA
- Capital gains are 100% taxable (rather than 50%) and there is no gross-up or tax credit for dividends

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

Show all work.

Commentary on Question:
Most students did not get this part fully correct. Many knew to transfer half of contributions, but didn't get the investment income correct, or just guessed on what to do. Some left this part blank. Partial credit was given if part of the answer was incorrect, but some calculations or formulas were done correctly.

The model solution for this part is in the Excel spreadsheet.

RETFRC, Spring 2021, Q3

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
Pension Benefits Act
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition
Ch. 15, 18
Morneau Shepell Handbook of Canadian Pension and Benefit Plans – Ch. 8

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Calculate the minimum required and maximum permissible employer contributions in 2021.

   Commentary on Question:
   Candidates were required to correctly identify the derivation of the formulas for minimum required and maximum allowable employer contributions. Successful candidates provided sufficient numerical and written descriptions of their work.

   Present value of special payments previously established in respect of any past service unfunded actuarial liability on a going concern basis =
   $= 200{,}000 \times (1 + 6\%)^{\wedge}(-0.5) = 194{,}257$

   PfAD on going concern liabilities =
   $= 16.04\% \times (30{,}000{,}000 - 10{,}000{,}000) = 16.04\% \times 20{,}000{,}000 = 3{,}208{,}000$
   PfAD is not required to be applied on the buy-in annuity liability.

   Going concern excess / (unfunded liability) =
   = going concern assets + present value of special payments previously established in respect of any past service unfunded actuarial liability – going concern liabilities – PfAD
   $= 25{,}600{,}000 + 194{,}257 - 30{,}000{,}000 - 3{,}208{,}000$
   $= (7{,}413{,}743)$

Hypothetical wind-up excess / (deficit) =
= solvency assets (excluding present value of special payments; including buy-in annuity before wind-up expenses) – wind-up expenses – solvency liabilities =
= 31,400,000 – 200,000 – 38,800,000
= 31,200,000 – 38,800,000
= (7,600,000)

-There is a going concern unfunded liability: the $200,000 going concern special payment is payable in 2021. Any new going concern special payments resulting from the $7,413,743 unfunded liability are deferred by 1 year and payable from 2022.

-As there is a going concern unfunded liability, there is no excess surplus as defined under the Income Tax Act.

- As there is a going concern unfunded liability, there is no actuarial available surplus.

- Any solvency special payments payable, if any, are deferred by 1 year and not payable in 2021.

Minimum required employer contributions for 2021 =
= employer current service cost + PfAD on current service cost + provision for administrative expenses + PfAD on provision for administrative expenses + going concern special payments + solvency special payments
= 120,000 + 120,000 x 16.04% + 50,000 + 50,000 x 16.04% + 200,000 + 0
= 120,000 + 19,248 + 50,000 + 8,020 + 200,000
= 397,268

Maximum permissible employer contributions for 2021 =
= greater of going concern unfunded liability and hypothetical wind-up deficit + employer current service cost (provision for administrative expenses and PfAD)
= max (7,413,743; 7,600,000) + 120,000 + 120,000 x 16.04% + 50,000 + 50,000 x 16.04%
= 7,600,000 + 120,000 + 19,248 + 50,000 + 8,020
= 7,797,268

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

Commentary on Question:
Candidates were required to show sufficient detail to show the numerous steps required to calculate 2022 minimum required and maximum permissible employer contributions. Partial marks were given to candidates that had documented the correct formulas, but made an error in the calculation of one of the question's components.

Going concern annual special payments payable from 2022 to 2031 =
= going concern unfunded liability / 10-year amortization factor at 6.0% (with 1-year deferral)
= 7,413,743 / 7.15
= 1,036,887

Solvency assets (including present value of special payments) =
= solvency assets + present value of special payments previously established in respect of any past service unfunded actuarial liability on a solvency basis + going concern annual special payments payable from 2022 to 2031 x 5-year amortization factor at 3.2% (with 1-year deferral)
= 31,400,000 – 200,000 + 200,000 x $(1 + 3.2\%)^{(-0.5)}$ + 1,036,887 x 4.48
= 31,200,000 + 196,875 + 4,645,254
= 36,042,129

Reduced solvency excess / (deficit) =
= solvency assets (including present value of special payments) – 85% x solvency liabilities
= 36,042,129 – 85% x 38,800,000
= 3,062,129

-As there is a reduced solvency excess, there is no solvency special payments payable from the Dec. 31, 2020 valuation.

PfAD calculation:
[1 point] A = 5% since plan is closed

J = Target asset allocation for fixed income assets = 45%
K = Target asset allocation for non-fixed income assets = 55%

B = from table for closed plans = (5% + 7%) / 2 = 6%

D = best estimate discount rate = going concern discount rate + passive investment expenses
= 6.00% + 0.05% = 6.05%

H = CANSIM V39056 = 2.00% (given)

E = 0.5% + H + (1.5% x J) + (5% x K) = 0.5% + 2.00% + (1.5% x 45%) + (5% x 55%) = 5.925%

C = duration x max (0, D – E) = 16 x max (0, 6.05% - 5.925%) = 2.00%

PfAD = A + B + C = 5% + 6% + 2.00% = 13.00%

Rolled forward Dec. 31, 2021 results – Going Concern:

Annuity buy-in value included in going concern assets and liabilities =
= 10,000,000 x (1+6%) – 600,000 x (1+6%)^0.5
= 9,982,262

Going concern liabilities excluding annuity buy-in value and PfAD =
= (30,000,000 – 10,000,000 + 120,000) x (1+6%)^1 – 200,000 x (1+6%)^0.5
= 21,121,287

PfAD on going concern liabilities =
= 13%% x 21,121,287 = 2,745,767

(PfAD is not required to be applied on the buy-in annuity liability.)

Going concern liabilities including PfAD =
= Annuity buy-in value included in going concern liabilities + going concern liabilities excluding annuity buy-in value and PfAD + PfAD on going concern liabilities
= 21,121,287 + 9,982,262 + 2,745,767
= 33,849,316

Present value of special payments previously established in respect of any past service unfunded actuarial liability on a going concern basis =
= 1,036,887 x (1 + 6%)^(-0.5) = 1,007,114

Going concern assets (excluding present value of special payments previously established in respect of any past service unfunded actuarial liability) =
= Pension fund assets at December 31, 2021 excluding the value of the buy-in annuity + Annuity buy-in value included in going concern assets
= 14,400,000 + 9,982,262
= 24,382,262

Going concern excess / (unfunded liability) =
= going concern assets + present value of special payments previously established in respect of any past service unfunded actuarial liability – going concern liabilities including PfAD
= 24,382,262 + 1,007,114 – 33,849,316
= (8,459,940)

-There is a going concern unfunded liability: the $1,036,887 going concern special payment is payable in 2022. Any new going concern special payments resulting from the $8,459,940 unfunded liability are deferred by 1 year and payable from 2023.

- As there is a going concern unfunded liability, there is no excess surplus as defined under the Income Tax Act.

- As there is a going concern unfunded liability, there is no actuarial available surplus.

Rolled forward Dec. 31, 2021 results – Hypothetical wind-up/solvency:

Annuity buy-in value included in solvency assets and liabilities =
= 15,800,000 x (1+3.2%)^1 – 600,000 x (1+3.2%)^0.5
= 15,696,076

Solvency liabilities excluding annuity buy-in value =
= (38,800,000 – 15,800,000 + 250,000) x (1+3.2%)^1 – 200,000 x (1+3.2%)^0.5
= 23,790,825

Solvency assets (excluding present value of special payments; including buy-in annuity before wind-up expenses) =
= Pension fund assets at December 31, 2021 excluding the value of the buy-in annuity + Annuity buy-in value included in solvency assets
= 14,400,000 + 15,696,076
= 30,096,076

Hypothetical wind-up excess / (deficit) =
= solvency assets (excluding present value of special payments; including buy-in annuity before wind-up expenses) – wind-up expenses – solvency liabilities =
= 30,096,076 – 200,000 – (Annuity buy-in value included in solvency liabilities + Solvency liabilities excluding annuity buy-in value)
= 29,896,076 – (15,696,076 + 23,790,825)
= 29,896,076 – 39,486,901
= (9,590,825)

- Any solvency special payments payable based on the Dec. 31, 2021 results, if any, are deferred by 1 year and not payable in 2022.

Minimum and maximum contributions for 2022:

Minimum required employer contributions for 2022 =
= employer current service cost + PfAD on current service cost + provision for administrative expenses + PfAD on provision for administrative expenses + going concern special payments + solvency special payments
= 150,000 + 150,000 x 13% + 50,000 + 50,000 x 13% + 1,036,887 + 0
= 150,000 + 19,500 + 50,000 + 6,500 + 1,036,887
= 1,262,887

Maximum permissible employer contributions for 2022 =
= greater of going concern unfunded liability and hypothetical wind-up deficit + employer current service cost (provision for administrative expenses and PfAD)
= max (9,102,027; 9,590,825) + 150,000 + 150,000 x 13% + 50,000 + 50,000 x 13%
= 9,590,825 + 150,000 + 19,500 + 50,000 + 6,500
= 9,816,825

RETFRC, Spring 2021, Q9

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
[Calculation of Incremental Cost on a Hypothetical Wind-Up or Solvency basis](), CIA Educational Note, Dec 2010 (HAS BEEN REPLACED ON THE SYLLABUS WITH A MORE RECENT VERSION)

RET301-103-25: Ontario Pension Benefits Act R.R.O. 1990, Reg 909 (excluding sections 5.5.1 and 5.5.2 - Funding and Funding Relief for Specified Pension Plans and 5.5.3, 5.6, 5.6.1, 5.6.2, 5.6.3, 5.7, 5.8, 5.9, 5.10 - Solvency Funding Relief) – update with current version of Regs (https://www.ontario.ca/laws/regulation/900909)

RET301-104-25: Ontario Pension Benefits Act, R.S.O. 1990, Ch. P.8 – update with current version of Act (https://www.ontario.ca/laws/statute/90p08)

Commentary on Question:
Most candidates were able to obtain some partial points on this question, with several capturing most components of the solution. The most common errors were not recognizing which plan members were eligible for grow-in, incorrect application of the termination decrement (or no application at all) and benefit payments for the following year liability calculation/solvency incremental cost.

