

# RET FRC Model Solutions

## Spring 2020

### 1. Learning Objectives:

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.

### Learning Outcomes:

- (3d) Analyze and communicate the impact on cost stability of a variety of asset valuation methods.

### Sources:

Guidance on asset valuation methods  
Survey of Asset Valuation Methods

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Describe the desirable characteristics of an asset smoothing method.

### Commentary on Question:

*Candidates did very well on this part.*

- Achieves objectives
  - Moderate volatility through the deferral of investment gains and losses
  - Moderate the volatility of contribution rates
  - Moderate the volatility of net benefit cost recognized in financial statements
- Tracks market value
  - Would include current market value as a component and ensure that the asset value is expected to track to market over time
- Does not unduly deviate from market value
  - Consider to restrict the value through the use of a corridor
- Has a reasonable and logical relationship to market value
- Generally free of any bias
  - Free of systematic overstatement or understatement of asset value in relation to the market value
- No undue influence on investment transactions

# 1. Continued

- (b) Calculate the smoothed value of assets as at January 1, 2019.

Show all work.

**Commentary on Question:**

*Many candidates were able to calculate the smoothed value of assets. Candidates often lost credit for forgetting to deduct investment expenses or including an additional year of experience in the calculation.*

$$\text{Net Investment Gain 2016} = 2,600,000 - 160,000 = 2,440,000$$

$$\text{Net Investment Gain 2017} = 7,200,000 - 175,000 = 7,025,000$$

$$\text{Net Investment Loss 2018} = -1,800,000 - 180,000 = -1,980,000$$

Smooth Value of Assets at January 1, 2019

$$= \text{FV at 1.1.2019} + 75\% * \text{Net 2018 Investment Loss} - 50\% * \text{2017 Net Investment Gain} - 25\% * \text{2016 Net Investment Gain}$$

$$= 99,335,000 + 75\% * 1,980,000 - 50\% * 7,025,000 - 25\% * 2,440,000$$

$$= 99,335,000 + 1,485,000 - 3,512,500 - 610,000$$

$$= 96,697,500$$

- (c) Describe two other appropriate asset smoothing methods.

**Commentary on Question:**

*Most candidates could identify at least one other asset smoothing method, but less were able to properly describe the asset smoothing method. Other appropriate asset smoothing methods were accepted.*

1. Write-up
  - Preliminary asset value developed by bringing forward the prior year's actuarial asset value by adding in net cash flows and increasing the result with assumed investment earnings
  - Modification of preliminary asset value towards fair market value or could elect to make no adjustments to preliminary asset value
2. Blend of cost and market value
  - Either blend the current fair market and cost values or averages the ratio of fair market value to cost value over two or more years
3. Average MVA
  - Preliminary asset value is developed as the average of the current year fair market value and one or more adjusted fair market values
4. Deferred recognition
  - Only a portion of the investment experience is recognized in the current year
  - Preliminary asset value is determined by subtracting (or adding) a portion of the previously unrecognized gains (or losses)

## 1. Continued

- (d) Describe how the asset smoothing would impact the calculation of the solvency liabilities.

**Commentary on Question:**

*Candidates did not perform well on this part of the question. To earn full credit, candidates were expected to explain how solvency liabilities are calculated and how they are impacted by smoothing. Some candidates mistakenly commented on the solvency deficiency rather than the calculation of solvency liabilities.*

- Solvency liabilities are determined by assuming a certain percentage of plan members will elect to settle their pension entitlements by electing a lump sum commuted value. All remaining members not electing a commuted value will elect to settle their pension entitlements through a purchase of a group annuity
- Will need to average the discount rates over the past 4 years to match the asset valuation method
- If the commuted value or annuity purchase interest rates during the year were determined under an old standard, need to adjust the interest rates to the current standard prior to determining the average discount rates
- For pension benefits settled through the payment of a commuted value, economic and demographic assumptions should be in accordance with Section 3500 of the CIA standards
- The mortality rates in effect under the CIA Standard on the valuation date apply throughout the smoothing period For pension benefits assumed to be settled by a group annuity purchase, interest rates need to be in accordance with the CIA Educational Notes

## 2. Learning Objectives:

2. The candidate will understand how to analyze/synthesize the factors that go into selection of actuarial assumptions for funding purposes.

### Learning Outcomes:

- (2a) Describe and apply the techniques used in the development of economic assumptions for funding purposes.
- (2b) Evaluate and recommend appropriate assumptions for funding purposes.
- (2c) Evaluate actual experience, including comparisons to assumptions.

### Sources:

ASOP 27, ASOP 35, Assumptions for hypothetical wind-up and solvency valuations, CSOP 3100-3500, CIA revised educational note expenses in funding valuations for pension plans

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Critique the CFO's proposed economic and demographic assumptions for the going concern valuation.

### Commentary on Question:

*Candidates performed reasonably well on this part of the question; many correctly identifying flaws in the proposed assumptions. Some candidates did not properly interpret the experience gain/(loss) items. Note that not all of the points below were required to receive full credit.*

### Inflation

To provide a full critique on reasonableness of the 4.00% inflation assumption, items as consumer price indices, the implicit price deflator, forecasts of inflation, yields on government securities of various maturities, and yields on nominal and inflation-indexed debt would be needed. Given the experience gain on indexation over the past two years, this would suggest that increasing the inflation assumption to 4.00% per year is not warranted.

### Salary Increase

Typically, the salary increase assumption will breakdown into the following components: General inflation + productivity growth + merit. The assumption of 1% would suggest the actuary is assuming 0% for productivity and merit. This may be acceptable if there were reasons to support the 1%, such as a collective bargaining agreement or plan specific data/sponsor's input. However, the recent actuarial loss, would not suggest lowering this assumption is reasonable.

## 2. Continued

### YMPE and ITA Increase assumption

Typically, these assumptions will breakdown into the following components: General inflation + productivity growth. Assumptions must be internally consistent – Each economic assumption selected by the actuary should be consistent with all other economic assumptions, unless the assumption is not material. These assumptions are not consistent when compared to each other and the salary increase assumption.

### Retirement Rates

The assumption should consider the plan provisions. The plan offers unreduced retirement at age 62, so 100% at age 67 would not seem appropriate. The assumption should take into account historical and current demographic data that is relevant as of the measurement date. The plan's experience suggests that members are retiring earlier than expected based on the current assumption given the losses observed. This experience would not support an increase to the assumed retirement age.

### Termination Rates

The assumption should take into account historical and current demographic data that is relevant as of the measurement date. No significant gains or losses during period based on current table. Plan is sufficiently large – the assumption should reflect relevant plan or plan sponsor experience, to the extent that it is credible. The CFO does not give any relevant support for their termination assumption proposal. Average age of the active membership is 50.4, a very heavy retirement assumption at age 50 would not seem to suit the demographics.

- (b) Critique the CFO's proposed assumptions for the solvency valuation.

