RET FRC Model Solutions
Fall 2016

1. **Learning Objectives:**
1. The candidate will understand how to analyze data for quality and appropriateness.

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.

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

Learning Outcomes:
(1a) Identify data needed.

(1b) Assess data quality.

(1c) Make and/or recommend appropriate assumptions where data cannot be provided.

(1d) Comply with regulatory and professional standards pertaining to data quality.

(3a) Differentiate between the various purposes for valuing pension plans:
  (i) Funding
  (ii) Solvency
  (iii) Termination/wind-up/conversion

(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.

(7e) Explain and apply all of the applicable standards of practice related to valuing pension benefits.

1. **Continued**

Sources:
FR-100-13: ASOP 23 Data Quality

CIA Consolidated Standards of Practice, Sections 1530, 1600, 3100 – 3500

FSCO W100-103: Windup procedures

Commentary on Question:
Candidates generally underperformed on this question, by listing too few items. The model solution includes some of the possible responses that would have been awarded marks; other appropriate responses would have been acceptable.

Solution:
Compare and contrast the treatment of the following items for a windup valuation versus a going concern valuation:

(i)   Member data

(ii)   Asset data

(iii)   Plan provisions

<u>Member data</u>
Under a going concern valuation:
- The going concern valuation assumes the plan goes on indefinitely
- The membership data are the responsibility of the plan administrator. The actuary would, however, report on the sufficiency and reliability of the membership data.
- The going concern report should include a reconciliation of plan membership from the valuation date of the last filed actuarial report.
- Assumptions and considerations related to going concern valuations should represent best estimates
- Appropriate assumptions can be made in the case of missing membership data.
  - For example, it may be appropriate to retro project current earnings based on aggregate historical pay increases in order to estimate final average earnings.
  - Any assumptions and methods used in respect of insufficient or unreliable membership data should be described in the report

Under a windup valuation:
- Unique to windup valuations, the windup valuation assumes the plan will wind up effective at the wind up date, not go on indefinitely.
- Similar to going concern valuation, the membership data are the responsibility of the plan administrator,

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1. Continued

- Unique to windup valuations, the actuary would report sufficiency and reliability of the membership data specifically including comments about the commuted value.
- Unique to windup valuations, the finality of wind-up would call for the actuary to obtain precise membership data
  - The actuary may, if the circumstances dictate, include contingency reserves in the wind-up valuation with respect to missing members if the actuary believes that additional members still have benefit entitlements under the pension plan but their membership information is missing.
- Unique to windup valuations, the reported membership data should include details of the amounts and terms of payment of each member's benefits.
- Similar to going concern valuations, the wind-up report should include a reconciliation of plan membership from the valuation date of the last filed actuarial report to the effective date of the wind-up.

Asset data
Under a going concern valuation:
- Market value of assets can be obtained from trust statements or audited financial statements
- Unique to going concern valuations, asset value other than market value can be used for assets in going concern valuations
  - For example, the use of a smoothed asset value may be appropriate to moderate the volatility of contribution rates for purposes of advice on funding.
- Unique to going concern valuations, asset data other than market value of assets should be included if using an asset method that is different from market value of assets
  - For example, historical assets for the last 4 years if smoothing asset over a 5 year period
  - Historical cash flows may be required if used in the asset method
- Unique to going concern valuations, no asset data needs to be collected with respect to wind-up expenses

Under a windup valuation:
- Similar to going concern valuations, market value of assets can be obtained from trust statements or audited financial statements
- Unique to windup valuations, asset data needs to be collected with respect to wind-up expenses

1. Continued

- Unique to windup valuations, market value of assets must be used
  - Can be obtained from trust statements or audited financial statements (similar to going concern valuations)
  - Including adjustments for receivables or payables at the effective date of the wind-up
    - Actuary should verify reliability when possible, i.e. benefits payable can be checked against benefit payment register
  - The actuary may rely on or use the opinion of another person, if such reliance or use is justified in the circumstances
    - Cash out value should be used for insurance company guaranteed annuity contracts and general fund deposit administration contracts.
- Similar to going concern valuations, any estimates that were made of market values should be described
  - In particular, actuary should disclose in detail if there is any estimate made that might adversely affect the value of the assets, and quantify the impact, to the extent possible.
- Unique to windup valuations, an assumption for wind-up expenses must be included
  - Unless the expectation is that the expenses will not be paid from the pension plan assets.
  - Wind-up report should state if expenses will not be paid from pension plan assets.
- Wind-up expenses should include:
  - Actuarial fees related to the wind-up report;
  - Legal fees;
  - Administration expenses; and
  - Custodial and investment management expenses
- Wind-up expenses should be included in the calculation of funded ratio of the plan:
  - Actuary can either net wind-up expenses against the pension plan's assets; or
  - Add the assumed wind-up expenses to the pension plan's liabilities.
  - The wind-up report should include a reconciliation of plan assets from the valuation date of the last filed actuarial report to the effective date of the wind-up.

Plan provisions
Under a going concern valuation:
- An amendment with effective date during the period for which the going concern report gives advice on funding may be disregarded for the period before the amendment is effective.
  - The advice on funding after the effective date of the amendment should take the amendment into account.
- An amendment with effective date after the period for which the going concern report gives advice on funding may be disregarded.

1. **Continued**

Under a windup valuation:
- The wind-up report must include a summary of plan provisions that were reflected in the wind-up valuation.
- The wind-up liabilities should include contingent benefits (such as grow-in).

2. **Learning Objectives:**

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

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

Learning Outcomes:

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

(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, 3rd Edition

Commentary on Question:
The question was intended to test candidates' knowledge of normal cost and actuarial liability calculations under the entry age normal, level percent of earnings actuarial cost method. In addition, candidates were asked to evaluate actuarial experience and identify all sources of gains/losses in comparison to actuarial assumptions.

