

RET FRC Model Solutions

Spring 2023

1. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Chapters in the WTW book, PA guide

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.

Member A

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

1. Continued

Uncapped Bridge Pension at Retirement

$$\begin{aligned} &= \$2,000 * 12 * (1 - 6\% * (65 - 56)) \\ &= \$11,040.00 \end{aligned}$$

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

$$\begin{aligned} &= \min (\$3,420, 2\% * \$313,766.33) * 9 * (1 - 3\% * (60 - 56)) \\ &= \$3,420 * 9 * (1 - 3\% * 4) \\ &= \$27,086.40 \end{aligned}$$

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

$$\begin{aligned} &= 12 * (\$1,253.59 + \$642.25) * \min (1, 9 / 10) * (1 - 3\% * (60 - 56)) \\ &= \$18,018.06 \end{aligned}$$

Combined maximum lifetime and bridge benefit = ITA dollar limit in the year of commencement * plan service + 25% * AYMPE * min (1, plan service /35)

$$\begin{aligned} \text{AYMPE} &= \text{three year average of YMPE} \\ &= \text{Average } (\$64900, \$61600, \$58700) \\ &= \$61,733.33 \end{aligned}$$

Combined Maximum limit

$$\begin{aligned} &= \$3,420 * 9 + 25\% * \$61,733.33 * \min(1, 9/35) \\ &= \$34,748.57 \end{aligned}$$

Lifetime Pension Payable

$$\begin{aligned} &= \min (\text{Uncapped Lifetime Pension, Maximum lifetime benefit}) \\ &= \min (\$33,022.62, \$27,086.40) \\ &= \mathbf{\$27,086.40} \end{aligned}$$

Bridge Pension Payable

$$\begin{aligned} &= \min (\text{uncapped Bridge Pension, Maximum bridge benefit, Combined Maximum Limit} - \text{maximum lifetime pension payable}) \\ &= \min (\$11,040, \$18,018.06, \$34,748.57 - \$27,086.40) \\ &= \min (\$11,040, \$18,018.06, \$7,662.17) \\ &= \mathbf{\$7,662.17} \end{aligned}$$

1. Continued

Member B

Best Average Earnings

= maximum of the average of three consecutive years earnings in the past five years

$$= \text{MAX} (98052, 96129.33, 94244.67)$$

$$= \$98,052.00$$

Uncapped Lifetime Pension

= 2% of Best Average Earnings * plan service * max (Plan ERF, ITA ERF)

$$= 2\% \times \$98,052 \times 31 \times \text{max} (1,1)$$

$$= \$60,792.24$$

Uncapped Bridge Pension at Retirement

$$= \$2,000 \times 12$$

$$= \$24,000$$

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

$$= \text{min} (\$3,420, 2\% \times \$98,052) \times 31 \times 1$$

$$= \$1,961.04 \times 31 \times 1$$

$$= \$60,792.24$$

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

$$= 12 \times (\$1,253.59 + \$642.25) \times \text{min} (1, 31 /10) \times (1 - 3\% \times (60 - 59))$$

$$= \$22,750.08 \times 1 \times 0.97$$

$$= \$22,067.58$$

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

$$= \text{Average} (\$64900, \$61600, \$58700)$$

$$= \$61,733.33$$

Combined Maximum limit

$$= \$3,420 \times 31 + 25\% \times \$61,733.33 \times \text{min}(1, 31/35)$$

$$= \$119,689.52$$

Lifetime Pension Payable

= min (Uncapped Lifetime Pension, Maximum lifetime benefit)

$$= \text{min} (\$60,792.24, \$60,792.24)$$

$$= \mathbf{\$60,792.24}$$

1. Continued

Bridge Pension Payable

$$\begin{aligned} &= \min (\text{uncapped Bridge Pension, Maximum bridge benefit, Combined Maximum Limit} - \text{maximum lifetime pension payable}) \\ &= \min (\$24,000, \$22,067.58, \$119,689.52 - \$60,792.24) \\ &= \min (\$24,000, \$22,067.58, \$58,897.28) \\ &= \mathbf{\$22,067.58} \end{aligned}$$

- (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

$$\begin{aligned} \text{2022 DB accrual} &= \min (2\% \times 1.0000 \times \$300,000, \$3,420 \times 1.0000) = \$3,420 \\ \text{PA formula} &= (9 \times \text{2022 DB accrual}) - 600 = 9 \times 3,420 - 600 = \$30,180.00 \end{aligned}$$