### **Commentary on Question:**

*A significant number of candidates failed to recognize that the wind-up expense decreased. Additionally, some candidates provided critique of the mortality assumption from a going concern rather than solvency perspective.*

### Wind up expenses

- \$50,000 quite low compared to:
  - historical wind up fee estimate (with no justification for the decrease)
  - the general admin fees expected annually based on the asset reconciliation
  - Considering the size of the plan

## 2. Continued

### Mortality adjustment

- An adjustment to regular annuity purchase assumptions would be expected where there is demonstrated sub- or super-standard mortality versus a typical group annuity purchase
- An adjustment can be made to the underlying table and/or a broad adjustment to the rates of the underlying table (note the mortality table for annuity proxy is not prescribed)
- A substandard adjustment does not match the experience of the last couple of years, given the loss (people living longer than expected)

### 3. Learning Objectives:

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.

#### Learning Outcomes:

- (3b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using a variety of cost methods.

#### Sources:

Anderson, FR-xxx-17: A Problem-Solving Approach to Pension Funding and Valuation, Second Edition, Ch. 5

#### Commentary on Question:

*A well-prepared candidate will be able to calculate unfunded liability and normal cost using the Projected Unit Credit, prorated on services, cost method. They will also be able to reconcile experience gains/losses in respect of these items.*

#### Solution:

- (a) Calculate the normal cost and the unfunded actuarial liability as at January 1, 2019.

Show all work.

#### Commentary on Question:

*Candidates performed quite well calculating the normal cost using the PUC method. Some candidates had some difficulty correctly calculating the retiree "pop-up" liability for member C.*

$$\begin{aligned} \text{PUC AL}_x &= \sum B_y \times \ddot{a}_y^{(12)} \times v^{(y-x)} \times [(x-w) \div (y-w)]; \text{ x-cur age; y-rtmt age; w-hire age} \\ \text{PUC NC}_x &= \sum B_y \times \ddot{a}_y^{(12)} \times v^{(y-x)} \times [1 \div (y-w)] \end{aligned}$$

#### Member A

$$\begin{aligned} \text{AL} &= 60,000 \times 1.03^{24} \times 2\% \times 5 \times 14.8 \times v^{25} \\ &= 53,306 \\ \text{NC} &= \div 5 \\ &= 10,661 \end{aligned}$$

#### Member B

$$\begin{aligned} \text{AL} &= 90,000 \times 1.03^{14} \times 2\% \times 10 \times 14.8 \times v^{15} \\ &= 193,828 \\ \text{NC} &= \div 10 \\ &= 19,383 \end{aligned}$$

### 3. Continued

Member C

$$\begin{aligned} \text{AL} &= 3,000 \times 12 \times (14.8+14.3-12.8) + 1,000 \times 12 \times (14.8 - 12.8) \\ &= 604,800 \end{aligned}$$

$$\text{Total AL}_{2019} = 851,934$$

$$\text{Total NC}_{2019} = 30,044$$

$$\begin{aligned} \text{UAL}_{2019} &= \text{AL} - \text{F} \\ &= 851,934 - 800,000 = 51,934 \end{aligned}$$

- (b) Calculate the unfunded actuarial liability as at January 1, 2020.

Show all work.

**Commentary on Question:**

*Most candidates were able to correctly determine the updated assets and the Accrued Liabilities. Some of the candidate did not reflect the pension payments to Member C when calculating the updated asset amounts.*

Member B

$$\begin{aligned} \text{AL} &= 193,828 * 11/10 \times 1.05 \\ &= 223,871 \end{aligned}$$

Member C

$$\begin{aligned} \text{AL} &= 4,000 \times 12 \times 14.0 \\ &= 672,000 \end{aligned}$$

$$\text{AL}_{2020} = 895,871$$

$$\begin{aligned} \text{F}_{2020} &= (800,000 + 20,000) \times 1.10 - 75,000 - 36,000 \times 1.05 \\ &= 789,200 \end{aligned}$$

$$\begin{aligned} \text{UAL}_{2020} &= \text{AL} - \text{F} \\ &= 895,871 - 789,200 = 106,671 \end{aligned}$$

- (c) Calculate the gains and losses by source for 2019.

Show all work.

**Commentary on Question:**

*Candidates performed reasonably well in this section of the question, many correctly identifying several of the sources of gains/loss. Candidates had the most difficulty when determining the gain/loss is respect of the Member C's spouse's death. As well, some candidates did not attempt to reconcile/check the gain/loss.*

### 3. Continued

$$\begin{aligned} \text{Exp'd UAL}_1 &= \text{UAL}_0 \times 1.05 \\ &= 51,934 \times 1.05 &= 54,531 \\ \text{Act'l UAL}_1 &= 106,671 \text{ (see above)} \\ \text{Gains/(Losses)} &= 54,531 - 106,671 &= (52,140) \end{aligned}$$

Loss on contributions/normal cost:

$$\begin{aligned} \text{Normal cost} &= 30,044 \times 1.05 &= 31,546 \\ \text{Act'l Conts} &= 20,000 \times 1.05 &= 21,000 \\ \text{Gain/(Loss)} &= 21,000 - 31,546 &= (10,546) \end{aligned}$$

Gain on fund return:

$$\begin{aligned} \text{Act'l F} &= 789,200 \text{ (see above)} \\ \text{Exp'd F} &= (800,000 + 20,000) \times 1.05 - 75,000 - 36,000 \times 1.025 \\ &= 749,100 \\ \text{Gain/(Loss)} &= 789,200 - 749,100 &= 40,100 \end{aligned}$$

Loss on termination – Member A:

$$\begin{aligned} \text{Exp'd AL} &= (53,306 + 10,661) \times 1.05 &= 67,165 \\ \text{Commutated value} &= 75,000 \\ \text{Gain/(Loss)} &= \text{AL}_{\text{exp}} - 75,000 \\ &= 67,165 - 75,000 &= (7,835) \end{aligned}$$

Loss on spouse's death – Member C:

$$\begin{aligned} \text{Exp'd AL} &= (604,800) \times 1.05 - 36,000 \times 1.025 = 598,140 \\ \text{Act'l AL} &= 672,000 \text{ (see above)} \\ \text{Gain/(Loss)} &= \text{AL}_{\text{exp}} - 522,540 \\ &= 598,140 - 672,000 &= (73,860) \end{aligned}$$

Check:

$$\begin{aligned} \text{Gains/(Losses)} &= (10,546) + 40,100 + (7,835) + (73,860) \\ &= (52,141) \text{ (rounding)} \end{aligned}$$

#### **4. Learning Objectives:**

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.
5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.
6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

#### **Learning Outcomes:**

- (3a) Differentiate between the various purposes for valuing pension plans:
  - (i) Funding
  - (ii) Solvency
  - (iii) Termination/wind-up/conversion
- (3b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using a variety of cost methods.
- (3c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding methods
- (5i) The candidate will be able to describe and apply regulation pertaining to contributions and benefits.
- (6b) Evaluate funding restrictions imposed by regulations.