Solution:
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.

Member 12001

Does not have 55 points and is therefore not grow-in eligible.

Liability at December 31, 2020:
Benefit at age 65 (normal retirement date) = 1.5% x FAE3 x credited service
= 1.5% x (65,000 + 63,000 + 62,500)/3 x 10 = 9,525

Liability = benefit x annuity factor (age 33, deferred 32 years)
= 9,525 x 8.04 = 76,550

Liability at December 31, 2021:

Assumed to remain active.

Benefit at age 65 (normal retirement date) = 1.5% x FAE3 x credited service
= 1.5% x (65,000*1.03 + 65,000 + 63,000)/3 x 11 = 10,722

Liability = benefit x annuity factor (age 34, deferred 31 years)
= 10,722 x 8.24 = 88,326

Member 12004

Has 55 points and is therefore grow-in eligible.

Liability at December 31, 2020:
FAE3 = (72,000 + 71,500 + 70,400)/3 = 71,300

Grow-in calculation

Decrement Age	ERF	FAE3	Credited Service	Benefit	Annuity Factor (age 55, deferred to decrement age)	Liability
55	0.6	71,300	16.0	10,267.20	15.07	154,721.89
56	0.64	71,300	16.0	10,951.68	14.43	158,062.36
57	0.68	71,300	16.0	11,636.16	13.81	160,750.58
58	0.72	71,300	16.0	12,320.64	13.22	162,817.44
59	0.76	71,300	16.0	13,005.12	12.63	164,289.87
60	0.8	71,300	16.0	13,689.60	12.07	165,190.41
61	0.84	71,300	16.0	14,374.08	11.52	165,537.80
62	0.88	71,300	16.0	15,058.56	10.98	165,350.43
63	0.92	71,300	16.0	15,743.04	10.46	164,646.43
64	0.96	71,300	16.0	16,427.52	9.95	163,451.09
65	1	71,300	16.0	17,112.00	9.45	161,789.57

Liability = 50% of maximum liability + 50% of liability at age 65
= 50% x 165,538 + 50% x 161,790 = 163,664

Liability at December 31, 2021:

There is a 2% probability of termination.
Expected termination benefit = age 65 liability x 2% = 161,799 x 2% = 3,236
(if assumed involuntary and solvency liability of 163,664 used, this would also be acceptable)

FAE3 = (72,000*1.03 + 72,000 + 71,500)/3 = 72,553

Grow-in calculation

Decrement Age	ERF	FAE3	Credited Service	Benefit	Annuity Factor (age 55, deferred to decrement age)	Liability
55	0.6	72,553	17.0	11,100.66	15.45	171,463.79
56	0.64	72,553	17.0	11,840.70	14.79	175,165.71
57	0.68	72,553	17.0	12,580.75	14.16	178,144.82
58	0.72	72,553	17.0	13,320.79	13.55	180,435.32
59	0.76	72,553	17.0	14,060.84	12.95	182,067.08
60	0.8	72,553	17.0	14,800.88	12.37	183,065.07
61	0.84	72,553	17.0	15,540.92	11.80	183,450.05
62	0.88	72,553	17.0	16,280.97	11.26	183,242.41
63	0.92	72,553	17.0	17,021.01	10.72	182,462.22
64	0.96	72,553	17.0	17,761.06	10.20	181,137.54
65	1	72,553	17.0	18,501.10	9.68	179,090.65

Liability = (50% of maximum liability + 50% of liability at age 65) x probability of remaining active
= (50% x 183,450 + 50% x 179,091) x (1-2%) = 177,645

Member 14052

Has 55 points and is therefore grow-in eligible.

<u>Liability at December 31, 2020</u>:
FAE3 = (82,500 + 81,000 + 80,000)/3 = 81,167

Grow-in calculation

Decrement Age	ERF	FAE3	Credited Service	Benefit	Annuity Factor (age 59, deferred to decrement age)	Liability
59	0.76	81,167	20.0	18,506.00	19.67	364,070.89
60	0.8	81,167	20.0	19,480.00	18.78	365,894.62
61	0.84	81,167	20.0	20,454.00	17.92	366,477.71
62	0.88	81,167	20.0	21,428.00	17.07	365,857.68
63	0.92	81,167	20.0	22,402.00	16.25	364,072.75
64	0.96	81,167	20.0	23,376.00	15.45	361,180.32
65	1	81,167	20.0	24,350.00	14.67	357,238.19

Liability = 50% of maximum liability + 50% of liability at age 65
= 50% x 366,478 + 50% x 357,238 = 361,858

Liability at December 31, 2021:
Assumed to remain active.

FAE3 = (82,500*1.03 + 82,500 + 81,000)/3 = 82,825

Grow-in calculation

Decrement Age	ERF	FAE3	Credited Service	Benefit	Annuity Factor (age 59, deferred to decrement age)	Liability
60	0.8	82,825	21.0	20,871.90	19.25	401,839.78
61	0.84	82,825	21.0	21,915.50	18.37	402,480.15
62	0.88	82,825	21.0	22,959.09	17.50	401,799.20
63	0.92	82,825	21.0	24,002.69	16.66	399,838.93
64	0.96	82,825	21.0	25,046.28	15.84	396,662.35
65	1	82,825	21.0	26,089.88	15.04	392,332.95

Liability = (50% of maximum liability + 50% of liability at age 65)
= (50% x 402,480 + 50% x 392,333) = 397,407

Member 30001

Liability at December 31, 2020:

Liability = annual pension x annuity factor (age 70, immediate)
= 2,000 x 12 x 14.22 = 341,367

Liability at December 31, 2021:

Assumed to remain retired, payment of 24,000 made during 2021.

Liability = annual pension x annuity factor (age 71, immediate)
= 2,000 x 12 x 13.72 = 329,279

Solvency Incremental Cost

Liability at December 31, 2020
= 341,367 + 361,858 + 163,664 + 76,550
= 943,439

Liability at December 31, 2021
= 329,279 + 397,407 + 177,645 + 88,326
= 992,657

Solvency Incremental Cost
= Present value of 2021 Liability + present value of benefit payments – 2020 liability
= 992,657/(1 + 0.025) + (24,000 + 3,236)/(1 + 0.025/2) – 943,439
= 51,906

(also correct if assumption is all benefit payments are paid at beginning of year)

RETDAC, Fall 2021, Q6

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
Morneau Shepell Handbook of Canadian Pension and Benefit Plans, Shepell, Morneau, Whiston, Bethune and Clooney, J. Gregory, 16th Edition, 2016, Ch. 11 (NOT THE EDITION CURRENTLY ON THE SYLLABUS).

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017. Ch. 23.

RET301-111-25: Personal Tax Planning – A Fresh Look at Retirement Compensation Arrangements: A Flexible Vehicle for Retirement Planning

Commentary on Question:
The question was testing candidates' knowledge of different funding options for Supplemental Executive Retirement Plans (SERPs) and applying that understanding to calculate the balances in different accounts under two different funding approaches.

Solution:
(a)   Describe the advantages and disadvantages of the two funding options from the perspective of Company XYZ.

   Commentary on Question:
   Part (a) tested a candidate's understanding of two different funding methods: Retirement Compensation Arrangement (RCA) and letter of credit. Candidates had to provide three advantages and disadvantages for each funding option in order to receive full credit. Credit was given for other valid advantages or disadvantages not listed below.

Funded Retirement Compensation Arrangement (RCA)

Advantages	Disadvantages
Prefunds the liability so there is no terminal funding for the employer when benefits commence	Can be a large cash outlay to pre-fund when the cash could have earned better returns by investing elsewhere in the company
Contributions are tax deductible	Half of the money goes into a Refundable Tax Account with CRA and earns no investment returns
Benefit security for the executive	Administrative burden of filing RCA forms

Letter of Credit

Advantages	Disadvantages
Frees up cash as letter of credit fees are lower than actual contributions	Letter of credit fees are a sunk cost and can get quite expensive as liabilities increase
Contributions are tax deductible	Letter of credit must be unsecured, otherwise if backed by specific assets then may need to make a contribution to the Refundable Tax Account
Still provides benefit security for the executive	Letter of credit needs to be renewed annually

(b)   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.

Commentary on Question:
In part (b), candidates had to apply their understanding of both funding arrangements to calculate the balance in each account (RCA and Refundable Tax Account) at the end of Year 4.

In Option 1, many candidates applied interest on the full contribution, rather than splitting the contributions first, then calculating the investment return. Candidates still received partial credit if the rest of their calculations were correct.
In Option 2, a common error was to try to calculate the RCA balance, however, the RCA balance at the end of Year 4 is zero since it is a notional account. Another common error was to forget to add the letter of credit fees together to calculate the balance in the Refundable Tax Account at the end of Year 4. Candidates received partial credit if the rest of their calculations were correct.

The model solution for this part is in the Excel spreadsheet.