Member B

$$\begin{aligned} \text{2022 DB accrual} &= \min (2\% \times 0.75 \times \$100,000, \$3,420 \times 0.75) = \$1,500 \\ \text{PA formula} &= (9 \times \text{2022 DB accrual}) - 600 = 9 \times 1,500 - 600 = \$12,900 \end{aligned}$$

- (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

$$\text{Plan Employee Contributions} = 7.5\% \times \$300,000 = \$22,500$$

ITA Max formula

$$\begin{aligned} &= \min (9\% \text{ of 2022 earnings, } \$1000 + 70\% \text{ of PA credit}) \\ &= \min (9\% \times \$300,000, \$1000 + 70\% \times 30,180 [(2022 \text{ PA for member A from (b)})]) \\ &= \min (\$27,000, \$22,126) = \$22,126 \end{aligned}$$

$$\mathbf{\text{Maximum allowable employee contributions} = \$22,126}$$

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:

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

(2c) Evaluate actual experience, including comparisons to assumptions.

Sources:

ASOP 25: Credibility Procedures

ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Assess the appropriateness of the current retirement and termination assumptions.

Commentary on Question:

Candidates generally did well on this part of the question.

However, some candidates described the current retirement and termination assumptions or suggested changes to these assumptions instead of assessing the appropriateness of the current assumptions. The focus should have been on assessing the current assumptions using the experience that was provided.

Some incorrectly mentioned that the assumptions were appropriate, while the retirement and termination gains given were quite important relative to the unfunded going concern liability.

Some incorrectly mentioned that there were losses instead of gains, but points were awarded if the explanations were consistent with that answer.

Retirement:

- Current retirement assumption assumes 100% retirement at age 62, and members will not take advantage of early retirement subsidies.
- Assuming 100% retirement at age 62 does not take into consideration of the plan design, given the plan provides generous early retirement subsidies from 62 rather than from normal retirement date.
- However, plan experience reveals consistent retirement gains over the last three years.

2. Continued

- Seems that retirement-eligible retirees are leaving later than anticipated.
- This suggests that the current retirement assumption may no longer be appropriate.
- The current assumption may not consider other factors such as the availability of other employer-sponsored post-retirement benefit programs available and the design of, and date of anticipated payment from, social insurance programs.

Termination:

- Current termination assumption with no terminations prior to retirement assumes all members will reach retirement eligibility since the DB plan is a differentiator for the company.
- However, plan experience reveals consistent termination gains over the past few years or systematic gains year over year.
- Gains have accelerated over last 2 years, which aligns with observation of termination patterns.
- This suggests that assuming no pre-retirement termination is not reasonable and not appropriate based on experience.
- Furthermore, termination gains show an increasing pattern indicating a termination assumption should be considered and is consistent with the fact that the firm is in an industry where turnover is common.

- (b) Describe the considerations for changing the retirement and termination assumptions for the January 1, 2023 valuation.

Commentary on Question:

Most candidates did not write enough to get full marks on this 5-point question. Very few candidates got full marks.

Some candidates listed some considerations instead of fully describing them and others described the considerations for setting assumptions in general instead of describing considerations for changing the current retirement and termination assumptions.

To get full marks, candidates were not required to describe all of the following, but most of them.

The actuary should consider:

- **Materiality** – The actuary should take into account the balance between refined demographic assumptions and materiality (the actuary should use professional judgement if the use of more refined assumptions is not expected to produce materially different results).

2. Continued

- **Cost of using refined assumptions** – The actuary should take into account the balance between refined demographic assumptions and the cost of using refined demographic assumptions.
- **Combined effect of assumptions** – The combined effect of all non-prescribed assumptions selected by the actuary (both demographic assumptions selected in accordance with this standard and economic assumptions selected in accordance with ASOP No. 27) should be reasonable. For example, the actuary may have decided not to make any assumption with regard to four different types of future events, each of which alone is immaterial. However, the effect of omitting assumptions for all four types of future events may be a material understatement or overstatement of the measurement results.
- **Changes in circumstance** – The demographic assumptions selected should reflect the actuary’s knowledge as of the measurement date. However, the actuary may learn of an event occurring after the measurement date, that would have changed the actuary’s selection of a demographic assumption. If appropriate, the actuary may reflect this change as a subsequent event as of the measurement date.
- **Views of experts** – Demographic data and analyses are available from a variety of sources, including representatives of the plan sponsor and administrator, demographers, economists, and other professionals. When the actuary is responsible for selecting or giving advice on selecting demographic assumptions within the scope of this standard, the actuary may incorporate the views of experts, but the selection or advice should reflect the actuary’s professional judgment.
- **Credibility** – The actuary must consider the credibility of the experience. Given it is a small firm, experience may not be fully credible.
- For both termination and retirement assumptions, should consider:
 - if **firm’s business environment** is changing that is leading to more rapid changes in withdrawal patterns compared to the past, and within industry
 - **employer-specific or job-related factors** such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment
- Specifically for termination, should also consider:
 - **plan provisions**, such as early retirement benefits, vesting schedule, or payout options.
- Specifically for retirement, should also consider:
 - **the plan design**, where specific incentives may influence when participants retire;
 - the design of, and anticipated payment from, **social insurance programs**; and
 - the availability of other employer-sponsored **postretirement benefit programs** (for example, postretirement health coverage or savings plan).