Most candidates did well on this question and were able to calculate the normal cost and actuarial liabilities under the given cost method. As is typical with math-based questions, some candidates had minor errors in their calculations which resulted in differences with the final answer. However, most candidates showed their work which allowed graders to provide the majority of marks (and any calculation errors in part a) were not penalized in parts b) and c)).

Solution:

(a)   Calculate the total normal cost and the unfunded accrued liability of the plan at January 1, 2016.

Show all work.

Commentary on Question:
Most candidates were able to calculate the Present Value of Benefits and Present Value of Future Salaries for both Members A and B, and then the resulting normal costs and actuarial liabilities. However, candidates could have saved themselves significant time if they realized that the percentage of earnings to apply for both Members A and B under the entry age normal, level percent of earnings actuarial cost method was the same (since both Member A and B entered at the same age)

2. **Continued**

Member A and Member B both entered the pension plan at the same age 30. Therefore, apply the same level percentage of earnings to both members in the determination of normal cost.

The level percentage of earnings to apply is determined as A / B, where:

$A = 1\% * \text{service at age } 65 * \ddot{a}_{65}^{(12)} * 1.03^{(64-30)} * 1.05^{-(65-30)} = 2.3401408$

$B = a_{\overline{35}|j} = 25.7183888$, where $j = 1.05/1.03 - 1$

$A/B = 9.0991\%$

January 1, 2016 Normal Cost for Member A = 9.0991% * $50,000 = $4,550
January 1, 2016 Normal Cost for Member B = 9.0991% * $100,000 = $9,099

January 1, 2016 Actuarial Liability for Member A = NC * $S_{\overline{5}|j}$ = $24,108
January 1, 2016 Actuarial Liability for Member B = NC * $S_{\overline{20}|j}$ = $224,074

Total Normal Cost at January 1, 2016 = $13,649
Total Actuarial Liability at January 1, 2016 = $248,182
Unfunded Actuarial Liability at January 1, 2016 = $248,182 - $200,000 = $48,182

(b)   Calculate the unfunded accrued liability of the plan at January 1, 2017.

Commentary on Question:
Almost all candidates were able to accurately determine the termination liability for Member A. When determining the actuarial liability for Member B, most candidates went through the full calculations of PVFB and PVFS. However, candidates could have saved themselves some calculation time if they simply applied the level percentage of pay determined in part b) to calculate Member B's actuarial liability. Alternatively, some candidates calculated the expected liability of Member B at January 1, 2017 and then adjusted for the actual salary increase of 5% versus the actuarial assumption of 3%. Full credit was given regardless of the method used.

Member A

Member A terminated at December 31, 2016 with final salary of $50,000, 6 years of credited service and age equal to 36.

$$\begin{aligned}
\text{Member A Actuarial Liability} &= 1\% * \text{final salary} * \text{service} * \ddot{a}_{65}^{(12)} * 1.05^{-(65-36)} \\
&= 1\% * \$50,000 * 6 * 13.5 * 1.05^{-(29)} \\
&= \$9,839
\end{aligned}$$

2. **Continued**

Member B

Member B received a 5% salary increase at December 31, 2016. Therefore, the salary to use for purposes of calculating the January 1, 2017 actuarial liability is $105,000.

Member B Normal Cost = 9.0991% * $105,000 = $9,554
Member B Actuarial Liability = NC * $S_{21|j}$ = $249,586   where j = 1.05/1.03-1

OR (alternative solution)

Member B Actuarial Liability =
Expected Actuarial Liability at January 1, 2017 * 1.05 / 1.03
(since member's actual salary increase was 5% compared to assumption of 3%).

where Expected Actuarial Liability = ($224,074 + $9,099) * 1.05 = $244,832
(using January 1, 2016 actuarial liability and normal cost from part A)

Therefore, actual Actuarial Liability = $244,832 * 1.05/1.03 = $249,586

Total Actuarial Liability at January 1, 2017 = $259,425
Unfunded Actuarial Liability at January 1, 2017 = $259,425 - $220,000
**   = $39,425**

(c)   Calculate the gains and losses by source for 2016.

Show all work.

Commentary on Question:
Most candidates were able to identify the termination gain for Member A, salary experience loss for Member B and a loss on the fund rate of return. However, not all candidates determined the contribution gain. Candidates were asked to show all work, and were therefore expected to reconcile the individual gain/loss components to the total gain on the unfunded actuarial liability.

Gain on termination of Member A
Using actuarial liabilities and normal cost determined in parts a) and b)
Expected Actuarial Liability at Jan. 1, 2017 = ($24,108 + $4,550) * 1.05
                                                                      = $30,091
Actual Actuarial Liability at Jan. 1, 2017   = $9,839
Gain   = $20,252

Loss on salary experience for Member B
Using actuarial liabilities and normal cost determined in parts a) and b)
Expected Actuarial Liability at Jan. 1, 2017 = ($224,074 + $9,099) * 1.05
                                             = $244,832
Actual Actuarial Liability at Jan. 1, 2017   = $249,586
Gain   = $4,754

Gain on contribution
Determined at January 1, 2017, compare actual contribution of $20,000 to normal cost requirement determined in part a) of $13,649. Gain since actual contribution is greater than normal cost requirement.
Contribution gain   = ($20,000 - $13,649) * 1.05
                                             = $6,668

Loss on fund return
Comparison of actual versus expected fund value at January 1, 2017
Expected fund value at Jan. 1, 2017 = ($200,000 + $20,000) * 1.05
                                     = $231,000
Actual fund value at Jan. 1, 2017   = $220,000
Loss   = $11,000

Check
Sum of individual gain/loss components = $20,252 - $4,754 + $6,668 - $11,000
                                       = **$11,166**

Expected Unfunded Actuarial Liability at Jan. 1, 2017 = $48,182 * 1.05
                                                      = $50,591
Actual Unfunded Actuarial Liability at Jan. 1, 2017 = $39,425
Gain   = $50,591-$39,425= **$11,166**
Matches the sum of the individual gain/loss components

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3. **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:
Canadian Pensions and Retirement Income Planning, Towers Watson, 5th Edition. Ch. 17

Commentary on Question:
Commentary for parts (a) and (b):

Candidates generally performed well on these parts. The accuracy of the final answer was not a key component in answering this question. If the wrong final answer for a part was given but some elements of the calculation were correct, partial marks were awarded accordingly.