#### **Sources:**

Canadian Pensions and Retirement Income Planning, 6th edition – Chapter 15, 18  
Morneau Shepell Handbook of Canadian Pension and Benefit Plans – Chapter 8, 9  
Ontario Pension Benefits Act  
Guidance on Asset Valuation Methods, CIA September 2014

#### **Commentary on Question:**

*Commentary listed underneath question component.*

#### **Solution:**

- (a) Calculate the annual minimum required and maximum permissible employer contributions for 2019. Assume that contributions under the Ontario funding regulations are lower based on the current regulations than the previous regulations.

Show all work.

## 4. Continued

### Commentary on Question:

*Many candidates were able to calculate the correct minimum and maximum contributions. To receive full credit, candidates needed to confirm that new special payments schedules would be established and deferred by one year.*

Solution in 000's

$$\begin{aligned}\text{GC excess/(deficit)} &= \text{AVA} - (\text{GC Liab} + \text{PfAD}) \\ &= 386,290 - (400,000 \times 1.12) \\ &= (61,710)\end{aligned}$$

$$\begin{aligned}\text{PV of current GC SP within 1}^{\text{st}} \text{ year @ 5\%} \\ &= 9,000 \times 0.97 \\ &= 8,730\end{aligned}$$

$$\begin{aligned}\text{New GC SP amortized over 10 years with 1-year deferral} \\ &= 52,980 / (7.86/1.05) \\ &= 7,077\end{aligned}$$

$$\begin{aligned}\text{Solvency asset adjustment} &= \text{Difference b/w MVA and AVA} + \text{PV GC SP within 6 years} \\ &\quad + \text{PV solvency SP within 6 years} \\ &= (386,290 - 400,000) + (9,000 \times 0.98 + 7,077 \times 4.64/1.03) + (7,000 \times 4.64 + 8,000 \times 3.76) \\ &= (13,710) + 40,701 + 62,560 \\ &= 89,551\end{aligned}$$

$$\begin{aligned}\text{Reduced solvency deficiency} &= 85\% \times \text{solvency liabilities} - (\text{solvency assets} - \text{wind-up expense} + \text{solvency asset adjustment}) \\ &= (0.85\% \times 580,000) - (400,000 - 5,000 + 89,551) \\ &= 8,449\end{aligned}$$

Since reduced solvency deficiency, new solvency SP schedule will be established over 5 years with 1-year deferral so no impact on 2019 contributions.

$$\begin{aligned}\text{2019 minimum contribution} &= \text{GC NC} + \text{PfAD} + \text{GC SP} + \text{solvency SP} \\ &= 25,000 \times 1.12 + 9,000 + 7,000 + 8,000 \\ &= \mathbf{52,000}\end{aligned}$$

$$\begin{aligned}\text{2019 maximum contribution} &= \text{Max}(\text{HWU deficit}, \text{GC deficit}) + \text{NC} + \text{PfAD} \\ &= \text{Max}(630,000 - (400,000 - 5,000), 400,000 \times 1.12 - 386,290) + 25,000 \times 1.12 \\ &= \text{Max}(235,000, 61,710) + 28,000 \\ &= \mathbf{263,000}\end{aligned}$$

- (b) Calculate the estimated minimum required and maximum permissible employer contributions for 2020 using extrapolated liabilities.

Show all work.

## 4. Continued

### Commentary on Question:

*Candidates did not perform as well on this part of the question. In particular, many candidates did not properly calculate the smoothed value of assets or determine that all special payments could be eliminated.*

Solution in 000's

$$\begin{aligned} 2019 \text{ net cash flow} &= \text{Actual contributions} - \text{BP} - \text{non-investment expenses} \\ &= 150,000 - 50,000 - 3,000 \\ &= 97,000 \end{aligned}$$

$$\begin{aligned} \text{AVA at 1.1.2020 using 1.1.2018 MVA} \\ &= 1.1.2018 \text{ AVA at 1.1.2019} \times 1.05 + \text{net cash flow for 2019} \times (1 + .05 \times 0.5) \\ &= 387,385 \times 1.05 + 97,000 \times 1.025 \\ &= 506,169 \end{aligned}$$

$$\begin{aligned} \text{AVA at 1.1.2020 using 1.1.2019 MVA} \\ &= 1.1.2019 \text{ MVA} \times 1.05 + \text{net cash flow for 2019} \times (1 + .05 \times 0.5) \\ &= 400,000 \times 1.05 + 97,000 \times 1.025 \\ &= 519,425 \end{aligned}$$

$$\begin{aligned} \text{AVA at 1.1.2020} &= \text{Average}(480,000, 506,169, 519,425) = 501,865 \text{ (within corridor)} \\ \text{Lower corridor} &= 0.8 \times 480,000 = 384,000 \text{ and upper corridor} = 1.2 \times 480,000 = 576,000 \end{aligned}$$

$$\begin{aligned} \text{GC liability at 1.1.2020} &= \text{GC liability} \times 1.05 + (\text{NC} - \text{BP}) \times (1 + .05 \times 0.5) \\ &= 400,000 \times 1.05 + (25,000 - 50,000) \times 1.025 \\ &= 394,375 \end{aligned}$$

$$\begin{aligned} \text{GC excess/(deficit)} &= \text{AVA} - (\text{GC Liab} + \text{PfAD}) \\ &= 501,865 - (394,375 \times 1.12) \\ &= 60,165 \end{aligned}$$

Since GC excess, can eliminate all GC SP schedules

$$\begin{aligned} \text{Solvency liability at 1.1.2020} &= \text{Solvency liability} \times 1.03 + (\text{SIC} - \text{BP}) \times (1 + .03 \times 0.5) \\ &= 580,000 \times 1.03 + (35,000 - 50,000) \times 1.015 \\ &= 582,175 \end{aligned}$$

$$\begin{aligned} \text{Solvency ratio} &= \text{AVA} / \text{solvency liabilities} \\ &= 501,865 / 582,175 \\ &> 85\% \end{aligned}$$

Since solvency ratio is greater than 85%, can eliminate all solvency SP schedules

$$\begin{aligned} \text{HWU liability at 1.1.2020} &= \text{WU liability} \times 1.025 + (\text{IC} - \text{BP}) \times (1 + .025 \times 0.5) \\ &= 630,000 \times 1.025 + (40,000 - 50,000) \times 1.0125 \\ &= 635,625 \end{aligned}$$

#### 4. Continued

$$\begin{aligned} 2020 \text{ minimum contribution} &= \text{GC NC} + \text{PfAD} + \text{GC SP} + \text{solvency SP} \\ &= 25,000 \times 1.05 \times 1.12 + 0 \\ &= \mathbf{29,400} \end{aligned}$$

$$\begin{aligned} 2020 \text{ maximum contribution} &= \text{Max}(\text{HWU deficit}, \text{GC deficit}) + \text{NC} + \text{PfAD} \\ &= \text{Max}(635,625 - (480,000 - 5,000), 394,375 \times 1.12 - 501,865) + 25,000 \times 1.05 \times 1.12 \\ &= \text{Max}(160,625, -60,165) + 29,400 \\ &= \mathbf{190,025} \end{aligned}$$

## 5. Learning Objectives:

5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.
6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

### Learning Outcomes:

- (5a) The candidate will be able to describe and apply regulation pertaining to plan design.
- (5i) The candidate will be able to describe and apply regulation pertaining to contributions and benefits.
- (6a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and the participants, and , for public pension plans, taxpayers.