3. Learning Objectives:

3. The candidate will understand how to apply/synthesize the methods used to value pension benefits for various purposes.
6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

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) Shared risk pension plan valuations
- (6b) 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 (excluding pp., 176-183)

Pension Mathematics for Actuaries, Anderson, Arthur W., 3rd Edition, 2006 Ch. 1-4 and 7

Calculation of Incremental Cost on a Hypothetical Wind-Up or Solvency Basis, CIA Educational Note, Dec 2010

FR-115-21: Ontario Pension Benefits Act, R.S.O. 1990, Ch. P.8

FR-123-19: Pension Benefits Act–Ontario Regulation 310/13

Commentary on Question:

Candidates were asked to perform full going concern and solvency valuations including determination of gains and losses, solvency incremental cost and minimum 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.

3. Continued

Solution:

- (a) Calculate the minimum required and maximum permissible employer contributions for 2022.

Commentary on Question:

Most candidates were able to correctly calculate the minimum and maximum contributions. Minor deduction if candidates did not realize the question provided beginning of year normal cost.

Minimum required contributions for 2022	73,920
Maximum permissible contributions for 2022	73,920

MVA	2,700,000	MVA	2,700,000
GC liability	1,898,000	Term expense	(100,000)
PfAD	189,800	Solv liability	2,586,000
GC funding target	2,087,800	Solvency excess	14,000
Funding excess	612,200	Transfer ratio	104%
GC ratio	129%		

While the plan has a GC ratio over 125%, the transfer ratio is under 105%, so no contribution holiday is permitted. Minimum and maximum contributions are both normal cost plus PfAD.

$$\begin{aligned}
 &\text{Min and max contributions} \\
 &= \text{NC}(\text{BOY}) \cdot (1+i) \cdot (1+\text{PfAD}) \\
 &= (13,000 + 22,000 + 29,000) \cdot (1+0.05) \cdot (1+0.1) \\
 &= 73,920
 \end{aligned}$$

- (b) Calculate the total normal cost, going concern liability, and the unfunded actuarial liability as at January 1, 2023.

Commentary on Question:

Candidates generally performed well on this part of the question. Most candidates were able to calculate the liabilities for the deferred and pensioners correctly but fewer candidates correctly calculated the liabilities for active members. Some common mistakes were miscalculating final average earnings, using the wrong early retirement reductions, or wrong factors.

3. Continued

Going concern funding target		
Going concern liabilities:		
Active members		992,862
Deferred pensioners		113,425
Pensioners		1,505,252
Subtotal		2,611,539
PfAD		182,808
Total		2,794,346
	Without PfAD	With PfAD
Funding excess (shortfall)	-11,539	-194,346
Normal cost	59,535	63,702

Active members (DR=3.5%):

Member 1														
x	Svc(x)	y	r	Svc(y)	v ^(r-x)	qy	(y-x)px	F AE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
40	11	45	65	16	0.4231	0.10	1.00	97,281	28,017	0.6875	19,262	15.3	12,470	1,134
40	11	55	65	26	0.4231	0.05	0.90	130,738	61,185	0.4231	25,886	15.3	7,542	686
40	11	60	60	31	0.5026	1.00	0.86	151,561	84,571	0.3548	30,009	17.2	221,789	20,163
													241,800	21,982
Member 2														
x	Svc(x)	y	r	Svc(y)	v ^(r-x)	qy	(y-x)px	F AE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
43	20	45	65	22	0.4692	0.10	1.00	147,167	58,278	0.9091	52,980	15.3	38,029	1,901
43	20	55	65	32	0.4692	0.05	0.90	201,646	116,148	0.6250	72,593	15.3	23,448	1,172
43	20	60	60	37	0.5572	1.00	0.86	233,763	155,686	0.5405	84,155	17.2	689,584	34,479
													751,061	37,553

$$FAE(y) = \text{Salary Current Year} * [1.03^{(y-x-1)} + 1.03^{(y-x-2)} + 1.03^{(y-x-3)}] / 3$$

$$f(x) = Svc(x) / Svc(y)$$

$$B(x) = B(y) * f(x)$$

$$AL(x) = v^{(r-x)} * qy * (y-x)px * B(x) * annuity(r)$$

$$NC(x) = AL(x) / Svc(x)$$

$$PfAD = 7\%$$

Inactive members (DR=3.5%):