Commentary for part (c):

Candidates generally performed well on this part; however, some candidates did not take into account the maximum pension form allowable under the ITA (i.e. did not apply actuarial equivalence to the 66.67% joint & survivor annuity, 120 payments guaranteed).

Solution:
(a)   Calculate the CEO's annual pension benefit payable from the NOC Salaried Plan under the normal form of pension.

   Calculate ITA maximum lifetime benefit
   Does CEO meet 30-60-80 rule? No.
   How long until would meet? 2 years (from age 60).

   ITA erf = 1 - 0.25%*12*2 = 94%

   ITA pension
   = credited service * min(2%*HAE , DB limit) * ITA erf
   =9 * min(2%*$500,000 , $2,890) * 94%
   =$24,449

   Calculate ITA maximum bridge benefit & ITA maximum combined benefit
   There is no bridge benefit offered under the Plan.

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3.   **Continued**

Calculate Plan lifetime benefit
Does CEO meet age 62 rule? No.
How long until would meet? 4 years.

Plan erf = 1 - 0.25%*12*4 = 88%

Plan pension
=2% * BAE * credited service * Plan erf
=2% * $500,000 * 9 * 88%
=$79,200

Calculate Plan bridge benefit
There is no bridge benefit offered under the Plan.

Calculate capped benefits
Capped pension
=min(ITA pension , Plan pension)
=min($24,449 , $79,200)
=$24,449

Capped bridge
There is no bridge benefit offered under the Plan.

(b)   Calculate the CEO's annual bridge benefit payable from the NOC Salaried Plan under the normal form of pension.

Show all work.

Calculate ITA maximum bridge benefit
Does CEO have 10 years of service? No, 1 year from 10.
Is CEO at least 60 years of age? No, 2 years from age 60.

Bridge erf = (1 - 0.25% * 12 * 2) * 9/10 = 85%

ITA bridge = (2016 maxCPP + 2016 maxOAS) * Bridge erf
= ($13,110 + $6,849) * 85%
=$16,885

Calculate Plan bridge benefit
Plan bridge = 0.75% * BAE * credited service
=0.75% * $500,000 * 9
=$33,750

3. **Continued**

Calculate capped bridge benefit
Capped bridge
=min((min(ITA bridge , Plan bridge), max(0,ITA combined-Capped pension)))
=min(min($16,885 , $33,750), max(0 , $29,460-$24,449))
=min($16,885 , $5,011)
=$5,011

(c)   Calculate the CEO's total enhanced annual lifetime pension benefit payable from the NOC Salaried Plan and any forfeited balance, if applicable.

Show all work.

Calculate commuted value of lifetime benefits
Identify applicable annuity factor: J&S 60% (non-indexed) = 21.2

CV = applicable annuity factor * capped lifetime pension
=21.2 * $24,449
=$518,319

Calculate commuted value of lifetime benefits, with post-retirement indexing
Identify applicable annuity factor: J&S 60% (indexed) = 23.8

CV = applicable annuity factor * capped lifetime pension
=23.8 * $24,449
=$581,886

Determine remaining OAC balance, after purchasing post-retirement indexing
OAC Balance
=$150,000-($581,886-$518,319)
=$86,433

Calculate commuted value of lifetime benefits, with post-retirement indexing & death benefits (G60)
Identify applicable annuity factor: J&S 66.67% G60 (indexed) = 25.4

CV = applicable annuity factor * capped lifetime pension
=25.4 * $24,449
=$621,005

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3. **Continued**

Determine remaining OAC balance, after purchasing post-retirement indexing & death benefits (G60)
OAC Balance
=$86,433-($621,005-$581,886)
=$47,314

Calculate commuted value of lifetime benefits, with post-retirement indexing & death benefits (G120)
Identify applicable annuity factor: J&S 66.67% G120 (indexed) = 27.6
Since the optional form is in excess of the ITA maximum benefit form of J&S 66.67% G60, the annual pension amount must be adjusted on an actuarially equivalent basis: $24,449 * 25.4/27.6 = $22,500

CV = applicable annuity factor * adjusted capped lifetime pension
=27.6*$22,500
=$621,005

Determine remaining OAC balance, after purchasing post-retirement indexing & death benefits (G120)
OAC Balance
=$86,433-($621,005-$581,886)
=$47,314

Identify maximum combination and forfeited balance
May choose either of the following for the same price:
OPTION 1
Annual pension: $24,449
Pension form: joint & 66.67% survivor, guaranteed for 60 months, with annual post-retirement indexing at the lesser of 1% or CPI.
OPTION 2
Annual pension: $22,500
Pension form: joint & 66.67% survivor, guaranteed for 120 months, with annual post-retirement indexing at the lesser of 1% or CPI.

The forfeited balance for either option is $47,314.

4. **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:
Determination of best estimate discount rate on GC funding valuations;

ASOP 27;

Financial economics and Canadian pension valuations;

Provisions for adverse deviations in GC actuarial valuations of defined benefit pension plans;

Anderson Chpt 6.

Commentary on Question:
Candidates were expected to describe appropriate approaches for setting a going concern discount rate in this question. Full credit was not awarded if the candidate simply mentioned the building block approach or cash flow matching. Many candidates understood these were two approaches, and understood the mechanics of how each approach works to set a discount rate. Part a), was generally done well, but candidates ran into trouble with parts b) and c). Candidates failed to describe the considerations and approach for determining the select period in part b). In part c) many candidates failed to describe considerations that would impact the discount rate in the select period (expected retirements and annuity purchases every two years), and the considerations for setting a discount that would apply to the annuity purchase.
Solution:
(a) Describe two approaches under the CIA Standards of Practice for determining the going concern discount rate for Plan 1.