RETFRC, Fall 2021, Q3

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017
- Ch. 15 (excluding Section 1525)

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020
- Ch. 3 and 6

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006
- Ch. 1-4 and 7

FR-108-13: Pension Funding Exercises (background only)

Calculation of Incremental Cost on a Hypothetical Wind-Up or Solvency basis, CIA Educational Note, Dec 2010

Commentary on Question:
Candidates were asked to perform full going concern and wind-up valuations including gain and loss and determination of contributions. While candidates were able to successfully complete some portions of the question, candidates struggled with other portions. Minor calculation errors were tracked through and resulted in minimal deductions if the rest of the calculations were done correctly.

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

   Commentary on Question:
   Overall this part of the question was done well by candidates. Many candidates struggled with determining the market value of assets as mistaken components were added in or excluded.

Market value of assets	**2,911,840**

Going concern funding target

Going concern liabilities:

Active members	1,411,749
Deferred pensioners	94,439
Pensioners	1,235,257
Subtotal	2,741,444
PfAD	274,144
Total	**3,015,589**
Funding excess (shortfall)	**(103,749)**

	Without PfAD	With PfAD
Normal cost	**57,293**	**63,022**

ACTUAL ASSETS	
1.1.2020 Market Value of Assets	2,500,000
2020 return on assets	300,000
Employer contributions remitted at 12.31.2020	150,000
2020 Benefit Payments with Interest	-38,160
1.1.2021 Market Value of Assets	**2,911,840**

ACTIVES	Member 1			Termination	Retirement				
	Age			65	60				
	v			0.2955	0.3736				
			3,560	321	3,239	38,871.82			
	Actuarial Liability		249,366	16,519	232,848				
	Normal Cost		19,182						
Proj. Date	Age	Service	Salary	FAE	Bft BOP	Discount	decrement	survival P	PUC
1/1/2018			83,000						
1/1/2019			85,000						
1/1/2020			98,000						
1/1/2021	39	13.00	108,000	88,667	23,053	1.0000	-	1.0000	-
1/1/2022	40	14.00	111,240	97,000	27,160	0.9542	0.10	0.9000	194
1/1/2023	41	15.00	114,577	105,747	31,724	0.9105	-	0.9000	-
1/1/2024	42	16.00	118,015	111,272	35,607	0.8688	-	0.9000	-
1/1/2025	43	17.00	121,555	114,611	38,968	0.8290	-	0.9000	-
1/1/2026	44	18.00	125,202	118,049	42,498	0.7910	-	0.9000	-
1/1/2027	45	19.00	128,958	121,590	46,204	0.7548	-	0.9000	-
1/1/2028	46	20.00	132,826	125,238	50,095	0.7202	-	0.9000	-
1/1/2029	47	21.00	136,811	128,995	54,178	0.6872	-	0.9000	-
1/1/2030	48	22.00	140,916	132,865	58,461	0.6558	-	0.9000	-
1/1/2031	49	23.00	145,143	136,851	62,951	0.6257	-	0.9000	-
1/1/2032	50	24.00	149,497	140,957	67,659	0.5971	0.05	0.8550	127
1/1/2033	51	25.00	153,982	145,185	72,593	0.5697	-	0.8550	-
1/1/2034	52	26.00	158,602	149,541	77,761	0.5436	-	0.8550	-
1/1/2035	53	27.00	163,360	154,027	83,175	0.5187	-	0.8550	-
1/1/2036	54	28.00	168,260	158,648	88,843	0.4950	-	0.8550	-
1/1/2037	55	29.00	173,308	163,407	94,776	0.4723	-	0.8550	-
1/1/2038	56	30.00	178,508	168,309	100,986	0.4507	-	0.8550	-
1/1/2039	57	31.00	183,863	173,359	107,482	0.4300	-	0.8550	-
1/1/2040	58	32.00	189,379	178,560	114,278	0.4103	-	0.8550	-
1/1/2041	59	33.00	195,060	183,916	121,385	0.3915	-	0.8550	-
1/1/2042	60	34.00	200,912	189,434	128,815	0.3736	1.00	0.0000	3,239
1/1/2043	61	35.00	206,939	195,117	136,582	0.3565	-	0.0000	-
1/1/2044	62	36.00	213,147	200,970	144,699	0.3402	-	0.0000	-
1/1/2045	63	37.00	219,542	206,999	153,180	0.3246	-	0.0000	-
1/1/2046	64	38.00	226,128	213,209	162,039	0.3097	-	0.0000	-
1/1/2047	65	39.00	232,912	219,606	171,292	0.2955	-	0.0000	-

ACTIVES	Member 2			Termination	Retirement				
	Age			65	60				
	v			0.7202	0.9105				
			2,828	-	2,828				
	Actuarial Liability		1,162,383	-	1,162,383				
	Normal Cost		38,111						
Proj. Date	Age	Service	Salary	FAE	Bft BOP	Discount	decrement	survival P	PUC
1/1/2018			133,000						
1/1/2019			135,000						
1/1/2020			138,000						
1/1/2021	58.00	30.50	141,000	135,333	82,553	1.0000	-	1.0000	-
1/1/2022	59	31.50	145,230	138,000	86,940	0.9542	-	1.0000	-
1/1/2023	60	32.50	149,587	141,410	91,917	0.9105	1.00	0.0000	2,828
1/1/2024	61	33.50	154,075	145,272	97,332	0.8688	-	0.0000	-
1/1/2025	62	34.50	158,697	149,630	103,245	0.8290	-	0.0000	-
1/1/2026	63	35.50	163,458	154,119	109,425	0.7910	-	0.0000	-
1/1/2027	64	36.50	168,361	158,743	115,882	0.7548	-	0.0000	-
1/1/2028	65	37.50	173,412	163,505	122,629	0.7202	-	0.0000	-

INACTIVES							
ID	Status	Age	Ann Bft	NRD	Discount	Factor	AL
3	Retired	59	36,666	59	1.0000	15.10	553,657
4	Deferred	45	18,000	65	0.3915	13.40	94,439
5	Retired	61	24,000	61	1.0000	14.60	350,400
6	Retired	77	36,000	77	1.0000	9.20	331,200

CALCULATIONS FOR BENEFIT CHANGES

MEMBER 3 - ACTIVE TO RETIRED

	FAE	105,000
	Svc	18.00
	Unreduced Benefit	37,800
	ERD	3%
	Reduced Benefit	36,666
	MEMBER 5 - DEFERRED TO RETIRED	
	Unreduced Benefit	24,000
	ERD	0%
	Reduced Benefit	24,000

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

Commentary on Question:
This question was overall done poorly by candidates. Many candidates were able to successfully calculate some gain and loss items, however they left off key components and the gain and loss did not balance overall.

Funding excess (shortfall) at January 1, 2020, excluding PfAD		96,000

	Sources	
	Interest on funding excess (shortfall) before PfAD	4,800
	Contributions in excess of accrual	64,950
	Investment return	173,740
	Salary	(8,346)
	Retirement	(81,557)
	Mortality	(6,000)
	Miscellaneous	(299)
	Impact of changes in assumptions	(72,893)

Funding excess (shortfall) at January 1, 2021, excluding PfAD		170,396

	Liabilities	Assets	Gain / (Loss)
1.1.2020	**2,404,000**	**2,500,000**	**96,000**
Normal Cost/Employer Contribuions	85,050	150,000	64,950
Benefit Payments	(36,000)	(36,000)	-
Interest	119,300	124,100	4,800
Salary Experience	8,346		(8,346)
Mortality Experience	6,000		(6,000)
Retiement Expense	81,557		(81,557)
Discount Rate Change	72,893		(72,893)
Investment Return		173,740	173,740
Misc	299		(299)
1.1.2021	**2,741,444**	**2,911,840**	**170,396**

G/L by individual	Expected	Actual		
- Mem1	(219,450)	(234,659)	(15,209)	salary
- Mem2	(1,141,350)	(1,134,487)	6,863	salary
- Mem3	(543,900)	(542,657)	1,243	retirement
- Mem4	(89,250)	(89,549)	(299)	misc - rour
- Mem5	(260,400)	(343,200)	(82,800)	retirement
- Mem6	(318,000)	(324,000)	(6,000)	mortality
Check	(2,572,350)	(2,668,552)	(96,202)	

ACTIVES — Member 1

				Termination	Retirement			
Age				65	60			
v				0.2812	0.3589			
			3,560	321	3,239			
Actuarial Liability			234,659	15,485	219,174			
Normal Cost			18,051					

Proj. Date	Age	Service	Salary	FAE	Bft BOP	Discount	decrement	survival P	PUC
1/1/2018			83,000						
1/1/2019			85,000						
1/1/2020			98,000						
1/1/2021	39	13.00	108,000	88,667	23,053	1.0000	-	1.0000	-
1/1/2022	40	14.00	111,240	97,000	27,160	0.9524	0.10	0.9000	194
1/1/2023	41	15.00	114,577	105,747	31,724	0.9070	-	0.9000	-
1/1/2024	42	16.00	118,015	111,272	35,607	0.8638	-	0.9000	-
1/1/2025	43	17.00	121,555	114,611	38,968	0.8227	-	0.9000	-
1/1/2026	44	18.00	125,202	118,049	42,498	0.7835	-	0.9000	-
1/1/2027	45	19.00	128,958	121,590	46,204	0.7462	-	0.9000	-
1/1/2028	46	20.00	132,826	125,238	50,095	0.7107	-	0.9000	-
1/1/2029	47	21.00	136,811	128,995	54,178	0.6768	-	0.9000	-
1/1/2030	48	22.00	140,916	132,865	58,461	0.6446	-	0.9000	-
1/1/2031	49	23.00	145,143	136,851	62,951	0.6139	-	0.9000	-
1/1/2032	50	24.00	149,497	140,957	67,659	0.5847	0.05	0.8550	127
1/1/2033	51	25.00	153,982	145,185	72,593	0.5568	-	0.8550	-
1/1/2034	52	26.00	158,602	149,541	77,761	0.5303	-	0.8550	-
1/1/2035	53	27.00	163,360	154,027	83,175	0.5051	-	0.8550	-
1/1/2036	54	28.00	168,260	158,648	88,843	0.4810	-	0.8550	-
1/1/2037	55	29.00	173,308	163,407	94,776	0.4581	-	0.8550	-
1/1/2038	56	30.00	178,508	168,309	100,986	0.4363	-	0.8550	-
1/1/2039	57	31.00	183,863	173,359	107,482	0.4155	-	0.8550	-
1/1/2040	58	32.00	189,379	178,560	114,278	0.3957	-	0.8550	-
1/1/2041	59	33.00	195,060	183,916	121,385	0.3769	-	0.8550	-
1/1/2042	60	34.00	200,912	189,434	128,815	0.3589	1.00	0.0000	3,239
1/1/2043	61	35.00	206,939	195,117	136,582	0.3418	-	0.0000	-
1/1/2044	62	36.00	213,147	200,970	144,699	0.3256	-	0.0000	-
1/1/2045	63	37.00	219,542	206,999	153,180	0.3101	-	0.0000	-
1/1/2046	64	38.00	226,128	213,209	162,039	0.2953	-	0.0000	-
1/1/2047	65	39.00	232,912	219,606	171,292	0.2812	-	0.0000	-