### Sources:

FR-141-18: Alberta Interpretive Guideline #07: Solvency Reserve Account

FR-117-15 FSCO overview and Q&A on Letters of Credit

FR-118-15 FSCO overview and Q&A on Letters of Credit – FAQs

### Commentary on Question:

*The question was to test candidates' understanding of Solvency Reserve Account as a plan design option available to plan sponsors for plans registered in Alberta; as well as the rules of letters of credit in Ontario.*

### Solution:

- (a) Describe Solvency Reserve Accounts (SRAs) as per Alberta's regulatory framework for pension plans.

**Commentary on Question:** *Candidates who studied this specific topic generally did well on this part of the question.*

- A solvency reserve account (SRA) is a separate account within a pension plan fund that is established to hold solvency deficiency payments made under a defined benefit component of a pension plan.
- An SRA is established to avoid “trapped capital” or is known as the “banker’s clause”.
- It is a provision for employers to reimburse certain contributions made to fund a solvency deficiency when the plan shows an actuarial surplus (i.e., solvency asset value exceeds 105 per cent of the solvency liability value).

## 5. Continued

- The only funds that may be deposited to an SRA are payments made in respect of a solvency deficiency.
  - Top up contributions (transfer deficiency) would be considered eligible for deposit to the solvency reserve account as they too relate to the solvency deficiency.
  - Plan assets cannot be transferred from another account of the pension plan fund to the solvency reserve account.
  - Solvency deficiency payments which were made prior to the establishment of the solvency reserve account may not be moved to the solvency reserve account once it is established.
- (b) Compare and contrast the use of and requirements for the following for the purpose of solvency special payments:
- (i) SRAs in Alberta; and
  - (ii) Letters of credit in Ontario.

### Commentary on Question:

*Some of the comparing items listed below could be viewed as contrasting items, and vice versa. Candidates would receive points as long as they are comparing or contrasting the two vehicles.*

*Candidates are not required to list all items and/or provide full details as illustrated below to receive full points. However, candidates who provided just a list of the characteristics of each vehicle without comparing and contrasting each element do not receive points for this question.*

Compare	Contrast
<p><b>The two vehicles both provided under regulatory frameworks to alleviate funding due to solvency deficiency of pension plans, except for the following distinction:</b></p> <ul style="list-style-type: none"> <li>○ <b>SRAs: Solvency special payments made can be deposited into an SRA; and employer could reimburse certain contributions made to fund a solvency deficiency when the plan shows an actuarial surplus.</b></li> <li>○ <b>Letters of Credit (LOCs): Instead of making solvency special payments, plan sponsor pays an annual premium for a LOC that can be used to reduce the solvency special payments and interests related to the plan's solvency deficiency.</b></li> </ul>	<p>Calculation of funded ratios (going concern assets or solvency assets) are treated differently</p> <ul style="list-style-type: none"> <li>○ SRAs: All assets are included in the calculations of funded ratios.</li> <li>○ LOCs: LOC amounts are excluded from the calculations of funded ratios.</li> </ul>
<p><b>There are limits to the amounts being funded or secured under both vehicles.</b></p>	<p>LOCs have one-year expiry and SRAs have no expiry.</p>

<ul style="list-style-type: none"> <li>○ <b>SRAs: The only funds that may be deposited to an SRA are payments made in respect of a solvency deficiency. That is, total amount is limited to solvency deficiency of the plan at each valuation.</b></li> <li>○ <b>LOCs: The aggregate of all LOCs cannot exceed 15 per cent of the plan's solvency liabilities.</b></li> </ul>	<ul style="list-style-type: none"> <li>○ LOCs have an expiry no later than one year after the effective date. The employer must renew the LOC, or pay an amount equal to the amount of the LOCs (unless certain requirements are met) into the pension fund immediately.</li> <li>○ SRAs: No expiry, but if the employer wants to cancel an SRA, the assets in the solvency reserve account must be transferred into another account of the pension plan fund and subsequent solvency deficiency payments must be made to that account.</li> </ul>
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<p><b>Both provisions are for payments due in the future, not in arrears.</b></p> <ul style="list-style-type: none"> <li>○ <b>SRAs: Solvency deficiency payments which were made prior to the establishment of the solvency reserve account may not be moved to the solvency reserve account once it is established; given plan assets cannot be transferred from another account of the pension plan fund to the solvency reserve account.</b></li> <li>○ <b>LOCs: A LOC can be applied towards future scheduled solvency special payments (that are not yet due) that are set out in valuation reports already filed.</b></li> </ul>	<p><b>Certain types of pension plans are being restricted to the uses of LOCs, but not SRAs.</b></p> <ul style="list-style-type: none"> <li>○ <b>SRAs: No restrictions. However, in the case of a divisional multi-employer plan, a solvency reserve account may be established for any of all of the participating employers. Where this occurs, the rules for maintaining, withdrawing funds, or closing the account apply in the same manner to that participating employer as it would if the plan were a single employer plan.</b></li> <li>○ <b>LOCs: Regulation prohibits use of LOCs by certain types of plans for funding solvency deficiencies (jointly sponsored pension plans (JSPPs), or multi-employer pension plans (MEPPs), or certain public sector pension plans).</b></li> </ul>
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<p><b>Prescribed documents must be filed with the superintendent.</b></p> <ul style="list-style-type: none"> <li>○ <b>SRAs: A copy of the trust agreement (if established) must be filed with the superintendent; or consent is required for withdrawal of funds from SRAs.</b></li> <li>○ <b>LOCs: The LOCs and the other required documents must be filed with the superintendent.</b></li> </ul>	<p><b>The establishment of LOCs has more restrictions than SRAs.</b></p> <ul style="list-style-type: none"> <li>○ <b>SRAs: A solvency reserve account (SRA) is a separate account within a pension plan fund. While it's not required by the regulation, SRAs can be established under a separate trust agreement to minimize any potential issues that could arise if the account was under the same trust as the balance of the pension plan fund.</b></li> <li>○ <b>LOCs: LOCs are issued by a financial institution which meets certain prescribed requirements.</b>  <b>The issuer must</b> <ul style="list-style-type: none"> <li>▪ be a member of the Canadian Payments Associations;</li> <li>▪ be a bank, credit union, "caisse populaire", or a cooperative credit society; and</li> <li>▪ have a credit rating that meets the prescribed level</li> </ul> </li> <li>○ <b>LOCs: The issuer cannot be the employer, or an affiliate of the employer, who is</b></li> </ul>
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	<b>required to make payments into the fund with respect to a solvency deficiency.</b>
	Fee payment structures are different <ul style="list-style-type: none"><li>○ SRAs: No particular requirements/ restrictions under the regulation.</li><li>○ LOCs: Fees and expenses related to obtaining, holding, amending or cancelling the letter of credit cannot be paid from the pension fund.</li></ul>

## 6. Learning Objectives:

4. The candidate will understand the principles and rationale behind regulation.
5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.