4.   Continued

A discount rate may be based on the

expected future investment return on the assets of the pension plan

If the actuary sets a discount rate that is based on a best estimate of the expected future investment return on the plan's assets

over a relevant time frame, then the discount rate assumption is unbiased.

Typically, this will be a long-term horizon such as 20–30 years but a shorter-term perspective may be needed for very mature plans

One accepted methodology for establishing a best estimate discount rate that reflects expected future investment returns is a building block approach

Determine best estimate long-term return for each asset class;

Combine best estimate long term returns (with consideration for effect of diversification)

Consider inclusion of an allowance for additional return from active management, where appropriate; and

Make appropriate provision for expenses

Alternatively, a discount rate may be based on the yields of investment grade debt securities, regardless of the plan's target asset mix. The yields of investment grade debt securities would reasonably match the projected benefit cash flows and reflect an appropriately low level of risk.

(b)   Explain how you would set the going concern discount rate for Plan 2.

A best estimate discount rate may be based on the yields of investment grade debt securities which would reasonably match projected benefit cash flows, with an appropriately low level of risk.

Alternatively, using the building block approach, we are given that the target asset mix will change once the plan becomes 95% funded on a wind-up basis. We will need to determine two best estimate discount rates that reflect expected future investment returns, one for the period up to the expected date the plan is to be 95%funded on a wind-up basis (the "select discount rate"), and the other for the period thereafter (the "ultimate discount rate").

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4. **Continued**

The building block approach can be applied for both periods; however, the best estimate discount rate during the select period would be based on the current target asset mix (60% equity, 40% fixed income) and apply for the assumed period from the valuation date to the expected date the plan is 95% funded on a wind-up basis (the "select period").

An assumption of the select period is required.

This would be based on a modelling of the evolution of the wind-up ratio.

The wind-up ratio following the valuation date would be modeled considering the following:

expected net rate of return from the valuation date
expected expenses to be incurred by the fund not reflected in the net rate of return
expected cash flows, in particular Company contributions,
considering the plan's funding policy
taking into account regulatory funding requirements
expected wind-up liability assumption basis
expected wind-up incremental cost following the valuation date

The best estimate discount rate following the select period (the "ultimate discount rate") would:

o be based on the post-95% funded on a wind-up basis target asset mix (15% equity, 85% fixed income)

o consider expected rates of return for each asset class following the end of the select period for the expected remaining time horizon

(c) Explain how you would set the going concern discount rate for Plan 3.

A best estimate discount rate may be based on the yields of investment grade debt securities which would reasonably match projected benefit cash flows, with an appropriately low level of risk.

Alternatively, using the building block approach, we are given that the target asset mix will be maintained indefinitely. ABC Company has a policy to engage in an annuity purchase every 2 years with respect to the pensions-in-payment. We will need to determine two best estimate discount rates:

• one for the periods up to the possible annuity purchase dates, and

• the other for the periods thereafter

4. **Continued**

The period up to the possible annuity purchase date would:

- o consider the expected dates of retirement for each member of the covered group, and

- o the once every 2 year frequency for group annuity purchases for pensions-in-payment.

The building block approach can be applied for both periods; however, the best estimate discount rate during the periods up to the possible annuity purchase dates would:

- o be based on the current target asset mix (90% equity, 10% fixed income)

- o consider expected rates of return for each asset class from the valuation date

- o consider the impact of the liquidation of assets to occur every two years.

- o The best estimate discount rate to apply at the expected annuity purchase date would consider the estimated/modeled annuity purchase pricing. This could include the following:

- o expected interest rates for debt expected to be used by insurers to back the annuities (assuming the mortality basis used by the insurers is consistent with that assumed for the going concern valuation)

- o expenses associated with the annuity purchase transaction

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

Learning Outcomes:
(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.

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

Sources:
Towers Watson, Canadian Pensions and Retirement Income Planning, Chapters 6, 10, and 11

Morneau Shepell, Handbook of Canadian Pension and Benefit Plants, Chapter 7

Commentary on Question:
This question was trying to test a candidate's knowledge of pension adjustments, past service pension adjustments and how they interact with Canada Revenue Agency's regulations. Candidates did very well on most parts of the question. Most candidates lost points on part e as they did not provide enough information to get full credit.

Solution:
(a)   The member's 2016 earnings are $145,000.

Calculate the 2016 pension adjustment (PA) for the member.

Show all work.

Commentary on Question:
This part was done very well by most candidates.

Calculate annual pension accrual:
2% x $145,000 = $2,900

Compare annual pension accrual with defined benefit limit
Min of:
1) Pension accrual: $2,900
2) Defined benefit limit: $2,890

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5. **Continued**

Max accrual = $2,890

Calculate the PA
9% x $2,890 - $600 = $25,410

The PA is $25,410 for 2016.

(b)   Calculate the member's grossed-up past service pension adjustment.

Show all work.

Commentary on Question:
Most candidates removed the qualifying transfer of $50,000 from the grossed-up past service pension adjustment; however the definition of grossed-up PSPA excludes the qualifying transfer. Otherwise this question was done well.

1 year of pension credits would equal minimum of:
- 2% x $142,000 = $2,840.00
- ITA Limit for leave of absence year

2009 PA: 9 x min($2,444.44, $2,840.00)-600 = $21,400
2010 PA: 9 x min($2,494.44, $2,840.00)-600 = $21,850
2011 PA: 9 x min($2,552.22, $2,840.00)-600 = $22,370
2012 PA: 9 x min($2,646.67, $2,840.00)-600 = $23,220
2013 PA: 9 x min($2,696.67, $2,840.00)-600 = $23,670

PSPA = sum of past Pas (2009 to 2013) = $112,510

(c)   The member does not have any unused RRSP contribution room.