ACTIVES — Member 2

				Termination	Retirement			
Age				65	60			
v				0.7107	0.9070			
			2,828	-	2,828			
Actuarial Liability			1,134,487	-	1,134,487			
Normal Cost			37,196					

Proj. Date	Age	Service	Salary	FAE	Bft BOP	Discount	decrement	survival P	PUC
1/1/2018			133,000						
1/1/2019			135,000						
1/1/2020			138,000						
1/1/2021	58	30.50	141,000	135,333	82,553	1.0000	-	1.0000	-
1/1/2022	59	31.50	145,230	138,000	86,940	0.9524	-	1.0000	-
1/1/2023	60	32.50	149,587	141,410	91,917	0.9070	1.00	0.0000	2,828
1/1/2024	61	33.50	154,075	145,272	97,332	0.8638	-	0.0000	-
1/1/2025	62	34.50	158,697	149,630	103,245	0.8227	-	0.0000	-
1/1/2026	63	35.50	163,458	154,119	109,425	0.7835	-	0.0000	-
1/1/2027	64	36.50	168,361	158,743	115,882	0.7462	-	0.0000	-
1/1/2028	65	37.50	173,412	163,505	122,629	0.7107	-	0.0000	-

INACTIVES

ID	Status	Age	Ann Bft	NRD	Discount	Factor	AL
3	Retired	59	36,666	59	1.0000	14.80	542,657
4	Deferred	45	18,000	65	0.3769	13.20	89,549
5	Retired	61	24,000	61	1.0000	14.30	343,200
6	Retired	77	36,000	77	1.0000	9.00	324,000

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

Commentary on Question:
Overall candidates did well on this part of the question. Note some candidates did not test for grow-in on the active members and some did not apply the new December 1, 2020 Commuted Value Standard.

Net assets	2,861,840
Present value of accrued benefits for:	
Active members	1,899,725
Deferred pensioners	216,000
Pensioners	1,659,253
Total solvency liability	**3,774,977**
Solvency excess (shortfall)	**(913,137)**

MEMBER	1		2	3	4	5	6
Status	Active	Active		Retired	Deferred	Retired	Retired
Bft	23,053		82,553	36,666	18,000	24,000	36,000
Pts	52		88.5				
Grow in?	FALSE		TRUE				
SVC?	TRUE		TRUE				
EURD	65		60				
MAX	10.60		20.30				
Opt Age	65		58				
Age	w/ Red	w/ Red					
55	6.60		-				
56	7.31		-				
57	7.90		-				
58	8.47		20.30				
59	8.96		20.08				
60	9.38		19.80				
61	9.73		18.90				
62	10.09		18.10				
63	10.30		17.20				
64	10.53		16.40				
65	10.60		15.70				
Solvency Liability	244,365.33		1,655,359	773,653	216,000	482,400	403,200

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

Commentary on Question:
Overall this part of the question was done well by candidates. Many candidates struggled with discounting the projected actuarial liabilities.

Solvency incremental cost			(59,005)
Blended Solvency DR		2.2%	
		2021	2022
Projected AL		3,774,977	3,700,000
AL at val date		3,774,977	3,620,352
Exp. Benefit		95,620	
SIC		(59,005)	

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

Commentary on Question:
*Many Candidates were able to correctly calculate the maximum contributions for
2021. Candidates struggled with determining the special payments with respect
to both 2021 and 2022.*

Minimum required contributions for 2021			**356,848**
Minimum required special payments for 2022			**11,265**
Maximum permissible contributions for 2021			**976,160**
		2021	
Normal cost		57,293	
PfAD on normal cost		5,729	
Special payments			
Going Concern		*19,000*	
Solvency		*274,825*	
Minimum annual contribution		356,848	
Maximum annual contribution		976,160	

Prior amortization schedules					1/1/2021	1/1/2021
Type	Monthly Amortization Payment ($000s)	Date Established	Date of Last Payment	Solv PV	GC PV
Going concern	1,583	1/1/2021	12/31/2022	18,776	18,515
Going concern	939	1/1/2022	12/31/2031	53,290	85,234
Solvency	21,917	1/1/2021	12/31/2025	1,244,177	
Solvency	4,167	1/1/2020	12/31/2024	191,285	
				1,507,527	

Solvency assets			2,911,840	2,911,840
PV GC SP			72,065	72,065
PV Solv SP			1,435,462	-
Termination Expense			(50,000)	(50,000)
Solvency liabilities			3,774,977	3,774,977
Reduced Solvency deficiency (85% ratio):			-	274,825

All solvency special payments cannot be eliminated but amortization period can
be shortened so the reduced solvency excess moves to zero

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

Commentary on Question:
This question was omitted or partially done by most candidates.

	Going concern results	Interest rate risk	Deterioration of asset values	Longevity risk
Market value of assets	2,911,840	3,028,314	2,693,452	2,911,840
Going concern liability	2,741,444	2,926,143	2,741,444	2,878,517
PfAD	274,144	292,614	274,144	287,852
Going concern funding target	3,015,589	3,218,757	3,015,589	3,166,368
Funding excess (shortfall)	(103,749)	(190,443)	(322,137)	(254,528)
Current service cost including PfAD	63,022	68,751	63,022	66,173

Interest Rate Risk		
Duration of Asset Portfolio	8.00	
Fixed income allocation	50%	
Market value of assets	3,028,314	=2,911,840*(1-8*-1%*0.5)
GC AL duration	13.47	
Going concern liability	2,926,080	=2,741,444*(1-13.47*-0.5%)
GC NC duration	18.18	
Current service cost	62,501	=57,293*(1-18.18*-0.5%)
Current service cost including PfAD	68,751	

Deterioration of asset values		
Market value of assets	2,693,452	=2,911,840*(1-0.5*15%)
Going concern liability	2,741,444	no change
Current service cost including PfAD	63,022	no change

Longevity risk		
Market value of assets	2,911,840	no change
Impact of longevity increase on AL & NC	5%	
Going concern liability	2,878,517	=2,741,444*(1+5%)
Current service cost	60,158	=57,293*(1+5%)
Current service cost including PfAD	66,173	

RETFRC, Spring 2022, Q4

Learning Outcomes:
The Candidate will be able to:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 Ch. 15 (excluding Section 1525)

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 3 and 6 (ASSUMED KNOWLEDGE FROM RET 201)

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006 Ch. 1-4 and 7 (ASSUMED KNOWLEDGE FROM RET 201)

Guidance on Selection and Disclosure of Plausible Adverse Scenarios, CIA Educational Note, Feb 2019

Commentary on Question:
Candidates were asked to perform full going concern and wind-up valuations including gain and loss and determination of contributions. While candidates were able to successfully complete some portions of the question, candidates struggled with other portions. Minor calculation errors were tracked through and resulted in minimal deductions if the rest of the calculations were done correctly.

Solution:
(a)   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.

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

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

Commentary on Question:
*Overall parts i) and ii) were done well by candidates, but candidates struggled in
determining the minimum contribution requirements in iii)*

(i) *Most candidates did not determine the actuarial value of assets correctly but
were awarded some points for trying to calculate smoothed assets. Most
candidates calculated the going concern liabilities correctly but forgot to
calculate the non-indexed liabilities for the purpose of determining the PfAD.*
(ii) *Overall most candidates determined the deferred and retiree liabilities
correctly, but some struggled in correctly determining the age that creates the
maximum value for active and deferred members.*
(iii) *This part of the questions was done poorly overall. Most candidates were
able to calculate the correct normal cost for each member. They however did
not calculate the non-indexed normal cost in order to properly apply the
PfAD. Candidates also did not include explicit expense allowance or PfAD in
most cases. The special payments were also done poorly as candidates did not
apply the going concern surplus to completely remove the Going concern
special payments. The solvency special payments were overall done well
however candidates did not apply the blended solvency rate.*

(i)

Actuarial Value of Assets	1,130,887
Going concern funding target	
Going concern liabilities:	
Active members	260,474
Deferred pensioners	258,069
Pensioners	375,760
Subtotal	894,304
PfAD	85,511
Total	979,815
Funding excess (shortfall)	151,072

- Calculation of smoothed assets:

Unrecognized capital gains (losses) realized or unrealized (from question):

2020	28,900
2019	(100,000)

MVA 31/12/2020	1,116,820
Yr 1 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2020)	(19,267)
Yr 2 (1/3 of Unrecognized capital gains (losses) realized or unrealized for 2019)	33,333
AVA 31/12/2020	**1,130,887**