	Status	x	r	benefit	v ^(r-x)	annuity	AL(x)
Member 4	Deferred	51	65	12,000	0.6178	15.3	113,425
Member 3	Retired	55	55	32,589	1.0000	18.9	615,932
Member 5	Retired	61	61	22,800	1.0000	16.9	385,320
Member 6	Retired	76	76	48,000	1.0000	10.5	504,000
							1,505,252

3. Continued

Member 3 benefit = $1.8\% * 18 * (122,000 + 118,000 + 115,000) / 3 * [1 - 3\% * (60 - 55)]$

Member 5 benefit = $2,500 * 12 * [1 - 6\% * (65 - 61)]$

- (c) Calculate the gains and losses on a going concern basis by source for 2022, excluding PfAD.

Commentary on Question:

Candidates generally did not complete or performed poorly on this part of the question.

Funding excess (shortfall) at January 1, 2022, excluding PfAD	802,000
Sources	
Interest on funding excess (shortfall) before PfAD	40,100
PfAD contributions with interest	6,720
Investment return	-259,720
Salary	-26,605
Retirement	29,613
Mortality	-11,700
Miscellaneous	-203
Impact of changes in assumptions	-591,744
Funding excess (shortfall) at January 1, 2023, excluding PfAD	-11,539

Active members (DR=5%):

Member 1														
x	Svc(x)	y	r	Svc(y)	$v^y(r-x)$	qy	$(y-x)px$	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
40	11	45	65	16	0.2953	0.10	1.00	97,281	28,017	0.6875	19,262	13.2	7,508	683
40	11	55	65	26	0.2953	0.05	0.90	130,738	61,185	0.4231	25,886	13.2	4,541	413
40	11	60	60	31	0.3769	1.00	0.86	151,561	84,571	0.3548	30,009	14.5	140,217	12,747
													152,266	13,842
Member 2														
x	Svc(x)	y	r	Svc(y)	$v^y(r-x)$	qy	$(y-x)px$	FAE(y)	B(y)	f(x)	B(x)	annuity(r)	AL(x)	NC(x)
43	20	45	65	22	0.3418	0.10	1.00	147,167	58,278	0.9091	52,980	13.2	23,907	1,195
43	20	55	65	32	0.3418	0.05	0.90	201,646	116,148	0.6250	72,593	13.2	14,741	737
43	20	60	60	37	0.4363	1.00	0.86	233,763	155,686	0.5405	84,155	14.5	455,192	22,760
													493,839	24,692

3. Continued

Inactive members (DR=5%):

	Status	x	r	benefit	$v^{(r-x)}$	annuity	AL(x)
Member 4	Deferred	51	65	12,000	0.5051	13.2	80,003
Member 3	Retired	55	55	32,589	1.0000	15.7	511,647
Member 5	Retired	61	61	22,800	1.0000	14.3	326,040
Member 6	Retired	76	76	48,000	1.0000	9.5	456,000
							1,293,687

At DR=5%

G/L by individual	Expected	Actual	(G)/L	
Member 1	154,350	152,266	(2,084)	salary
Member 2	465,150	493,839	28,689	salary
Member 3	541,800	511,647	(30,153)	retirement
Member 4	79,800	80,003	203	miscellaneous
Member 5	325,500	326,040	540	retirement
Member 6	444,300	456,000	11,700	mortality
Total	2,010,900	2,019,795	8,895	

	Liabilities	Assets	Gain / (Loss)
1/1/2022	1,898,000	2,700,000	802,000
NC	67,200	73,920	6,720
BP	(48,000)	(48,000)	-
Interest	93,700	133,800	40,100
Salary	26,605		(26,605)
Mortality	11,700		(11,700)
Retirement	(29,613)		29,613
Assumption	591,744		(591,744)
Return		(259,720)	(259,720)
Misc	203		(203)
1/1/2023	2,611,539	2,600,000	(11,539)

- (d) Calculate the solvency funded position as at January 1, 2023.