Calculate the minimum amount of the qualifying withdrawal that the member must make in order for Canada Revenue Agency to certify the provisional past service pension adjustment (PSPA).

Show all work.

Commentary on Question:
If qualifying transfer was removed in part b no deduction in points was made if the candidate carried the incorrect value forward through the question properly.

5. **Continued**

PSPA Formula = A – B – C + D, report if the amount is greater than zero.

A = Recalculate the member's benefit earned and pension credits under all defined benefit provisions of the employer's RPPs for all post-1989 years covered by the past service event.

B = Do the same calculation, based on the benefits provided immediately before the past service event. This generally represents PAs and PSPAs previously reported on behalf of the individual for prior years

C = Subtract any qualifying transfers

D = any excess money purchase transfers

A = $112,510 (amount from part b)
B = $0
C = $50,000
D = $0

PSPA = $112,510 – $0 - $50,000 + $0 = $62,510

CRA allowable RRSP excess is $8,000

Since the member does not have any unused RRSP room, the member will have to withdrawal funds from the member's individual RRSP to enable the PSPA to be certified.

Qualifying Withdrawal   = PSPA – (Available RRSP Room + $8,000)
                              = $62,510 – ($0 + $8,000) = **$54,510**

(d)   The member was paid a commuted value of $290,000 to fully settle their entitlement under the plan.

    Calculate the Pension Adjustment Reversal (PAR).

    Show all work.

    Commentary on Question:
    This part was done very well by most candidates.

5.   **Continued**

PAR Formula = A + B – C – D

A = Total pension credits = $91,500+$74,510+$12,730 = $178,740
B = Grossed up PSPA = $112,510
C = Specified distribution = $290,000
D = PA Transfer = 0

PAR = $178,740 + $112,510 - $290,000 – 0 **= 1,250.**

(e)   Explain the principles behind PARs.

Commentary on Question:
Candidates that focused on principles of PAR's got full marks.

- PAs measure the value for tax purposes of the employee's participation in an RPP
- PAs reduce RRSP room
- PA calculations in DB plans use assumptions that may not be realized
- When member terminates or retires, the actual value may not be equal to the reported PAs.
- Recognize the fact that PAs are often overstated for members of defined benefit pension plans (as a result of the factor of nine calculation)
- The PAR is a measure of the extent to which an individual's RRSP deduction room has been reduced on account of membership in an RPP (i.e. Total PAs greater than the commuted value)
- The PAR restores lost RRSP room
- A PAR is calculated whenever an individual ceases entitlement to a benefit under a provision of the RPP, for which PAs and/or PSPAs were originally reported.

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

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

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

Learning Outcomes:
(2a) Describe and apply the techniques used in the development of assumptions for funding purposes

(3a) Differentiate between the various purposes for valuing pension plans:
  (i) Funding
  (ii) Solvency
  (iii) Termination/wind-up/conversion

(3c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding and asset valuation methods.

(3d) 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) Shared risk pension plan valuations

(7e) Explain and apply all of the applicable standards of practice related to valuing pension benefits.

(7f) Recognize situations and actions that violate or compromise Standards or Professional Conduct Guidelines.

Sources:
Guidance on Asset Valuation Methods, CIA Educational Note, September 2014

CIA Consolidated Standards of Practice - Pension Plans 3100-3500

Asset Valuation Methods under ERISA, Pension Forum 9/2002, Ch. 1, 3, 4 & 5

FR-126-15: Asset Smoothing for Solvency Valuations, FSCO Q1 and A1

FR-125-15: Financial Services Commission of Ontario: Actuarial Guidance Note: Determination of the Solvency Liability Adjustment

6. Continued

Commentary on Question:
Commentary is provided in each part. .

Solution:
(a)   State an appropriate objective for using a smoothed asset valuation method for going concern funding purposes instead of using the market value.

   Commentary on Question:
   Most candidates were able to provide an appropriate objective for using a smoothed asset valuation method for going concern funding purposes.

   An appropriate objective is to moderate the volatility of contribution rates.

(b)   Compare the proposed asset valuation method to the current asset valuation method based on the CIA guidance on asset valuation methods.

   Commentary on Question:
   Candidates were generally good at comparing the two asset valuation methods. However, candidates who only listed the desirable characteristics of an asset valuation method did not receive grading points as they were expected to provide commentary to compare the two methods.

6. Continued

Desirable Characteristics of an Asset Valuation Method	Current asset valuation method	CFO's proposed asset valuation method
Achieves objectives	n/a – as objectives not disclosed	n/a – as objectives not disclosed
Tracks to market value	The method includes current market value as a component and ensures that the asset value is expected to track to market value over time (see below).	The method includes current market value as a component; however given the design uses a reference rate that does not consider the asset mix, it is not expected to track to market value over time (see below).
Does not unduly deviate from market value	Cap and floor are +/- 10% of MV, which ensures that when actual returns over the smoothing period are significantly different from the discount rate, the AVA is not excessively different from the MV.	With an upper limit of 125% it could be argued that when actual returns over the smoothing cycle are significantly less than T-bills + 2%, the AVA could be far greater than MV. Floor of 100% of MV will be equal to MV.
Has a reasonable and logical relationship to market value	Smoothing is relative to actuary's best estimate rate of return, which reflects the asset mix. Over short-periods actual returns could deviate from expected. However, over longer periods, actual returns are expected to trend toward best estimate.	Smoothing is relative to T-bills + 2%, which is not expected to relate to market value as it does not reflect the asset mix and expected return on assets.
Is generally free of any bias	Generally free of bias. Cap and floor are symmetric. If actual fund return is discount rate, then AVA will equal MV.	There is an inappropriate bias the AVA equals the greater of market value and the asset value derived through the use of an asset smoothing technique. Asset loss recognition would be deferred but asset gains are reflected immediately.