### Learning Outcomes:

- (4a) Describe the principles and motivations behind pension legislation and regulation.
- (5a) The candidate will be able to describe and apply regulation pertaining to plan design.
- (5c) The candidate will be able to describe and apply regulation pertaining to plan amendment.

### Sources:

Canadian Pensions and Retirement Income Planning, Willis Towers Watson  
Chapter 1: section 105; Chapter 3, Chapter 7

### Commentary on Question:

*The question was to test candidates' understanding of the calculations of RRSP contribution room; the rationale behind the calculation of PA system; as well as plan design options that don't affect PA calculations.*

### Solution:

- (a) Describe the calculation of a Canadian taxpayer's unused Registered Retirement Savings Plan contribution room.

### Commentary on Question:

*Candidates did not receive full points if they had missed some details, such as 18% of the prior year's earned income, PAR adjustment, PSPA adjustment, etc.*

RRSP contribution room in a calendar year is broadly determined as

- any unused RRSP contribution room that has been carried forward from a previous calendar year, plus
- newly generated RRSP contribution room\* for the calendar year, plus
- any PARs for the year, less
- any net PSPA for the year

\*The new contribution room for the year is equal to the lesser of 18% of earned income in the previous calendar year and the flat dollar overall limit for the current calendar year, reduced by PAs for the previous calendar year.

## 6. Continued

- (b) Explain the rationale behind the calculation of the Pension Adjustment for a single-employer defined benefit pension plan.

**Commentary on Question:**

*Candidates generally did well on this part of the question.*

- Ideally the value of the defined benefit earned should be calculated individually to reflect the level of benefits, the type of plans, the individual age, gender etc. However, this would be very difficult to do efficiently.
  - Therefore, for tax purposes, a single factor is defined to convert the defined benefit accrued during the year to a lump sum, to be comparable to a contribution made to a DPSP/DC plan.
  - In general PAs for defined benefit plans are calculated as nine times the benefit entitlement during the year, minus 600.
  - The factor of 9 was chosen to tie together the limits on the pension payable from a DB plan and the contribution limits to a DPSP/DC plan. Certain assumptions had to be made resulting in an overstated PA for a typical defined benefit plan:
    - individual retires at age 63 with an unreduced pension and 35 years of service
    - pension is indexed at 100% of CPI less 1%
    - form of pension is J&S 60%
- (c) Recommend changes to the DPC plan provisions that maximize the benefits payable from the DPC plan upon retirement.

**Commentary on Question:**

*Candidates would receive full points on this part of the question if they provide details of each plan design change that would maximize the plan's benefits.*

Possible changes to maximize benefits without affecting PAs:

- Early retirement subsidy: provide the maximum early retirement subsidy allowed under the Income Tax Act for a registered defined benefit pension plan: unreduced pension at the earliest of 30 years of service, age 60 or 80 points
- Post-retirement indexing: increase lifetime pension by 100% of CPI (i.e. remove the 1% cap)
- Index pensionable earnings
- Form of pension: improve the normal form to Joint and Survivor 66.66% with 5-year guarantee for members with spouse, and 15-year guarantee for single members
- Final Average Earnings formula: reduce the period over which the average earnings are calculated (for example, average earnings during 36 months instead of 60 months)

## 6. Continued

- Bridge: increase the bridge benefit to the maximum amount allowed by the Income Tax Act

## 7. Learning Objectives:

5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.
6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

### Learning Outcomes:

- (5a) The candidate will be able to describe and apply regulation pertaining to plan design.
- (6a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and the participants, and, for public pension plans, taxpayers.

### Sources:

Towers Watson – 5, 6, 7, 11, 14, 18, 19, PA guide, Morneau – 2, 8

### Commentary on Question:

*The question required candidates to compare and contrast the pre-retirement and post-retirement tax implications for the different retirement arrangements. Many candidates did not do this and instead only listed a few characteristics of those arrangements, and not necessarily tax-related.*

### Solution:

Company DEF wants to provide a retirement savings arrangement for its employees in Canada. Company DEF is considering one of the following arrangements:

- (i) Defined Benefit (DB) registered pension plan;
- (ii) Group Registered Retirement Savings Plan (RRSP);
- (iii) Group Tax-Free Savings Account (TFSA); or
- (iv) Deferred Profit Sharing Plan (DPSP).

Compare and contrast the pre-retirement and post-retirement tax implications of the above arrangements for the employees.

#### DB Plan

- Member will not be taxed until receive pension payments from the plan
- Age 71 limit for benefit accruals and pension commencements
- A Pension Adjustment (PA) is calculated each year for benefit accruals and reduces the member's RRSP room in the following year
- $PA = 9 \times \text{Benefit entitlement} - 600$
- Could add ancillary benefits down the road without impacting the PA
- Employee contributions for current service are tax deductible up to the limit
- Employee contribution limit is lesser of 9% of pay and \$1,000 + 70% of the PA

## 7. Continued

- To restore RRSP contribution room, Pension Adjustment Reversal (PAR) is issued if the member receives a lump sum instead of a monthly pension and the lump sum is lower than the sum of historical PA's
- Lump sum payments to members are tax sheltered up to a maximum based on Income Tax Act (ITA) rules

### Group RRSP

- Employer contributions are taxable are tax-deductible
- Employee contributions are tax-deductible
- Investment income is not taxed
- Member will not be taxed until RRSP money is withdrawn
- Contribution limit is  $A + B + C + D$ , where
  - A = Unused contribution room at end of previous year
  - B = (lesser of 18% of previous year earnings and ITA dollar limit) minus PA for preceding year
  - C = PAR for the year
  - D = Net PSPA for the year
- Money can be transferred to another RRSP or RRIF
- Early withdrawals are allowed and taxed as income (not taxed for home purchase or education)
- RRSP contributions not permitted after age 71 at which time RRSP assets must be converted to RRIF or annuity, or taken in cash

### TFSA

- Employee contributions are not tax-deductible
- Investment earnings will remain tax sheltered
- Withdrawals are tax-free
- Withdrawals not counted as income for GIS and OAS clawback tax
- TFSA contribution limit applies each year and unused contribution room can be carried forward without age limit
- Withdrawal of contributions/investment earnings frees up contribution room for future years

### DPSP

- Employee contributions are not allowed
- Employer contributions and investment income are not taxable to the member until money is withdrawn
- Early withdrawals are allowed and taxed as income
- Money can be transferred to an RRSP or RRIF
- A PA is calculated each year and reduces the member's RRSP room in the following year

## 8. Learning Objectives:

5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.

### Learning Outcomes:

- (5c) The candidate will be able to describe and apply regulation pertaining to plan amendment.
- (5i) The candidate will be able to describe and apply regulation pertaining to contributions and benefits.