- Calculation of going concern liabilities:

<u>Active Members:</u>

Member ID	ID1	Earnings	2018	55,000								
Current age	49		2019	58,000								
Service	4.00		2020	61,000								
	Age	Years to Decrement	Projected earnings	Projected pension	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Termination	49	0	58,000	4,060	3%	0%	1.0000	7.4	6.0	906	731
EURD=NRD	65	16	95,064*	6,654	0%	100%	0.4512*	16.0	12.9	48,039	38,732
										48,946	**39,463**

*where:
95,064 = AVERAGE(61000*(1+0.03)^16,61000*(1+0.03)^(16-1),61000*(1+0.03)^(16-2))
0.4512 = (1-0.03-0)/(1+0.049)^16

Member ID	ID2	Earnings	2018	68,000								
Current age	54		2019	72,000								
Service	12.00		2020	74,000								
	Age	Years to Decrement	Projected earnings*	Projected pension	QxT	QxR	tPxV*	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Termination	62	8	91,037	19,118	0%	50%	0.6820	17.3	13.8	112,785	89,967
EURD=NRD	65	11	99,479	20,891	0%	100%	0.2954	16.0	12.9	98,744	79,612
										211,528	**169,579**

*where:
91,037 = AVERAGE(74000*(1+0.03)^8,74000*(1+0.03)^(8-1),74000*(1+0.03)^(8-2))
99,479 = AVERAGE(74000*(1+0.03)^11,74000*(1+0.03)^(11-1),74000*(1+0.03)^(11-2))
0.6820 = 1/(1+0.049)^8
0.2954 = (1-0-0.5)/(1+0.049)^11

Deferred Members:

	Indexed AL		Non-indexed AL	
	ID3	ID4	ID3	ID4
Age	39	60	39	60
Service	5.00	20.50	5	21
Lifetime pension	8,600	12,000	8,600	12,000
EURA	65	60	65	60
Lifetime factor	16.00	18.2	12.9	14.3
AL	39,669	218,400	31,983	171,600

Pensioners:

	Indexed AL		Non-indexed AL	
	ID5	ID6	ID5	ID6
Age	63	68	63	68
Spouse Age	n/a	64	n/a	64
Lifetime pension	12,100	9,900	12,100	9,900
Lifetime factor	16.9	17.3	13.5	13.8
AL	204,490	171,270	163,350	136,620

Summary of liabilities:

Indexed	894,304
Active	260,474
Deferred	258,069
Pensioners	375,760
Non-Indexed	712,595
Active	209,042
Deferred	203,583
Pensioners	299,970

- Calculation of PfAD:

Determine PfAD

1)	5.0% for a closed plan	5.00%
2)	Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets	7.00%
3)	BDR > GC DR	0.00%
PfAD		**12.00%**

PfAD = 12.00% x 712,595 = 85,511

(ii)

Solvency assets	966,820
Solvency Liabilities for:	
Active members	394,464
Deferred pensioners	389,820
Pensioners	596,750
Total solvency liability	1,381,034
Solvency excess (shortfall)	(414,214)

- Calculation of solvency assets:

MVA 31/12/2020	1,116,820
Termination expenses	(150,000)
Solvency assets 31/12/2020	**966,820**

- Calculation of solvency liabilities:

Active Members:

Member ID	ID1	Earnings	2018	55,000
Current age	49		2019	58,000
Service	4.00		2020	61,000

Not entitled to grow-in since less than 55 points.

	Best Age	FAE3	Reduction	Accrued pension	Factor LS	AL
LS	65	58,000	0%	4,060	18.2	**73,892**

Member ID	ID2	Earnings	2018	68,000
Current age	54		2019	72,000
Service	12.00		2020	74,000

Entitled to grow-in, unreduced at age 62. Best Age = EURA (will reach 20 pts at age 62).

	Best Age	FAE3	Reduction	Accrued pension	Factor LS	AL
LS	62	71,333	0%	14,980	21.4	**320,572**

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Deferred Members:

	ID3	ID4
Age	39	60
Service	5.00	20.50
Lifetime pension	8,600	12,000
LS max age	65	60
Reduction	0%	0%
Lifetime factor LS	11.7	24.1
AL	**100,620**	**289,200**

Pensioners:

	ID5	ID6
Age	63	68
Spouse Age	n/a	64
Lifetime pension	12,100	9,900
Lifetime factor AP	26.9	27.4
AL	**325,490**	**271,260**

(iii)

2021 Employer Minimum Contribution Requirements	
Employer current service cost contributions	83,143
Special payments	43,200
Minimum required contributions for 2021	**126,343**
2022 Employer Minimum Contribution Requirements	
Employer current service cost contributions (roll forward with interest)	84,748
Special payments	40,628
Minimum required contributions for 2022	**125,376**

- Calculation of normal cost:

Member ID	ID1			
Current age	49			
Service	4.00			
	Age	Projected pension (NC)	NC (indexed)	NC (non-indexed)
Termination	49	5,075	227	183
EURD=NRD	65	8,318	12,010	9,683
			12,236	**9,866**

4.0000000

Member ID	ID2			
Current age	54			
Service	12.00			
	Age	Projected pension (NC)	NC (indexed)	NC (non-indexed)
EURD	62	20,711	9,399	7,497
NRD	65	22,631	8,229	6,634
			17,627	**14,132**

- Calculation of elements of Total Employer Current Service Cost:

	2021	2022
Total Normal Cost	29,864	31,327
PfAD on Non-Indexed CSC	2,880	3,021
Total Current Service Cost	**32,743**	**34,348**
Explicit Expense Allowance	45,000	45,000
PfAD on explicit expense allowance	5,400	5,400
Total Employer Current Service Cost Contributions	**83,143**	**84,748**

- Calculation of Special Payments
Discount Rates for Amortization
GC = 4.90%
Solvency = 1.88% (Blended Discount Rate

Going Concern Deficit = $0
Solvency Deficit = $414,214
Reduced Solvency Deficit = $207,059

Existing Special Payments Schedule (from previous valuation schedule)

Type	Start	End	Monthly Amount	Remaining Months
GC existing	1/1/2020	12/31/2020	4,000	12
GC consolidated	1/1/2021	12/31/2030	1,500	120
Solvency One	1/1/2017	12/31/2021	1,200	12
Solvency Two	1/1/2021	12/31/2025	2,400	60

New Special Payments Schedule

Type	Start	End	Monthly Amount	Remaining Months	Solvency PV (5 years)
GC **none**					
Solvency One	1/1/17	12/31/21	1,200	12	$14,256
Solvency Two	1/1/21	12/31/25	2,400	60	$137,407
Solvency Three **new**	1/1/22	12/31/26	986	60	$55,396
					$207,059

(b)

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

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

Commentary on Question:
This question was asking candidates to do similar calculations as in a), but a year later. Similar to a) i) the AVA was calculated poorly. Most candidates forgot to calculate the non-indexed liabilities for the purpose of determining the PfAD. A few candidates forgot to reflect that member ID3 has been paid out, and that the member's liability is nil. Only a few candidates thought about indexing the retiree's pensions and/or reflecting the death of member ID6 and the continuation of 60% of the pension to the spouse.

(i)

Actuarial Value of Assets	1,141,933
Going concern funding target	
Going concern liabilities:	
Active members	409,808
Deferred pensioners	249,600
Pensioners	345,980
Subtotal	1,005,388
PfAD	94,814
Total	1,100,202
Funding excess (shortfall)	41,731

- Calculation of smoothed assets:

Unrecognized capital gains (losses) realized or unrealized (from question):

2021	260,000
2020	28,900

MVA 31/12/2021	1,324,900
Yr 1 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2021)	(173,333)
Yr 2 (1/3 of Unrecognized capital gains (losses) realized or unrealized for 2020)	(9,633)
AVA 31/12/2021	**1,141,933**

- Calculation of going concern liabilities:

Active Members:

Member ID	ID1	Earnings	2019	58,000
Current age	50		2020	61,000
Service	5.00		2021	70,000

	Age	Years to Decrement	Projected earnings	Projected pension	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Termination	50	0	63,000	5,513	0%	0%	1.0000	10.8	8.6	0	0
EURD=NRD	65	15	105,912*	9,267	0%	100%	0.5883*	18.4	14.6	100,317	79,599
										100,317	79,599

*where:
105,912= =AVERAGE(70000*(1+0.03)^15,70000*(1+0.03)^(15-1),70000*(1+0.03)^(15-2))
0.4512 = (1-0-0)/(1+0.036)^15

Member ID	ID2	Earnings	2019	72,000								
Current age	55		2020	74,000								
Service	13.00		2021	76,220								

	Age	Years to Decrement	Projected earnings*	Projected pension	QxT	QxR	tPxV*	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)
Termination	62	7	91,037	20,711	0%	50%	0.7807	20.2	15.8	163,306	127,735
EURD=NRD	65	10	99,479	22,631	0%	100%	0.3511	18.4	14.6	146,185	115,994
										309,491	**243,729**

*where:

91,037 = AVERAGE(74000*(1+0.03)^8,74000*(1+0.03)^(8-1),74000*(1+0.03)^(8-2))

99,479 = AVERAGE(74000*(1+0.03)^11,74000*(1+0.03)^(11-1),74000*(1+0.03)^(11-2))

0.7807 = 1/(1+0.036)^7

0.3511 = (1-0-0.5)/(1+0.036)^10

Deferred Members:

	Indexed AL		Non-indexed AL	
	ID3	ID4	ID3	ID4
	(Paid out)		(Paid out)	
Age	40	61	40	61
Service	5.00	20.50	5.00	20.50
Lifetime pension	8,600	12,000	8,600	12,000
EURA	65	61	65	61
Lifetime factor	0	20.8	0	16.1
AL	**0**	**249,600**	**0**	**193,200**