6. **Continued**

Has no undue influence on investment transaction decisions or vice versa	Would not influence investment transaction decisions or vice-versa.	Would not influence investment transaction decisions or vice-versa.
Is consistent with the length of typical economic cycles	The 4-year period is consistent with the length of a typical economic cycle.	The 4-year period is consistent with the length of a typical economic cycle.

(c) Describe in words how you would determine the interest rates used to value the solvency liabilities.

Commentary on Question:
Candidates generally underperformed because they did not integrate the impact asset smoothing has on setting solvency discount rates assumptions.

Commuted value interest rates (set in accordance with CIA Standards)
- Over the same smoothing period used for asset smoothing
- Determine the arithmetic average of the commuted value interest rates (select and ultimate respectively) at each January 1st
- This will be the smoothed select and ultimate interest rates used in the determination of the liabilities assumed to be settled with a commuted value.

Annuity proxy value interest rates (set in accordance with CIA Guidance)
- Over the same smoothing period used for asset smoothing
- Determine an adjusted interest rate at each January 1st, where the liability determined using the adjusted interest rate in combination with the January 1, 2017 mortality table is equal to the liability determined using the actual interest rate and mortality table that were in effect at the respective January 1st.
- Determine the arithmetic average of the adjusted interest rates
- This will be the smoothed annuity proxy interest rate used in the determination of the liabilities assumed to be settled with an annuity purchase.

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

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

Learning Outcomes:
(3a)   Differentiate between the various purposes for valuing pension plans:
   (i)   Funding
   (ii)   Solvency
   (iii)   Termination/wind-up/conversion

Sources:
Reference – Report of the Task Force on Target Benefit Plans, CIA; FR-127-15

Commentary on Question:
Many candidates were not familiar with the target benefit regulations for these jurisdictions, or simply listed features of target benefit plans in general.

Solution:
Compare and contrast the main features of these regulations as they pertain to the funding of target benefit plans.

	New Brunswick	*Alberta*
Prescribed method	*Annual deterministic test:* Traditional unit credit with 15-year open group projection *Additional test at inception and when benefits change:* 20-year stochastic projection to assess probabilistic goals	*Triennial deterministic test:* Traditional or projected unit credit, closed group basis
Prescribed assumptions	None	Benchmark discount rate (BDR) as baseline, higher PfAD if using higher rate

7. **Continued**

Probabilistic goals with respect to benefit risk	*Primary:* less than 2.5% chance of cuts in base benefits over 20-year horizon	No explicit goals
	Secondary: Amount of ancillary benefits actually provided over 20-year horizon is at least 75% of aspired ancillaries	
Minimum required contributions at onset	Normal cost + admin expenses over 0.5% of assets + amount necessary to meet probabilistic goals	Normal cost + 15-year amortization of any shortfalls + prescribed PfAD + admin expenses
Trigger for action on downside	Open group funded ratio (OGFR) < 100% two years in a row	Actual contributions < minimum required contributions
Opportunity to take action on upside	Open group funded ratio > 105%	Fund value > Actuarial liability + PfAD
Spending limit on upside	Spending can eliminate portion of OGFR in excess of 140% and one-fifth of OGFR between 105% and 140% (Probabilistic test must still be satisfied)	PfAD requirement must still be met after benefit improvement
Benefit ladder	Explicit requirement; subject to restrictions on the type, order, and extent of actions to be taken	Discretionary (type, order, extent); no requirement for explicit ladder

8. **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.

(3e)   Calculate actuarially equivalent benefits.

Sources:
Pension Mathematics for Actuaries, Anderson, 3rd Edition

Commentary on Question:
The question was intended to test candidates' knowledge of normal cost and actuarial liability calculations under two actuarial cost methods: projected unit credit, pro-rated on service and aggregate, level percent of pay. In addition, candidates were tested on their ability to calculate actuarially equivalent benefits.

Most candidates had no trouble calculating the total normal cost and actuarial liability under the projected unit credit, pro-rated on service actuarial cost method. However, not as many candidates were familiar with the aggregate, level percent of pay actuarial cost method. Many candidates overlooked the fact that the question asked for the employer portion of the normal actuarial cost, and did not account for the required employee contributions under the pension plan (some part marks were missed as a result).

Most candidates were able to determine the pension payable from the plan under the optional form of payment.

Solution:
(a)   Calculate the total employer normal cost and unfunded accrued liability as at January 1, 2017.

        Commentary on Question:
        A common mistake made by many candidates was to include a pre-retirement decrement in the calculation of the actuarial liability. The actuarial assumptions clearly indicated there were no pre-retirement decrements, and the $_3p_{62} = 0.98$ provided in the question was only intended to be used for part c).

        Member A
        Member A will not reach 25 years of service prior to age 62. Therefore, the only decrement is retirement at age 65.

8. Continued

Actuarial Liability at Jan. 1, 2017
$= 100\% * \$50,000 * 1.03^{15} * 1\% * 5 * 13.1 * 1.05^{-15}$
$= 24,543$

Total Normal Cost at Jan. 1, 2017
$= \$24,543/5$
$= \$4,909$

Expected 2017 employee contributions
$= \$50,000 * 1.03 * 3\%$
$= \$1,545$

Employer Normal Cost at Jan. 1, 2017
$= \$4,909 - \$1,545$
$= \$3,364$

Member B
Member B is expected to retire immediately (i.e., age 62 with 20 years of service) with 50% probability and at age 65 with the remaining 50% probability.

Actuarial Liability at Jan. 1, 2017
$= 50\% * 1\% * \$100,000 * 25 * 13.8 + (1-50\%) * 1\% * 100,000 * 1.03^3 * 25 * 13.1 * 1.05^{-3}$
$= \$327,070$

Total Normal Cost at Jan. 1, 2017
$= \$327,070 / 25$
$= \$13,083$

Expected 2017 employee contributions
$= 50\% * \$100,000 * 1.03 * 3\%$ *(reflects 50% probability of immediate retirement at age 62)*
$= \$1,545$

Employer Normal Cost at Jan. 1, 2017
$= \$13,083 - \$1,545$
$= \$11,538$

Final Results
Total Employer Normal Cost = \$3,364 + \$11,538 = \$14,902
Total Actuarial Liability = \$24,543 + \$327,070 = \$351,613
Unfunded Accrued Liability = \$351,613 - \$300,000 = \$51,613

8.   Continued

(b)   Calculate the total employer normal cost as at January 1, 2017 using the
Aggregate, level percent of pay actuarial cost method.