Commentary on Question:

Candidates generally performed well on this part of the question. Most deductions were on the active liabilities where there was incorrect application of grow-in.

3. Continued

Net assets	2,500,000
Present value of accrued benefits for:	
Active members	873,464
Deferred pensioners	159,600
Pensioners	1,759,890
Total solvency liability	2,792,954
Solvency excess (shortfall)	-292,954

Active members (DR=2.3%):

If 55 points, eligible to grow into early retirement subsidies

Member 1 = 40 + 11 = 51 therefore not eligible for grow-in

Member 2 = 43 + 20 = 63 therefore eligible for grow-in

Member 1				Member 2			
Benefit	16,896			Benefit	47,880		
Points	51			Points	63		
Grow in?	FALSE			Grow in?	TRUE		
SVC?	TRUE			SVC?	TRUE		
EURD	65			EURD	60		
Age	ERF	Factor	CV	Age	ERF	Factor	CV
55	0.40	16.40	110,838	55	0.85	17.50	712,215
56	0.46	15.80	122,800	56	0.88	16.80	707,858
57	0.52	15.10	132,667	57	0.91	16.10	701,490
58	0.58	14.50	142,095	58	0.94	15.50	697,612
59	0.64	13.90	150,307	59	0.97	14.80	687,365
60	0.70	13.30	157,302	60	1.00	14.20	679,896
61	0.76	12.70	163,080	61	1.00	13.50	646,380
62	0.82	12.10	167,642	62	1.00	12.90	617,652
63	0.88	11.60	172,474	63	1.00	12.30	588,924
64	0.94	11.00	174,705	64	1.00	11.80	564,984
65	1.00	10.50	177,408	65	1.00	11.20	536,256
		Max CV	177,408			Max CV	712,215
		EURD CV	177,408			EURD CV	679,896
		Solv AL	177,408			Solv AL	696,056

3. Continued

Inactive members (DR=2.3%):

	Status	benefit	annuity	AL(x)
Member 4	Deferred	12,000	13.3	159,600
Member 3	Retired	32,589	22.7	739,770
Member 5	Retired	22,800	19.9	453,720
Member 6	Retired	48,000	11.8	566,400
				1,759,890

- (e) Calculate the 1-year solvency incremental cost for 2023.

Commentary on Question:

Many candidates knew how to calculate incremental cost, but some struggled to discount the projected liability or forgot to adjust for benefit payments.

Solvency incremental cost	145,235
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SIC

$$\begin{aligned}
 &= \text{PV Exp 2023 BP} + \text{PV Solv AL 2024} - \text{Solv AL 2023} \\
 &= 102,220 + 2,900,000/(1+0.023) - 2,792,954 \\
 &= 144,066
 \end{aligned}$$

$$\begin{aligned}
 &\text{PV Exp 2023 BP (assuming mid-year payments)} \\
 &= (\text{Member 3 BP} + \text{Member 5 BP} + \text{Member 6 BP})/(1+0.023)^{0.5} \\
 &= (32,589 + 22,800 + 48,000)/(1+0.023)^{0.5} \\
 &= 102,220
 \end{aligned}$$

- (f) Calculate the minimum required and maximum permissible employer contributions for 2023.

Commentary on Question:

This part of the question was answered well by most of the candidates. Some candidates failed to recognize special payments are deferred 1 year.

Minimum required contributions for 2023	63,702
Maximum permissible contributions for 2023	356,656

From previously
 GC deficit after PfAD = 194,396
 GC ratio = 93%
 NC with PfAD = 63,702

3. Continued

From part (c)
Solvency deficit = 292,954
Transfer ratio = 93%

No special payments in 2023 since transfer ratio over 85% and new GC SP are deferred 1 year

Minimum contribution
= NC with PfAD
= 63,702

Maximum contribution
= Max(GC deficit, solvency deficit) + NC with PfAD
= Max(194,396, 292,954) + 63,702
= 356,656

4. 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, sections 3100-3500

CIA Rules of Professional Conduct

SOA Code of Professional Conduct

Commentary on Question:

This question is intended to test areas related to Standards of Practice and Professional Conduct. In general, candidates seem to write too few for a question with 8 points. For Part (a), most candidates did not perform well. Candidates in general did not write enough to earn points for this part. For Part (b), in general, candidates performed quite well and were able to relate to Rule 13 and elaborate the situation.

Solution:

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

4. Continued

- 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.”

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

- 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.

4. Continued

- 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:
 1. The member in apparent noncompliance did not agree to a discussion;
 2. The discussion did not result in an agreement as to whether a noncompliance has taken place; or
 3. 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

5. 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 the accrued liability and normal cost using the Aggregate cost method, while properly reflecting multiple decrements and actual plan experience.