### Sources:

Funding and Actuarial Filing Requirements for Plan Improvements under the New Funding Regime

### Commentary on Question:

*A well-prepared candidate will be able to calculate the minimum required funding contributions, as well as the incremental contributions resulting from the benefit improvement. They will also be able to correctly determine the PSPA resulting from the benefit improvement.*

### Solution:

- (a) Calculate the minimum required contributions for 2019.

Show all work.

### Commentary on Question:

*Most candidates had no problem correctly determining the minimum required contributions.*

Going concern special payments: none, since plan has going concern surplus.

Solvency special payments:

Reduced solvency deficiency (excess) =  $85\% \times \text{solvency liabilities} - \text{solvency assets}$   
 $= 85\% \times 1,348,173 - 1,236,947 = (\$91,000)$

Plan has reduced solvency excess so no solvency special payments required

Normal cost, including PfAD required to be contributed = \$45,618

- (b) You are preparing a cost certificate in respect of the amendment.

Calculate the incremental 2019 contributions to be disclosed in the cost certificate resulting from the benefit improvement.

Show all work

## 8. Continued

### Commentary on Question:

*Candidates performed reasonably well in this section, especially when determining the incremental normal cost contributions. However, many candidates did have difficulty determining the correct incremental going concern special payments resulting from the plan improvement.*

Going concern and solvency ratios remain above 80% after benefit improvement, so no one-time lump sum contributions required.

Going concern excess at January 1, 2019 before plan improvement: \$48,057  
Incremental increase in GC liability (without Pfad): \$73,000  
Going concern excess can be applied to reduce the incremental increase in GC liability since there were no GC or solvency special payments required at the last valuation

$$\text{Amount to amortize: } \$73,000 - \$48,057 = \$24,943$$

$$\text{Annual GC special payment (8 year): } \$24,943 \text{ amortized using } \ddot{a}_8^{(12)} = 24,943 / 6.55 = \$3,808$$

Solvency ratio after benefit improvement:

$$\begin{aligned} & \text{MV of assets} / (\text{solvency liability} + \text{incremental solvency liability}) \\ & = 1,236,947 / (1,348,173 + 86,000) \\ & = 86.2\% \end{aligned}$$

Since solvency ratio is greater than 85%, there is no reduced solvency deficiency. Therefore, no solvency special payments required

Normal cost

$$\text{PfAD} = 1 + 2,913/38,335 = 1.076$$

$$\begin{aligned} & \text{Incremental normal cost subject to PfAD} * (1 + \text{PfAD}) + \text{incremental} \\ & \text{normal cost not subject to PfAD} \\ & = \$3,800 * (1.076) + \$500 \\ & = \$4,589 \end{aligned}$$

2019 Minimum incremental contributions required as a result of benefit improvement, as filed in cost certificate:

$$\text{Normal cost} = \$4,589$$

$$\text{Going concern special payments} = \$3,808$$

$$\text{Solvency special payments} = \$0$$

$$\text{Total} = \$8,397$$

- (c) Calculate the Past Service Pension Adjustment for the sample member resulting from the plan amendment.

Show all work

## 8. Continued

### Commentary on Question:

*Candidates performed very well in the section, correctly determining the PSPA.*

Calculate the Pension Adjustments (PAs) for 2016, 2017 and 2018 before and after the plan improvements.

Year	Pensionable Earnings	B. Pension Adjustment before Plan amendment	A. Pension Adjustment after Plan amendment	Difference
2016	\$65,000	$1.5\% * 65,000 * 9 - 600 = \$8,175$	$1.65\% * 65,000 * 9 - 600 = \$9,053$	
2017	\$72,000	$1.5\% * 72,000 * 9 - 600 = \$9,120$	$1.65\% * 72,000 * 9 - 600 = \$10,092$	
2018	\$85,000	$1.5\% * 85,000 * 9 - 600 = \$10,875$	$1.65\% * 85,000 * 9 - 600 = \$12,023$	
<b>Total</b>		<b>\$28,170</b>	<b>\$31,168</b>	<b>\$2,998</b>

$$\text{PSPA} = \$31,168 - \$28,170 - \$0 + \$0 = \$2,998$$

**9. Learning Objectives:**

2. The candidate will understand how to analyze/synthesize the factors that go into selection of actuarial assumptions for funding purposes.

**Learning Outcomes:**

- (2b) Evaluate and recommend appropriate assumptions for funding purposes.

**Sources:**

Selection of Mortality Assumptions for Pension Plan Actuarial Valuations

Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates between December 31, 2017, and December 30, 2018

FR-128-19: Educational Note Supplement: Guidance for Assumptions for Hypothetical Wind-Up and Solvency Valuations Update – Effective June 30, 2018, and Applicable to Valuations with Effective Dates Between June 30, 2018, and December 30, 2018

**Commentary on Question:**

*This question tested the candidates' understanding of setting mortality assumptions for pension plans actuarial valuations. Additional commentary for each part of the question is provided.*

**Solution:**

- (a) Describe the three elements that are typically determined in order to set a best estimate assumption of future mortality improvement rates.

**Commentary on Question:**

*In general, part (a) was answered well.*

1. A short-term rate based on recently observed improvement rates;
  2. An ultimate long-term improvement rate, which is highly uncertain; and
  3. A transition from the short-term to the ultimate improvement rates over a certain period and based on a particular pattern.
- (b) Recommend an approach for determining the best estimate post-retirement mortality assumption for the going concern valuation for each plan.

Justify your answer.

## 9. Continued

### **Commentary on Question:**

*Many candidates listed general considerations when setting the best estimate post-retirement assumption for a going concern valuation of a pension plan – however, the question was asking to recommend an approach for each specific plan. Some candidates incorrectly recommended to create a mortality table from scratch based on experience data for Plan A while 50,000 retirees is not sufficient to have credible mortality experience for a fully plan-specific mortality table.*

### **Plan A**

- Use an experience study to customize a public mortality table to plan experience by using a percentage adjustment to standard mortality rates.
- The number of retirees (50,000) means that the data is likely fully credible to support this approach.
- Experience studies should be conducted every 3 to 5 years
- The white collar nature of the plan members would indicate lower mortality rates than a typical plan.

### **Plan B**

- Use an appropriate published mortality table because the number of retirees is insufficient for a credible experience study
- Examine the gain/loss related to pensioner mortality arising from past actuarial valuations to draw inferences on the validity of the assumption and to identify any strong trends
- It may be appropriate to consider using experience from other similar plans to adjust the base table.
- It may be appropriate to adjust for the blue collar status.

- (c) Describe considerations in setting the mortality assumption for the purpose of determining the liabilities assumed to be settled through the purchase of annuities for the hypothetical wind-up valuation for each plan.

### **Commentary on Question:**

*In general, part (c) was not answered well. Many candidates did not describe any specific considerations for the plans.*

### **Plan A**

- Demographic and occupational factors: This plan covers banking, or “white collar”, employees who likely live longer than the average pension plan. This should be reflected in the mortality assumption – potentially as a broad adjustment to the standard mortality table.