Commentary on Question:
*A common mistake made by many candidates was to include a pre-retirement
decrement in the calculation of the actuarial liability. The actuarial assumptions
clearly indicated there were no pre-retirement decrements, and the $_3p_{62}$ = 0.98
provided in the question was only intended to be used for part c).*

Employer Normal Cost   = $\dfrac{(PVFB - Fund\ Value - PVFEEC) * S}{PVFS}$

Where:
PVFB is the present value of future benefits determined in total for both members
PVFEEC is the present value of future employee contributions determined in total
for both members
PVFS is the present value of future salaries determined in total for both members
S is the salary determined in total for both members

Member A
Member A will not reach 25 years of service prior to age 62. Therefore, the only
decrement is retirement at age 65.

e = entry age = 45
x = current age = 50
y = retirement age = 65
S_{49} = $50,000
S_{50} = $50,000 * 1.03 = $51,500
S_{64} = S_{50} * $(1.03)^{14}$ = $77,898.37

$$
\begin{aligned}
PVFB &= & 1\% * S_{64} * (y\text{-}e) * v^{(y\text{-}x)} * \ddot{a}_{65}^{(12)} \\
&= & 1\% * 77{,}898.37 * 20 * (1.05)^{-15} * 13.1 \\
&= & \$98{,}173
\end{aligned}
$$

$$
\begin{aligned}
PVFS &= & S_{50} * \ddot{a}_{y\text{-}x}\ \text{at discount rate i} = 1.05/1.03 \\
&= & \$677{,}536 \\
PVFEEC &= & 3\% * PVFS \\
&= & 3\% * 677{,}536 \\
&= & \$20{,}326
\end{aligned}
$$

8. **Continued**

<u>**Member B**</u>
Based on current service, member is expected to retire immediately with 50% probability and then at 65. Therefore, there are two retirement decrement ages which need to be taken into account in the PVFB and PVFS calculations.

e = entry age = 37
x = current age = 62
y_1 = retirement age 62
y_2 = retirement age 65
S_{61} = \$100,000 S_{62} = \$100,000 * 1.03 = \$103,000
$S_{64} = S_{62} * (1.03)^2$ = \$109,272.70

$$
\begin{aligned}
\text{PVFB} \quad = \quad & 50\% * 1\% * S_{61} * (y_1\text{-}e) * v^{(y1\text{-}x)} * \ddot{a}_{62}^{(12)} + \\
& 50\% * 1\% * S_{65} * (y_2\text{-}e) * v^{(y2\text{-}x)} * \ddot{a}_{65}^{(12)} \\
= \quad & 50\% * 1\% * 100,000 * 25 * (1.05)^0 * 13.8 + \\
& 50\% * 1\% * 109,272.70 * 28 * (1.05)^{-3} * 13.1 \\
= \quad & 172,500 + 173,118 \\
= \quad & \$345,618
\end{aligned}
$$

$$
\begin{aligned}
\text{PVFS} \quad = \quad & 50\% * S_{62} * \ddot{a}_{y1\text{-}x} + 50\% * S_{62} * \ddot{a}_{y2\text{-}x} \text{ at discount rate } i = 1.05/1.03 \\
= \quad & 0 + 151,576 \\
= \quad & \$151,576
\end{aligned}
$$

$$
\begin{aligned}
\text{PVFEEC} = \quad & 3\% * \text{PVFS} \\
= \quad & 3\% * 151,576 \\
= \quad & \$4,547
\end{aligned}
$$

<u>**Aggregate Results**</u>

Total PVFB	= \$98,173 + \$345,618 = \$443,791
Total PVFS	= \$677,536 + \$151,576 = \$829,112
Total PVFEEC	= \$20,326 + \$4,547 = \$24,873
S	= \$51,500 + \$103,000 = \$154,500

Aggregate ER NC = (PVFB – F – PVEEC)/ PVFS * S
= [(\$443,791 – \$300,000 - \$24,873)/ \$829,112] * \$154,500
= \$22,160

8. **Continued**

(c) Calculate the lifetime pension payable to Member B under the following forms of payment:

(i) The Normal form of payment.

(ii) The Optional form of payment.

Show all work.

Retirement pension at retirement under the normal form:

B_{62} = 1% * 100,000 * 25 = $25,000 per annum

Actuarial equivalence calculation:

Value of lifetime pension available from the pension plan:

B_{62} * $ä_{62}^{(12)}$ = 25,000 * 13.8 = $345,000

Value of government benefits:
$G * (ä_{62}^{(12)} – 1.05^{-3} * {}_3p_{62} * ä_{62}^{(12)})$
= $12,000 * (13.8 – 1.05^{-3} * 0.98 * 13.1)$
= $32,521

Adjusted lifetime pension:

($345,000 - $32,521) / 13.8 = $22,643

Annual pension from age 62 to 65 from the pension plan: $32,521
Annual pension after age 65 from the pension plan: $22,643

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

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.

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

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.

(3a)   Differentiate between the various purposes for valuing pension plans:
(i)   Funding
(ii)   Solvency
(iii)   Termination/wind-up/conversion

(5a)   The candidate will be able to describe and apply regulation pertaining to plan design.

(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.

(7c)   Explain and apply relevant qualification standards.

(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.

Sources:
Canadian pensions and retirement income planning, chapter 18, PBA , Morneau chapter 7

9. **Continued**

Commentary on Question:
Most candidates realized that all the factors were given and used the information throughout the question. In general, candidates answered this question very well.