Pensioners:

	Indexed AL		Non-indexed AL	
	ID5	ID6	ID5	ID6
Age	64	65	64	65
Spouse Age	n/a	n/a	n/a	n/a
Lifetime pension	12,342	6,059	12,342	6,059
Lifetime factor	19.0	18.4	15.0	14.6
AL	**234,498**	**111,482**	**185,130**	**88,458**

Summary of liabilities:

Indexed	1,005,388
Active	409,808
Deferred	249,600
Pensioners	345,980
Non-Indexed	**790,117**
Active	323,329
Deferred	193,200
Pensioners	273,588

- Calculation of PfAD:

Determine PfAD

1)	5.0% for a closed plan	5.00%
2)	Provision based on Combined Target Asset Allocation for Non-Fixed Income Assets	7.00%
3)	BDR > GC DR	0.00%
PfAD		**12.00%**

PfAD = 12.00% x 790,117 = 94,814

(ii)   Gain & Loss

Funding excess (shortfall) at December 31, 2020	**151,072**
PfAD at December 31, 2020	85,511
Funding excess (shortfall) before PfAD	**236,583**
Interest on the excess/deficit	11,593
Special Payments to fund the deficit with interest	51,210
PfAD contributions with interest	8,480
Net experience gains (losses)	
Normal Cost Contributions Not as Expected	(897)
Investment	12,465
Expense	(308)
Salary	(7,411)
Mortality	72,290
Termination & Inactive Cash out	(84,612)
Retirement	16,856
Misc	0
Total experience gains (losses)	**8,383**
Assumption Changes - Going Concern discount rate	(179,704)
Funding excess (shortfall) at December 31, 2021 before PfAD	**136,545**
PfAD at December 31, 2021	94,814
Funding excess (shortfall) at December 31, 2021	**41,731**

(c)   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.

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

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

Commentary on Question:
This question was testing candidates' ability to apply the new plausible scenario disclosures given the changes in assumptions. Candidates struggled to complete this question and often did not apply the correct shock to the assets and/or liabilities.

(i)   Interest Rate Shock

	Interest rate risk
Actuarial value of Assets	1,154,299
Going concern liability	1,163,737
PfAD	108,553
Going concern funding target	1,272,290
Funding excess (shortfall)	(117,990)

- Calculation of Market Value and AVA of assets after shock

Increase in Fixed Income Assets	7.00%
Portion of Assets in Fixed Income	40.00%
Increase in total Market Value of Assets	2.80%
Market Value after Shock = 1,324,900 * 1.028 =	$1,361,997

Smoothed assets

Unrecognized capital gains (losses) realized or unrealized	**2021**	297,097
	2020	28,900

Market Value after Shock	1,361,997
Yr 1 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2021)	-198,065
Yr 2 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2020)	-9,633
AVA after Shock	**1,154,299**

- Calculation of Liabilities after shock

Discount Rate Drop	0.90%
Discount Rate Before Shock	3.60%
Discount Rate After Shock	2.70%

Liabilities	GC (with Indexing)	GC (Non-Indexed)
Current DR	1,005,388	790,117
Duration	17.5	16.1
Updated DR	1,163,737	904,605
	= (1,005,388 * (1+17.5*(0.009)))	= (790,117 * (1+16.1*(0.009)))

PfAD = 12.00% x 904,605 = 108,553

(ii) Equity Market Shock:

	Equity market shock
Market value of assets	1,102,186
Going concern liability	1,005,388
PfAD	94,814
Going concern funding target	1,100,202
Funding excess (shortfall)	1,984

- Calculation of Market Value and AVA of assets after shock

Decrease in Equity Portfolio	-15.00%
Portion of Assets in Equity	60.00%
Decrease in total Market Value of Assets	-9.00%
Market Value after Shock = 1,324,900 * 0.91 =	1,205,659

Smoothed assets

Unrecognized capital gains (losses) realized or unrealized	**2021**	140,759
	2020	28,900

Market Value after Shock	1,205,659
Yr 1 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2021)	-198,065
Yr 2 (2/3 of Unrecognized capital gains (losses) realized or unrealized for 2020)	-9,633
AVA after Shock	**1,102,186**

- Calculation of Liabilities after shock – None – Equity Shock does not impact the liabilities.

RETDAC, Fall 2022, Q6

Learning Outcomes:
The Candidate will be able to:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020
o   Ch. 13

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017
o   Ch. 1 (sections 120-145)
o   Ch. 16 (sections 1615-1619 & 1680)
o   Ch. 17 (section 1790)
o   Ch. 18 (sections 1825-1835)
o   Ch. 23

RET301-111-25: Personal Tax Planning – A Fresh Look at Retirement Compensation Arrangements: A Flexible Vehicle for Retirement Planning

Commentary on Question:
This question relates to the concepts of supplemental retirement plans. Successful candidates were able to fully describe plan features that can help a company with its strategy in attracting and retaining executives.

Solution:

(a) 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

Commentary on Question:
Successful candidates were able to identify plan provisions that could help in attracting and/or retaining executives.

    (i)   Eligibility
- Company could provide for automatic enrollment when affected by tax limits if want to attract executives
- Depending on level of executives the company wants to hire, the SERP could be set up so that certain job titles are eligible (ex: eligible if VP and up)
- If the company wants to attract, better to have less stringent eligibility requirements

    (ii)   Benefit formula

           To attract and retain executives:
- Could set up formula that restores lost benefit due to tax limits
- Could provide larger accruals than base plan
- Could provide a salary definition more generous than registered plan (ex: include bonuses, commissions, overtime, etc.)

    (iii)   Vesting
- Could provide immediate vesting if goal is to attract
- If the company wants to retain the executives, better to vest benefit later on in career
  - o Vesting could be based on a number of years of credited service with the company (ex: 100 % vested after 10 years)
  - o Could be vested only if the executive retires with company
  - o Could set up progressive vesting (ex: 50 % vested after 3 years; 75 % vested after 5 years and 100 % vested after 10 years)

       (iv)   Service
- Could recognize service after becoming eligible to participate in plan
- Could recognize service since employment with the company, effectively recognizing past service at eligibility
- Could recognize service from prior employer to make sure the executives don't lose benefits by changing jobs

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)   Calculate the January 1, 2026 account balances in the following:

(i)   RCA

(ii)   RTA

Show all work.

Commentary on Question:
Successful candidates understood the impact of contributions, investment returns and benefit payments on the transfer between the RCA and RTA accounts at year end. Many candidates struggled with correctly calculating the final balances as of January 1, 2026; partial credit was provided for parts of the work which were done correctly.

The model solution for this part is in the Excel spreadsheet. Simple interest was used in the model solution. Candidates who used compound interest also received credit.

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

Commentary on Question:
Candidates did not do as well on part c as on part a. Successful candidates understood how the letter of credit funding arrangement would operate.

The client enters into a letter of credit (LOC) with an insurer based on the liabilities of the SERP
The client will set up an RCA and deposit twice the premium in the account
Half of the amount deposited will go to government as a refundable tax (RTA account)
Half is used to pay premiums to the insurance company
Benefit paid at the end from general account of company

RETFRC, Fall 2023, Q2

Learning Outcomes:
a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and participants
b) Evaluate funding restrictions imposed by regulations

Sources:
SOME SOURCES HAVE BEEN REMOVED THAT ARE NO LONGER ON THE SYLLABUS

Canadian Pensions and Retirement Income Planning, Willis Towers Watson, 6th Edition, 2017 Ch. 15 (excluding Section 1525)

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 17th Edition, 2020 Ch. 3 and 6 (excluding pp., 176-183) (ASSUMED KNOWLEDGE FROM RET 201)

RET301-109-25: Regulation 193/18 Purchase of Pension Benefits from an Insurance Company under Ontario Pension Benefits Act

Section 3500 of the Practice-Specific Standards for the Pension Plans – Pension Commuted Values, CIA Educational Note, Aug 2020

Commentary on Question:
This question was to test candidates' understanding of the following:
- *Calculation of funded status and contribution requirements of an Ontario registered pension plan on going concern and solvency bases;*
- *Use of asset smoothing method to determine the going concern asset value;*
- *Valuation of buy-in liabilities; and*
- *Evaluating actual experience compared to the assumptions.*

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

   Commentary on Question:
   Many candidates did not get the AVA calculation correct (e.g. not calculating the investment gain/loss correctly, missing the 1/3 and 2/3 gain/loss deferral for years 2022 and 2021 respectively and some candidates just took the average of the market values).
   There were also a few errors in the treatment of the buy-in piece (e.g. candidates incorrectly included the buy-in piece in the PfAD calculation, or excluded the buy-in piece in the total asset/liability calculation).
   Most candidates also forgot to add back the wind-up expense piece in the solvency ratio calculation.