## 9. Continued

- Credible experience: The salaried plan has 50,000 retirees and likely has credible experience to determine a mortality assumption
- Experience of similar pension plans: If experience is available for other similar pension plans, the experience of these plans could be used to adjust the mortality basis.

### Plan B

- Demographic and occupational factors: This plan covers mining, or “blue collar”, employees who likely have shorter life expectancies than the average pension plan. This should be reflected in the mortality assumption – potentially as a broad adjustment to the standard mortality table.
- Credible experience: The hourly plan has only 500 retirees and therefore unlikely has credible experience to use to adjust the mortality assumption.
- Experience of similar pension plans: If experience is available for other mining sector pension plans is available, the experience of these plans could be used to adjust the basis.

- (d) Calculate the discount rate in accordance with the Guidance for the purpose of determining the liabilities assumed to be settled through the purchase of annuities for the hypothetical wind-up valuation as at December 31, 2018 for each plan.

Show all work.

### Commentary on Question:

*In general, part (d) was answered well. Some candidates incorrectly used Plan A's non-indexed proxy discount rate for Plan B instead of determining Plan B's non-indexed proxy discount rate based on its duration.*

### Plan A

Interpolate to determine the applicable spread:

$$\{(9.3 - 8.5) * (1.10\%) + (11.0 - 9.3) * (1.00\%)\} / (11.0 - 8.5) = 1.03\%$$

Combine the information to provide the final answer:

$$\text{CANSIM V39062} + \text{spread: } 2.13\% + 1.03\% = 3.16\%$$

### Plan B

The non-indexed proxy discount rate for this group is 3.23% (2.13% + 1.10%) and the indexed proxy for this group is 0.08% (0.78% - 0.70%).

The non-indexed proxy spread is 1.10% since 12.1 lies between the medium and high durations and the spread for both medium and high duration blocks is 1.10%.

## 9. Continued

CANSIM V39062 + spread:  $2.13\% + 1.10\% = 3.23\%$

CANSIM V39057 + spread:  $0.78\% - 0.70\% = 0.08\%$

$60\% * (0.08\%) + (1 - 60\%) * (3.23\%) = 1.34\%$ , which reflects indexation of 60% of CPI.

## 10. Learning Objectives:

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.

### Learning Outcomes:

- (3b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using a variety of cost methods.

### Sources:

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006

### Commentary on Question:

*A well-prepared candidate will be able to calculate unfunded liability and normal cost using the Unit Credit cost method. They will also be able to reconcile experience gains/losses. Additional commentary for each part of the question is provided.*

### Solution:

- (a) Calculate the unfunded actuarial liability as at December 31, 2018 and the 2019 normal cost.

Show all work.

### Commentary on Question:

*In general, part (a) was well answered in respect of determining the unfunded actuarial liability, other than some candidates using the wrong cost method. Many candidates calculated the normal cost incorrectly by applying a shortcut for flat benefit plans assuming a single retirement age assumption.*

$${}^{\text{UC}}\text{AL}_x = B_x \times [0.4 \times \ddot{a}_{62}^{(12)} \times v^{(62-x)} \times (1 - \text{Early ret reduction}_{62}) + 0.6 \times 0.4 \times \ddot{a}_{63}^{(12)} \times v^{(63-x)} \times (1 - \text{Early ret reduction}_{63}) + 0.6^2 \times 0.4 \times \ddot{a}_{64}^{(12)} \times v^{(64-x)} \times (1 - \text{Early ret reduction}_{64}) + 0.6^3 \times \ddot{a}_{65}^{(12)} \times v^{(65-x)}]$$

$${}^{\text{UC}}\text{NC}_x = \Delta B_x \times [0 \times \ddot{a}_{62}^{(12)} \times v^{(62-x)} \times (1 - \text{Early ret reduction}_{62}) + 0.6 \times 0.4 \times \ddot{a}_{63}^{(12)} \times v^{(63-x)} \times (1 - \text{Early ret reduction}_{63}) + 0.6^2 \times 0.4 \times \ddot{a}_{64}^{(12)} \times v^{(64-x)} \times (1 - \text{Early ret reduction}_{64}) + 0.6^3 \times \ddot{a}_{65}^{(12)} \times v^{(65-x)}]$$

$$\text{AL}_{2018} = 30,100 \times [0.4 \times 14.3 \times 1 \times 1 + 0.24 \times 14.0 / 1.05 \times 1 + 0.144 \times 13.7 / 1.05^2 \times 1 + 0.216 \times 13.4 / 1.05^3] = 397,611$$

$$\text{NC}_{2019} = 0.015 \times 90,000 \times 1.03 \times [0.4 \times 0 + 0.24 \times 14.0 / 1.05 \times 1 + 0.144 \times 13.7 / 1.05^2 \times 1 + 0.216 \times 13.4 / 1.05^3] = 10,414$$

$$\text{UAL}_{2018} = \text{AL}_{2018} - \text{F}_{2018} = 397,611 - 380,000 = 17,611 \text{ Plan is in a deficit.}$$

## 10. Continued

- (b) Calculate the unfunded actuarial liability as at December 31, 2019.

Show all work.

**Commentary on Question:**

*In general, candidates made the same mistakes in part (b) that they made in part (a). Some candidates incorrectly rolled forward the December 31, 2018 actuarial liability to December 31, 2019 instead of determining the correct actuarial liability at December 31, 2019. Most candidates determined the market value of assets at December 31, 2019 correctly.*

$$\begin{aligned}AL_{2019} &= (30,100 + 0.015 \times 90,000 \times 1.02) \times [0.4 \times 14.0 \times 1 \times 1 + 0.24 \times 13.7 / \\ &1.05 \times 1 + 0.2 \times 13.4 \times 1.05^2] = 412,567 \\ F_{2019} &= 380,000 \times 0.98 + 24,000 = 396,400 \\ UAL_{2019} &= 412,567 - 396,400 = 16,167 \text{ Plan is in a deficit.}\end{aligned}$$

- (c) Calculate the gains and losses by source for 2019.

Show all work.