Solution:

- (a) Calculate the normal cost of the plan as at December 31, 2022.

Commentary on Question:

Candidates generally performed well on this part of the question, determining the normal cost (NC) using the Aggregate cost method, incorporating the multiple decrements. However, quite a few candidates did have some difficulty correctly determining the Present Value of Future Salaries (PVFS) and many candidates didn't use a salary consistent with the PVFS when determining the NC [in particular, the decrements (beginning of year) were often applied to the PVFS, but not the salary].

$$\text{Aggr NC} = (\sum \text{PVFB}_x - \text{AL}_t) / \sum \text{PVFS}_x \times \sum S_x$$

Member A

$$\begin{aligned} \text{PVFB} &= 5\% \times [1.5\% \times 80,000 \times 9 \times 12.5 \times v^{36}] + (95\% \times 50\%) \times \\ & [1.5\% \times 80,000 \times 1.035^{31} \times 40 \times 13.9 \times v^{31} \times (1-3\% \times 5)] + \\ & (95\% \times 50\%) \times [1.5\% \times 80,000 \times 1.035^{36} \times 45 \times 12.5 \times v^{36}] \\ &= 364,611 \end{aligned}$$

$$\begin{aligned} \text{PVFS} &= 5\% \times 0 + (95\% \times 50\%) \times 80,000 \times a^{\overline{s}_{31}|} + \\ & (95\% \times 50\%) \times 80,000 \times a^{\overline{s}_{36}|}, \text{ where } s = 1.035/1.05 \\ &= 2,032,597 \end{aligned}$$

$$S = 95\% \times 80,000 = 76,000$$

Member B

$$\begin{aligned} \text{PVFB} &= 50\% \times [1.5\% \times 120,000 \times 1.035^{10} \times 30 \times 13.9 \times v^{10} \times (1-3\% \times 5)] \\ & + 50\% \times [1.5\% \times 120,000 \times 1.035^{15} \times 35 \times 12.5 \times v^{15}] \\ &= 593,566 \end{aligned}$$

$$\begin{aligned} \text{PVFS} &= 50\% \times 120,000 \times a^{\overline{s}_{10}|} + 50\% \times 120,000 \times a^{\overline{s}_{15}|}, \\ & \text{where } s = 1.035/1.05 \\ &= 1,378,200 \end{aligned}$$

$$S = 120,000$$

5. Continued

<u>Plan</u>			
Aggr AL _t	=	F _t	
	=	\$400,000	
∑PVFB _x	=	364,611 + 593,566	
	=	958,177	
∑PVFS _x	=	2,032,597 + 1,378,200	
	=	3,410,797	
∑S _x	=	76,000 + 120,000	= 196,000
Aggr NC	=	(958,177 – 400,000) / 3,410,797 * 196,000	
	=	32,075	

- (b) Calculate the accrued liability and normal cost for the plan as at December 31, 2023.

Commentary on Question:

Candidates generally also performed reasonably well on this part of the question, determining the accrued liability and NC, while incorporating actual plan experience. However, some candidates had difficulty correctly determining Member B's retiree liability and a few candidates incorrectly excluded this liability when determining the plan's normal cost.

<u>Member A</u>		
PVFB	=	50% x [1.5% x 88,000 x 1.035 ³⁰ x 40 x 13.9 x v ³⁰ x (1-3% x 5)] + 50% x [1.5% x 88,000 x 1.035 ³⁵ x 45 x 12.5 x v ³⁵] +
	=	426,931
PVFS	=	50% x 88,000 x a ^s ₃₀ + 50% x 88,000 x a ^s ₃₅ , where s = 1.035/1.05
	=	2,298,371
S	=	88,000

<u>Member B</u>		
PVB	=	1.5% x 120,000 x 20 x 12.5 x v ¹⁴
	=	227,281
PVFS	=	0 (terminated)
S	=	0

<u>Plan</u>			
Aggr AL _t	=	F _t	= (400,000 + 50,000) x 1.15
	=	517,500	
∑PVFB _x	=	426,931 + 227,281	
	=	654,212	
∑PVFS _x	=	2,298,371	
∑S _x	=	88,000	
Aggr NC	=	(654,212 – 517,500) / 2,298,371 * 88,000	
	=	5,234	

6. Learning Objectives:

4. The candidate will understand the principles and rationale behind regulation.

Learning Outcomes:

- (4a) Describe the principles and motivations behind pension legislation and regulation.
- (4b) Describe sources and framework of government regulation.