Calculate the funded status of the plan on a going concern basis at January 1, 2022

Actuarial Value of Assets (AVA) Calculation

Discount rate (DR)	5.7%	5.7%	5.7%
	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

Cash Flow (CF) = Contributions + Tramsfer in - Benefit payments - Admin expenses	(3,300)	1,300	28,700
Expected investment return = [Asset (beg) + CF/2] x DR	71,156	76,799	60,554
Asset gain and (loss) = Expected investment return - Actual investment return	28,844	(376,799)	(30,554)

	Gain and (loss)	Percent deferred	Percent Recognized	Deferred Amount
2021 gain and (loss)	(30,554)	66.7%	33.3%	(20,369.30)
2020 gain and (loss)	(376,799)	33.3%	66.7%	(125,599.65)

AVA at 1/1/2022 = MV at Dec 31, 2021 – total deferred amount
$$= \$1,106,700 - [-\$145,969]$$
$$= \mathbf{\$1,252,669}$$

Total GC Value of Asset = AVA at 1/1/2022 + Buy-in contract value
$$= \$1,252,669 + \$850,000$$
$$= \mathbf{\$2,102,669}$$

Going concern liabilities:	*indexed*	*non-indexed*
Active members	1,198,000	963,000
Retired members	663,000	549,400
Subtotal	**1,861,000**	**1,512,400**
PfAD = non-indexed liabilities x PfAD %	136,116	
Insured liabilities	850,000	
Total Going Concern Liability	**2,847,116**	

Going concern Value of Assets	2,102,669
Going concern liabilities:	2,711,000
PfAD	136,116
Total	**2,847,116**
Going concern excess/(shortfall) at 1/1/2022	**(744,447)**
Going Concern Funded Ratio at 1/1/2022	74%

Calculate the funded status of the plan on a solvency basis at January 1, 2022

Market value of asset	1,106,700
Plan termination expenses:	(100,000)
Buy-in contract (solvency excludes indexation)	870,000
Solvency assets	**1,876,700**

Total solvency liability = sum of all liabilities (including insured pensioners)
= $1,242,100 + $678,000 + $870,000
= **$2,790,100**

Solvency assets	1,876,700
Total solvency liability	2,790,100
Solvency excess (shortfall)	**(913,400)**
Solvency ratio*	71%

*adding back windup expense in solvency ratio calculation

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

Commentary on Question:
Some candidates missed the one-year deferral period in calculating the present value of the existing (2022) going concern special payments.
The blended solvency ratio should be calculated excluding the insured liability.
Solvency special payment should be calculated on a reduced solvency ratio of 85%.

Total Employer Current Service Cost Contribution
Total normal cost (incl. indexation) = 13,000 + 38, 200 = $51,200
PfAD = total normal cost (excl. indexation) x PfAD % = [10,000 + 30,700] x 9% = $3,663
Total employer service cost contributions = $51,200 + $3,663 = **$54,863**

Total 2022 special payment = sum of going concern and solvency payments
= (1,000 + 1,500) x 12 = **$30,000**

2022 minimum required employer contributions	
Employer current service cost contributions	54,863
Special payments	30,000
Total	**84,863**

Blended solvency rate* = [Transfer value discount rate x Active members solvency liability + Annuity purchase discount rate x retired members solvency liability]/ [total liabilities]
= [2.1% x 1,242,100 + 3.0% x $678,000]/[$1,242,100 + $678,000]
=2.42%
* calculated excluding the insured annuities
* weighted using active vs. inactive liabilities given breakdown of liabilities using transfer rate vs. annuity purchase rate was not provided

Going concern excess/(shortfall) = **($744,447)**
Solvency excess/ (shortfall) = ($913,400)
Reduced Solvency excess/ (shortfall) = Solvency asset – 85% x Solvency liability
= $1,876,700 – 0.85 x $2,790,100
= **($494,885)**

Existing Special Payments Schedule (from previous valuation schedule)

Type	Start	End	Monthly amount	GC Period	Solvency Period	GC PV per annum (using 5.7%)	Solvency PV per annum (using 2.42%)
GC One	1/1/2021	12/31/2021	1,800	-		-	
GC Two	1/1/2022	12/31/2031	1,000	120	60	91,907	56,496
Solvency One	1/1/2022	12/31/2026	1,500		60		84,744
				120		91,907	141,239

New Special Payment Schedule

Type	Start	End	Monthly amount	GC Period	Solvency Period	GC PV per annum	Solvency PV per annum
Existing GC	1/1/2022	12/31/2022	1,000	12	12	11,647	11,846
New GC	1/1/2023	12/31/2032	8,427.74	120	60	732,800	464,881
Solvency One	1/1/2022	1/30/2023	1,500		12.3		18,158
						744,447	494,885

New Going Concern Special payment of $8,428 was calculated using discount rate of 5.7% per annum (i.e., 0.46% per month) and amortization period of 10 years (i.e., 120 months), taking into account 1-year of existing going concern special payment.

Note that the end period for the existing solvency special payment schedule has been reduced based on the reduced solvency shortfall and the existing/new going concern special payments.

New amortization Schedule

Type	Monthly amortization payment	Date established	Start date	Date of last payment
Going concern One	1,000	12/31/2020	1/1/2022	12/31/2022
Going concern Two	8,428	12/31/2021	1/1/2023	12/31/2032
Going concern Three	-	-	-	-
Solvency One	1,500	12/31/2021	1/1/2022	1/30/2023
Solvency Two	-	-	-	-
Solvency Three	-	-	-	-

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

Commentary on Question:
Same comment as above for the AVA calculation. As for the liabilities, most candidates did well in the calculations of liabilities for inactive members, but some did not score well for the active liabilities due to incorrect projection of benefits/service, missing decrements.. Some candidates excluded the insured liabilities in the funded status calculation.

Calculate the liabilities for inactive members at January 1, 2023

ID	Status	Age	Actual Monthly Pension (indexed at 6.3%)	Factor GC (indexed)	Factor GC (non-indexed)	Factor Solv (non-indexed)	Going Concern Liability (indexed)	Going Concern Liability (non-indexed)	Solvency Liability (non-indexed)
3	Pensioner	61	1,276	15.68	12.62	15.05	240,017	193,177	230,373
4	Pensioner	70	2,658	12.69	10.68	12.45	404,684	340,585	397,031
5	Annuitant	66	1,913	14.11	11.63	13.70	323,977	267,034	314,563
6	Deceased	69	0				0	0	0

Calculate the liabilities for active members at January 1, 2023

For ID 1 - Calculation of going concern liability and normal cost:

Calculation of Final average earning (FAE) and projected pension benefit at each decrement

	Actual earnings/projected earnings at 2.5%					
Age	Year-2	Year - 1	Year - 0	Final Average Earning (FAE)	Service	Projected pension (1.8%xFAExSvc)
45	83,000	85,000	85,000	84,333	5	7,590
50	91,536	93,824	96,170	93,843	5	8,446
62	123,105	126,183	129,338	126,209	5	11,359
65	132,571	135,885	139,282	135,913	5	12,232

Age	Years to decrement	tPxV calculation = [Product of all (1-qxT)(1-qxR)]/[(1+DR)^years to decrement]	tPxV
45	0	$1/(1+DR)^0 = 1/(1+6.5\%)^0$	1
50	5	$[(1-5\%)(1-0\%)]/[(1+6.5\%)^5]$	0.6934
62	17	$[(1-5\%)(1-0\%)(1-1.8\%)(1-0\%)]/[(1+6.5\%)^{17}]$	0.3198
65	20	$[(1-5\%)(1-0\%)(1-1.8\%)(1-0\%)(1-0\%)(1-50\%)]/[(1+6.5\%)^{20}]$	0.1324

AL(x) = tPXv * Qx * B(x) * annuity(r)

Where B(x) is the projected pension calculated above times ERF. ERF = 100% at termination since plan provides deferred pension starting at age 65 at termination or early commencement from age 55 on an actuarially equivalent basis.
ID1 will be entitled to unreduced pension at age 62 based on plan provision [i.e., retire with 10 or more years of service]

At age 45, indexed factor for deferred pension = 14.44/ [1.065^(65-45)] = 4.0980
At age 50, indexed factor for deferred pension = 14.44/ [1.065^(65-50)] = 5.6147
At age 62/65, ID1 will be entitled to immediate pension.

NC(x) = AL(x) / Svc(x)
NC (indexed) = 53,482/5 = 10,696
NC (non-indexed) = 43,545/5 = 8,709

	Age	Years to Decrement	Projected FAE	Projected pension	ERF	QxT	QxR	tPxV	Factor (indexed)	Factor (non-indexed)	AL (indexed)	AL (non-indexed)	Projected pension (NC)	NC (indexed)	NC (non-indexed)
Termination	45	0	84,333	7,590	100%	5%	0%	1.0000	4.10	3.36	1,555	1,276	9,108	311	255
Termination	50	5	93,843	8,446	100%	1.80%	0%	0.6934	5.61	4.61	592	486	10,135	118	97
EURA	62	17	126,209	11,359	100%	0%	50.00%	0.3198	15.39	12.44	27,953	22,595	13,631	5,591	4,519
NRD	65	20	135,913	12,232	100%	0%	100%	0.1324	14.44	11.85	23,382	19,188	14,679	4,676	3,838
											53,482	43,545		10,696	8,709

ID1 - Calculation of solvency liability:
ID1 is under the age of 55 and member's benefit is assumed to be settled by commuted value. ID1 is not entitled to early retirement subsidy at termination and therefore, liability is calculated on an actuarial equivalent basis.

Age	FAE3	Accrued pension	Non-Indexed LS Factor	AL (non-indexed)
55	84,333	7,590	11.10	45,844
56	84,333	7,590	10.47	45,844
57	84,333	7,590	9.88	45,844
58	84,333	7,590	9.31	45,844
59	84,333	7,590	8.77	45,844
60	84,333	7,590	8.26	45,844
61	84,333	7,590	7.77	45,844
62	84,333	7,590	7.31	45,844
63	84,333	7,590	6.86	45,844
64	84,333	7,590	6.44	45,844
65	**84,333**	**7,590**	**6.04**	**45,844**

For ID2 - Calculation of going concern liability and normal cost:
Similar methodology as above

												Projected		
Member ID	ID2		2020	120,000										
Current age	63		2021	140,000										
Service	30		2022	143,500										
		Years to	Projected	Projected					Factor	Factor (non-		AL (non-	pension	NC	NC (non-
	Age	Decrement	earnings	pension	ERF	QxT	QxR	tPxV	(indexed)	indexed)	AL (indexed)	indexed)	(NC)	(indexed)	indexed)
EURA	63	0	134,500	72,630	100%	0%	0%	1.0000	15.08	12.25	0	0	75,051	0	0
NRD	65	2	147,117	79,443	100%	0%	100%	0.8817	14.44	11.85	1,011,407	829,998	82,092	33,714	27,667
											1,011,407	829,998		33,714	27,667

For ID2 - Calculation of solvency liability:

ID2 is entitled to earliest unreduced pension at current age (63), liability is therefore optimal at age 63.