**Commentary on Question:**

*Most candidates correctly determined the loss on fund return. Many candidates did not calculate all possible sources of gains and losses. Some candidates incorrectly calculated the expected actuarial liability at December 31, 2019 with salary or retirement assumption.*

$$\begin{aligned}\text{Expected UAL} &= 17,611 \times 1.05 = 18,492 \\ \text{Actual UAL} &= 16,167 \\ \text{Gains/(Losses)} &= 18,492 - 16,167 = 2,325 \text{ total gain}\end{aligned}$$

Gain on Contribution:

$$\text{Gain} = 24,000 - 10,414 \times 1.05 = 13,065$$

Loss on fund return:

$$\begin{aligned}\text{Expected } F_{2019} &= 380,000 \times 1.05 + 24,000 = 423,000 \\ \text{Actual } F_{2019} &= 396,400 \\ \text{Loss} &= 423,000 - 396,400 = 26,600\end{aligned}$$

Gain on salary increase:

$$\begin{aligned}\text{Expected } AL_{2019} \text{ with salary assumption} &= (30,100 + 0.015 \times 90,000 \times 1.03) \times [0.4 \\ &\times 14.0 \times 1 \times 1 + 0.24 \times 13.7 / 1.05 \times 1 + 0.2 \times 13.4 \times 1.05^2] = 412,744 \\ \text{Actual } AL_{2019} &= 412,567 \\ \text{Gain} &= 412,744 - 412,567 = 177\end{aligned}$$

## 10. Continued

Gain on retirement:

$$\text{Expected } AL_{2019} = (AL_{2018} + NC_{2018}) \times (1 + i) = (397,611 + 10,414) \times 1.05 = 428,427$$

$$AL_{2018} \text{ with salary assumption} = 405,249$$

$$\text{Gain} = 428,427 - 412,744 = 15,683$$

Check:

$$\text{Gains/(Losses)} = 13,065 - 26,600 + 177 + 15,683 = 2,325$$

## 11. Learning Objectives:

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.
5. The candidate will understand how to evaluate and apply regulatory policies and restrictions for registered retirement plans.

### Learning Outcomes:

- (3b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using a variety of cost methods.
- (3e) Perform valuations for special purposes, including:
  - (i) Plan termination/wind-up/conversion valuations
  - (ii) Hypothetical wind-up and solvency valuations
  - (iii) Open group valuations
  - (iv) Share risk pension plan valuations
- (5d) The candidate will be able to describe and apply regulation pertaining to plan termination/wind-up.
- (5g) The candidate will be able to describe and apply regulation pertaining to reporting requirements.
- (5h) The candidate will be able to describe and apply regulation pertaining to members' rights.

### Sources:

LO – 5

References: FR -114-17, FR – 115-17,

### Commentary on Question:

*The question was answered well by most candidates. However, many candidates did not explain why bridge benefits were not applicable in part b) and lost marks.*

### Solution:

- (a) Calculate the commuted value assuming the active member voluntarily terminates employment on January 1, 2019.

Show all work.

Member is not eligible for grow-in as termination was voluntarily.

Committed value based on deferred annuity payable at age 65 and member is not eligible for bridge benefits.

## 11. Continued

Final Average Earnings:  
 $(80,000 + 76,000 + 70,000) / 3 = \$75,333$

Accrued pension benefit:  
 $1.5\% \times \text{final average earnings} \times \text{service}$   
 $= 1.5\% \times 75,333 \times 9$   
 $= \$10,170$

Commutated value at age 65:  
 $= \text{Annual benefit} \times \text{early retirement reduction} \times \text{annuity factor}$   
 $= \$10,170 \times 1 \times 10.2$   
 $= \$103,734$

- (b) Calculate the funded position upon plan wind-up as at January 1, 2019.

Show all work.

Determining grow-in eligibility  
 $\text{age} + \text{service} > 55$   
 $= 49 + 9 = 58$   
Active member is eligible for grow-in

Member has less than 10 years of continuous service at wind-up date, hence is not eligible to grow-in to the bridge benefit

Final Average Earnings:  
 $(80,000 + 76,000 + 70,000) / 3 = \$75,333$

Accrued pension benefit:  
 $1.5\% \times \text{final average earnings} \times \text{service}$   
 $= 1.5\% \times 75,333 \times 9$   
 $= \$10,170$

Calculate CV at eligible retirement ages to determine best age

Age	Lifetime Factor	ER factor	Commutated value
55	17.6	0.50	89,496
56	16.7	0.55	93,411
57	15.9	0.60	97,022
58	15	0.65	99,158
59	14.3	0.70	101,802
60	13.5	0.75	102,971
61	12.8	0.80	104,141
<b>62</b>	<b>12.1</b>	<b>1.00</b>	<b>123,057</b>

Best age = 62 years

## 11. Continued

Commuted value at best age = 123,057

Wind-up funded position = Assets – wind-up expenses – wind-up liabilities

Wind-up liabilities = 200,000 + 123,057 = \$323,057

Wind-up funded position = 300,000 – 60,000 – 323,057 = -\$83,057 (deficit)

- (c) Describe the requirements for funding any wind-up deficit and the potential restrictions on the payment of benefits to plan members.

No calculations are required.

- If the plan has a wind-up deficit, the sponsor must pay the amount of deficit into the pension fund
- At a minimum the deficit must be funded over a maximum period of five years starting on the effective date of the wind-up
- The deficit can also be funded through a lump sum payment
- The administrator is required to file a report annually until the deficit is fully funded
- The report should provide a gain and loss analysis since the last filed report and specify special payments that are required to liquidate the remaining unfunded liabilities
- While the deficit remains unfunded, there are restrictions on payments that may be made out of the pension fund
- Payments to existing pensioners (commencing pension before the wind-up date) and new pensioners can still be paid with regulatory approval.
- Commuted values can only be paid to the extent that they are funded in the plan

## 12. Learning Objectives:

7. The candidate will understand how to apply the standards of practice and professional conduct guidelines.

### Learning Outcomes:

- (7a) Apply the standards related to communications to plan sponsors and others with an interest in an actuary's results (i.e., participants, auditors, etc.).
- (7b) Explain and apply the Professional Conduct Guidelines.
- (7d) Demonstrate compliance with requirements regarding the actuary's responsibilities to the participants, plans sponsors, etc.
- (7f) Recognize situations and actions that violate or compromise Standards or Professional Conduct Guidelines.
- (7g) Recommend a course of action to repair a violation of the Standards or Professional Conduct Guidelines.

### Sources:

CIA Consolidated Standards of Practice - Pension Plans 3100-3500

CIA Rules of Professional Conduct

SOA Code of Professional Conduct

CIA Guidance Document: General Advice on the Application of Rule 13

### Commentary on Question:

*Candidates were encouraged to provide answers that moved beyond simply writing down lists and to provide answers in the context of the information provided in the question. Full marks were provided for answers that noted specific instances of derivation between the email and relevant professional standards.*

### Solution:

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

## 12. Continued

### **Commentary on Question:**

*Successful candidates were able to correctly identify the many issues in the email communication. Some candidates provided detailed explanations of the CIA and SOA professional conduct rules/codes, but were not awarded any points for doing so.*

- The communication should include any standard reporting language applicable to the work.
- The communication includes mention of purpose for the work and 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 is missing a description of the audience for which the figures are prepared.
- 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
  - 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.”

## 12. Continued

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

**Commentary on Question:**

*Successful candidates were able to determine that CIA Rule of Professional Conduct standards Rule 13 may apply to this particular instance of non-compliance with professional standards, and provide sufficient detail for a potential remediation plan. Points were also awarded for a recommended course of action that is different than the answer below, yet is reasonable and adheres to professional standards.*

- Due to the actuary’s adjustment of assumptions used in the analysis to “produce a lower cost to gain the approval of your company’s senior executives”, in addition to the significant missing information, it may be appropriate to follow the CIA Rule of Professional Conduct standards (Rule 13)
- 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 member 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 member 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 member 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