Commentary on Question:

Candidates did poorly on this question. Most candidates were not aware of the OECD core principles, or were not able to connect them to the Pension Benefits Act. It seems that most candidates did not read the study note on OECD principles. For a 10-point questions, candidates were expected to spend more time on this question and provide more details.

Solution:

Describe how the Pension Benefits Act (Ontario) complies with Core Principle 5 from the OECD Core Principles of Private Pension Regulation with respect to the following:

- (i) Plan design;
- (ii) Member choice;
- (iii) Disclosure and availability of information; and
- (iv) Entitlement process and rights of redress.

Plan design

- Proper design of private pension plans should be promoted, especially when these schemes play a public role, through substitution of or substantial complementarity to public schemes, when they are mandatory, and when members face choices between plans or within the pension plan
- Overall benefit adequacy should be evaluated taking into account the various sources of retirement income (tax-and-transfer systems, advance-funded systems, private savings and earnings).
- Factors to be taken into consideration include member choice, degree of risk sharing, protection of the value of benefits, entitlements, accruals, contributions, coverage, and financial and market risks.

PBA complies with promoting an appropriate plan design by

- PBA requires a normal retirement date of no more than 65 years

6. Continued

- Protects member contributions through the 50% excess rule post 1986
- Entitles terminated members to receive an early retirement pension within 10 years of the normal retirement date
- Provides benefit protection through commuted value entitlements
- Joint and survivor pension: PBA requires pension payments for retired members with spouse to be a joint and survivor pension
- Ensure the joint and survivor pension is not less than 60%
- Ensures commuted value of J&S pension is not less than commuted value of normal form of pension for a retired member
- Entitles members/spouses to a payment for pre-retirement death benefits as commuted value
- Allows pension plans to allow variations in benefit payments for shortened life expectancy
- Allows unlocking of small pension benefits. Commuted value allowed if annual benefit < 4% of YMPE , or if commuted value < 20% of YMPE
- Prevents discrimination of contributions, benefits, commuted values, eligibility conditions and ancillary benefits on the basis of sex
- Provides limitation on benefit reductions due to government CPP/QPP offsets
- Requires contributions by employers and employees to be made in the prescribed manner and time
- Requires administrator of the pension plan/agent to ensure all contributions are paid when due
- Requires administrator to provide trustee a summary of contributions required to be made in respect of the pension plan in a timely manner
- Requires employee contributions to be held in a trust until employer pays the money into the pension fund
- Requires any due and unpaid employer contributions for beneficiaries of the plan to be held in a trust
- Protects member accruals/benefits through the PBGF

6. Continued

Member Choice

- Provide members the right to a sufficient number and diversity of investment choices to permit them to construct an appropriate investment portfolio that, as far as possible, reflects their individual circumstances and in the context of the particular pension program.
- Members should be provided with information regarding investment choices that is standardized, readily comparable and sufficient to permit them to make appropriate choices. At a minimum this information should include disclosure of all charges, fees and expenses associated with each investment choice, as well as information about the riskiness of each choice, portfolio composition and historical investment performance
- Provide members the right to timely and fair execution of their investment decisions and to written confirmation of these transactions. The right (or responsibility) to make and execute investment decisions should not be inhibited by the assessment of any unreasonable charges or fees
- Members and beneficiaries should be provided sufficient opportunity to acquire the financial skills or education and other assistance to help them make appropriate investment and retirement decisions in their pension plans. Appropriately designed default options should be established for members who do not make an active investment choice or benefit pay-out choice, where such choice is offered
- Where members direct their own investments in a private pension plan and can choose between different benefit pay-out options, they should be provided with relevant information that is standardized, readily comparable, and sufficient to permit them to make appropriate choices. At a minimum this information should include disclosure of all charges, fees and expenses associated with each choice, as well as information about the extent of protection offered by each product against longevity, inflation and market risks.

Disclosure and availability of information

- Appropriate disclosure and education should be promoted regarding benefits and members' rights and responsibilities, especially when individual choice is offered.
- Plan members and beneficiaries should be informed on the impact of plan participation and contributions on overall retirement income and the potential misuse of retirement benefits.

6. Continued

- In the case of pension plans with individual accounts, disclosure of the fee structure and level, investment options and their associated performance, and benefit modalities should be promoted.