	Age	FAE3	Reduction	Accrued pension	Non-Indexed AP Factor	AL (non-indexed)
EURA (also Optimal age)	63	134,500	0	72,630	14.53	1,055,314

Going concern funding target		
Going concern liabilities:	*indexed*	*non-indexed*
Subtotal (AL of ID1, ID2, ID3, ID4)	**1,709,590**	**1,407,305**
PfAD (9%* 1,407,305)	126,657	
Insured liabilities (ID5)	323,977	
Total	**2,160,224**	

Actuarial Value of Assets (AVA) Calculation [same methodology as in part (a)]

Expected return on asset	5.7%	5.7%	5.7%
	2020	**2021**	**2022**
January 1 market value of assets:*	1,346,700	1,048,000	1,106,700
Employer normal cost contribution:	17,000	18,000	54,863
Employer special payments:	70,000	95,000	30,000
Benefit payments:	(96,000)	(98,000)	(84,000)
Transfer in from insurer:	55,300	55,700	39,600
Administration expenses:	(45,000)	(42,000)	(45,000)
Investment return:*	(300,000)	30,000	190,000
December 31 market value of assets:*	1,048,000	1,106,700	1,292,163
Cash Flow	1,300	28,700	(4,537)
Expected investment return	76,799	60,554	62,953
Asset gain and (loss)	(376,799)	(30,554)	127,047

	Gain and (loss)	Percent deferred	Percent Recognized	Deferred Amount
2022 gain and (loss)	127,047	66.7%	33.3%	84,698
2021 gain and (loss)	(30,554)	33.3%	66.7%	(10,185)

AVA at 1/1/2023 = MV at Dec 31, 2022 – total deferred amount
= $1,292,163 –$74,514
= **$1,217,649**

Total GC Value of Asset = AVA at 1/1/2023 + Buy-in contract value
= $1,217,649 + $323,977*
= **$1,541,626**
*Going concern liability (indexed) for buy-in annuitant (ID5), see calculation above.

Market value of asset	1,292,163
Windup expense	(100,000)
Buy-in contract	314,563
Solvency assets	**1,506,726**

Present value of accrued benefits for:	
Active members	1,101,158
Retired members	627,404
Insured annuities	314,563
Total solvency liability	**2,043,124**

Going concern value of assets	1,541,626
Going concern liabilities	2,033,567
PfAD	126,657
Total	**2,160,224**
Going concern excess/(shortfall) at 1/1/2023	**(618,598)**
Solvency assets	1,506,726
Total solvency liability	2,043,124
Solvency excess (shortfall)	**(536,398)**

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

Commentary on Question:
Similar comment as in part (b).

2023 employer minimum contribution requirements	
Employer current service cost contributions	47,684
Special payments	101,133
Total	**148,817**

2023 special payment = 8,427.74 x 12

Amortization schedule:

Type	Monthly amortization payment	Date established	Start date	Date of last payment
Going concern One	8,428	12/31/2020	1/1/2023	12/31/2023
Going concern Two	6,241	12/31/2021	1/1/2024	12/31/2033
Going concern Three	-	-	-	-
Solvency One	-	-	-	-
Solvency Two	-	-	-	-
Solvency Three	-	-	-	-

Intermediate steps:

Blended solvency rate*
= [4.3% x 1,101,158 + 4.9% x $627,404]/[$ 1,101,158 + $627,404]
=4.52%
* calculated excluding the insured annuities
* weighted using active vs. inactive liabilities
* Full points will be given for candidates calculating the blended solvency rate weighted on liabilities (as calculated from part c) using transfer rate vs. annuity purchase rate.

From part (c)

GC liabilities indexed without buy in	1,709,590
GC liabilities non-indexed without buy in	1,407,305
GC Buy-In	323,977
Solvency liabilities non-indexed without buy in	1,728,561
Solvency buy-in	314,563
Normal Cost indexed	44,410
Normal Cost non-indexed	36,376

Calculate minimum required contributions	2023
Total Normal Cost	44,410
PfAD on Non-Indexed CSC (9% x 36,376)	3,274
Total Employer Current Service Cost Contributions	**47,684**

Going Concern excess/(shortfall)	(618,598)
Solvency excess/(shortfall)	(536,398)
Reduced Solvency excess/(shortfall) = 1,506,726 - 0.85* 2,043,124	(229,930)

Existing GC special payment schedule

Type	Start	End	Monthly amount	GC Period	Solvency Period	GC PV per annum (using 6.5% p.a.)	Solvency PV (using 4.52% per annum)
GC One	1/1/2023	12/31/2032	8,428	120	60	1,404,926	564,834
					60	1,404,926	564,834

New special payment schedule

Type	Start	End	Monthly amount	GC Period	Solvency Period	GC PV per annum	Solvency PV per annum
Existing GC	1/1/2023	12/31/2023	8,428	12	12	97,757	98,749
New GC	1/1/2024	12/31/2033	6,241	120	60	520,434	320,876
						618,191	419,625

New Going Concern Special payment of $6,241 was calculated using discount rate of 6.5% per annum (i.e., 0.53% per month) and amortization period of 10 years (i.e., 120 months), taking into account 1-year of existing going concern special payment.

No solvency special payment is required based on the reduced solvency shortfall and the existing/new going concern special payments.

(e) 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)

Commentary on Question:

Candidates would have received full marks on this part if they commented on 1) whether the gain/loss sign is correct/incorrect; 2) reasonableness of the magnitude of the gain/loss; 3) provided supporting rationale (could be descriptions) to assess the reasonableness of the gain/loss analyses.
Many candidates did not do well in this part.

Source	Gain/ (Loss)	Actuary's comment
Investment return	127,000	**Correct/ Gain/ magnitude is reasonable** Investment gain adequately reflect a gain of 17% vs 5.7%; 2/3 of Gain in 2023 will be deferred and 1/3 of past loss will be recognized in 2023. We would expect the investment experience after smoothing on GC to reflect a smaller gain for the period
Mortality gain	500,000	**Incorrect/ should be a small loss.** Buy-in annuitant's death is not reflected as plan's mortality experience. All other members remain in the plan, there should be no mortality gain but a small mortality loss given members' age are still relatively young.
Inflation	70,000	**Incorrect/ should be a small loss** Both sign and amount are incorrect. Inflation experience should be a loss on two retirees' liability. The buy in member's experience should be not be included, the actual loss is smaller than 70K.
Retirement	(130,000)	**Incorrect/ should be a gain** The sign is incorrect. Retirement experience is expected to be a gain as active defer retirement by one year roughly equal to 1 year of benefit payment minus the additional pension amount accrued
Salary	(10,000)	**Incorrect/ should be a small gain.** 2022 salary experience is incline with assumption for ID 2 (salary increased by 2.5%) and salary for ID 1 is unchanged The salary experience dollar amount is expected to be small.

Investment return

MVA 2021.12.31	1,106,700
Expected return rate	5.70%
Pension payment	(84,000)
Expected contribution	84,863
Transfer In	39,600
Administration expenses	(45,000)
Expected return	62,953
Actual Investment gain	190,000
Investment Gain	127,047

Expected return = MVA 2021.12.31 * 5.7% + sum of cash flow * 5.7% /2
$\qquad$ = 1,106,700 * 5.7% + [(84,000)+84,863+39,600-45,000]*5.7%/2
$\qquad$ = \$62,953
Investment gain = actual gain – expected return = 190,000 – 62,953 = \$127,047

Mortality experience

Estimated Expected liability at 1/1/2023	492,152	rollforward liability with six month benefit payment with interest rate. This buy-in retiree died mid year, no further liability.
Actual liability at 1/1/2023	0	
Mortality Gain/(loss)	492,152	However, this gain is from a buy-in retiree's death, no gain/loss on insured liabilities

Estimated expected liability (ID6) = pben x 12 x annuity x (1+DR) ^0.5 – 6 x pben x (1+DR) ^0.5
$\qquad$ = 3,000 x 12 x 13.42 x (1.057) – 6 x 3,000 x (1.057) ^0.5
$\qquad$ = 492,152

Inflation
loss on the non-insured annuities only

Expected inflation: 2.0%
Actual inflation: 6.3%

ID	monthly pension	Expected monthly pension	Actual monthly pension	Gain/(loss) = [expected pension - actual pension] x annuity
3	1,200	1,224	1,276	(9,709)
4	2,500	2,550	2,658	(16,370)
			Inflation loss	**(26,079)**

Retirement

ID2 could have retired at age 62 but did not.

Gain on deferred retirement by 1 year (not paying for pension plus member's aging by one year, offset by one more year of accrual)

NC = 38,200

Estimated pension amount = projected pension at age 63 x 29 year of service/ 30 year of service

$$= \$72,630 \times 29/30 = 70,209$$

Rough estimate gain/(loss) = 70,209 – 38, 200 = \$32, 009

Salary

	Expected liability (*use solution b) to estimate by changing 2022 salary to expected salary*)	Actual GC liability	Gain/(loss)	
ID1	54,794	53,482	1,311	
ID2	1,011,407	1,011,407	0	none since actual salary increase is 2.5% which is inline with assumptions
		Salary gain	**1,311**	