PBA complies with this rule by requiring the administrator to:

- Provide eligible members explanation of provisions of the plan that apply to them
- Provide eligible members explanation of rights and obligations in respect of the pension plan
- Provide plan information to members in a timely fashion before the pension plan is established or before the date a pension is likely to become eligible to the pension plan
- Provide early disclosure of amendments to the pension plan that result in a reduction of pension benefits accruing subsequent to the amendment date, or amendments that adversely affect the rights/obligations of a member or former member.
- Provide disclosure of all amendments within a prescribed period of time after the amendment if registered
- Provide annual statements to each member of the pension plan containing the prescribed information about the pension plan, the member's pension benefits and any ancillary benefits
- Provide statement of benefits to each member who terminates employment with the employer or otherwise ceases to be a member, or to any other person who as a result becomes entitled to a payment under the pension plan, within the prescribed period, a written statement containing the prescribed information about the benefits, rights and obligations of the member or person
- Provide, on written request, prescribed records about the pension plan and the pension fund for inspection without charge by member, former member, retired member, spouse, any other person entitled to the pension benefits, etc
- Protect member data by not send a document in electronic form if the document contains personal information or any prescribed information, unless the administrator sends the document by way of a secure information system

6. Continued

Entitlement process and rights of redress

- Pension plan members should have access to appropriate complaints handling and redress mechanisms that are accessible, affordable, independent, fair, accountable, timely and efficient

PBA complies with this rule by requiring the administrator to respond to any claims or request for information by members in a fair and timely process

7. 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 25: Credibility Procedures

ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations

Commentary on Question:

Generally, candidates did not perform well on this question. Most candidates did not provide enough details to obtain full credit.

Solution:

Describe the considerations for determining the following actuarial assumptions for a going concern valuation as at December 31, 2022.

- (i) Inflation;
- (ii) YMPE and Income Tax Act Maximum Defined Benefit Pension increases;
and
- (iii) Salary Scale.

- (i) Inflation
A best estimate inflation rate assumption may consider the following:
 - Bank of Canada inflation target range
 - Inflation forecasts
 - Yields on inflation-indexed securities
 - Yields on various government securities used to derive the market implied rate of inflation (e.g., the spread between Government of Canada long-term nominal and real return bonds) – also called the Break-Even Inflation Rate

7. Continued

The actuary should review appropriate inflation data:

- the data used to develop inflation should include the consumer price indices, the implicit price deflator, forecasts of inflation, etc.
- not appropriate to base long term assumption exclusively on recent experience.

May consider choosing select and ultimate rate given uncertainty around economist consensus that inflation may either be transitory or that factors that drove recent inflation may be permanent.

- In this case, a 1-year select rate may be chosen given high levels of short-term inflation.
- It may be appropriate to select a 2% long-term ultimate rate given Break-Even Inflation Rate of 2% (2.86%-0.86%), Long-Term Economist Consensus Inflation Expectation of 2%, and Bank of Canada Target for Inflation midpoint.
- If economic consensus about long-term inflation changes, or if central bank authorities outline rationale for increased long-term inflation, based on structural/permanent changes to economy, it may be appropriate to increase long-term ultimate rate.

- (ii) YMPE and Income Tax Act Maximum Defined Benefit Pension increases
- 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. In this case, methodology for selecting inflation should apply to these assumptions.
 - YMPE and ITA Maximum increase assumptions will breakdown into the following components: General inflation + productivity growth, merit, and advancement.
 - YMPE assumption is often determined as the long-term inflation assumption increased for productivity gains in the economy (consistent with salary scale assumption development). Common increases for productivity gains for most plans was in the range of 0.50% to 1.00%.

7. Continued

(iii) Salary Scale

- Should be internally consistent with inflation and YMPE/ITA increase assumption
- Typically, the salary increase assumption will breakdown into the following components: General inflation + productivity growth + merit.
- May consider select/ultimate rates if considering a similar methodology for inflation assumption, especially if special consideration is given to a larger short-term compensation increases as a result of short-term inflation or competitive pressures.
- May consider:
 - Separate scales for different employee groups (Executive vs. non-executive, Salaried vs. hourly, Long-term disability, Leave of absence, etc.)
 - Separate scales for different compensation elements (salary, bonus, etc.)
 - Age of employee population – salary growth potential for the older and long service groups is more limited
 - Any special considerations as part of collective bargaining agreements
- Would want to consider multiple sources of data:
 - the plan sponsor’s current compensation practice and any anticipated changes in this practice;
 - may use plan sponsor specific data but would want to consider limitations imposed by credibility of data;
 - current compensation distributions by age or service;
 - historical compensation increases and practices of the plan sponsor and other plan sponsors in the same industry or geographic area; and
 - historical national wage increases and productivity growth.