Solution:
(a)   Calculate the 2016 minimum required and maximum permissible contributions.

Show all work.

Commentary on Question:
In general, most candidates answered part (a) and (b) very well. Successful candidates were able to identify that going concern special payments can be reduced and that any new solvency special payments established are deferred for 12 months.

Determining Going Concern Special Payments:

Present value of going concern special payments (PVGC SP) = 600,000 * $\ddot{a}_{\overline{n}|i}$ (n=10, i= 4.5%) = 600,000 * 8 = 4,800,000

Need to compare PVGC SP with the going concern deficit:

If PVGC SP is greater than going concern deficit, could reduce current schedule of past service payments so that the PVGC SP is equal to the deficit

If PVGC SP is less than the going concern deficit, a new going concern special payment is required

The Deficit is less than PVGC SP, so:

Deficit = revised annual payment * $\ddot{a}_{\overline{n}|i}$ (n=10, i= 4.5%);
Revised annual payment = 2,880,000/8 = 360,000

The revised annual payment above starts and end at the same dates as the 600,000 annual payment

9. **Continued**

Determining Solvency Special Payments:

Solvency excess/(deficit) revealed at this valuation which is determined by adjusting the solvency excess/(deficit) by the present value of all existing special payments on a solvency basis ("PVSP Existing")

PV Existing Special Payments =

Revised going concern annual payment * $\ddot{a}_{\overline{n}|i}$ (n=6, i= 2.9%)

$\qquad$ +1,150,000 * $\ddot{a}_{\overline{n}|i}$ (n=2, i= 2.9%)

$\qquad$ + 925,000 * $\ddot{a}_{\overline{n}|i}$ (n=5, i= 2.9%)

$\qquad$ = 360,000 * 5.5 + 1,150,000 * 1.9 + 925,000 * 4.7

$\qquad$ = 1,980,000 + 2,185,000 + 4,347,500

$\qquad$ = 8,512,500

Solvency excess/(deficit) revealed at valuation = -11,200,000 + 8,512,500

$\qquad\qquad\qquad\qquad$ = - 2,687,500

Solvency deficit = new solvency special payment * $\ddot{a}_{\overline{n}|i}$ (n=5, i= 2.9%);

New Annual Solvency Special Payment = 2,687,500/4.7 = 571,809

New Annual Solvency Special Payment starting at 1.1.2017

= 571,809 * 1.029 = 588,391

The new annual solvency payment starting at 1.1.2017 ends with the last payment on December of 2021

2016 minimum required contributions

= 2016 Normal Cost + Sum of all special payments

= 750,000 + (360,000 + 1,150,000 + 925,000)

= 3,185,000

2016 Maximum Contributions

= 2016 Normal Cost + greater of the going concern or windup deficit

= 750,000 + 11,200,000

= 11,950,000

(b)   Calculate the 2017 minimum required contributions based on the January 1, 2016 valuation.

Show all work.

9. Continued

2017 minimum required contributions
= 2017 Normal Cost + sum of special payments
= 784,000 + 360,000 + 1,150,000 + 925,000 + 588,391
= 3,807,391

(c)   Assess your client's request with respect to the assumptions and methods above, taking into account professional standards.

Commentary on Question:
The question leads candidates to discuss professional standards given the context. Successful candidates were able to evaluate the assumptions and methods given in the question while applying the code of conduct (rules 1, 3, and 6) if applicable. Successful candidates explicitly mentioned the rules above and correctly critiqued the assumptions and methods used.

Rule 1 – Professional integrity. The actuary is to act in a manner to fulfil the actuary's professional responsibility to the public and uphold the reputation of the profession, which could be violated if the actuary makes inappropriate changes in order to account for the plan sponsor's budget when determining how much the sponsor is required to contribute into the pension plan

Rule 3 – Standards of Practice. The actuary is required to observe applicable standards of practice that have been promulgated by the CIA when rendering professional services. This must be considered if any consideration is given to the Company's budget when setting assumptions

Rule 6 – Control of work product. The actuary is to take reasonable steps to ensure that services are not used to mislead other parties or to violate or evade the law. The work product violates the law if it's not in compliance with the standards of practice.

All solvency assumptions are in accordance with the latest guidance from Canadian Institute of Actuaries. These assumptions are prescribed.

Can consider smoothing of the solvency discount rates and market value of assets to help offset short term volatility. This can help reduce costs.

If there is any margin in the going concern discount rate, the amount of margin could be reviewed
Could consider variable retirement rates at different ages, but since the plan is actuarial equivalent from age 65, changing this assumption will not affect the going concern valuation results

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9. Continued

Could change the withdraw rates from 0% at all ages to a recognized withdrawal table or a customized table based on an experience study. Introducing a withdrawal table lowers liabilities and will help with the sponsor's budget

Could consider adding a pre-retirement mortality assumption if the plan's experience shows that members are dying prior to reaching normal retirement age. This could help decrease costs depending on what type of death benefits are paid from the plan

10.

Learning Objectives:

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

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

Learning Outcomes:

(2a)   Describe and apply the techniques used in the development of economic assumptions for funding purposes.

(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:

CIA Doc 214101

FSCO Policy S900-510

FSCO Policy W100-103

Commentary on Question:

The first two parts question asked candidates to <u>describe</u> the considerations when setting a wind-up expense assumption, and contrast that with considerations for setting hypothetical wind-up expense assumption.

The third part of the question asked candidates to <u>explain</u> the surplus distribution process on plan wind up. Candidates were expected to communicate the various filings/notification specific to each stakeholder, as well as address how the process would unfold for the client's specific situation – no surplus when wind-up report filed and a unionized group.

Candidates mostly listed types of expenses to include in the wind-up expense assumption and failed to describe the considerations that go into setting the assumption. Part (c) was answered better parts (a) and (b), but many candidates failed to provide the detail needed for full marks, and did not tie into the client's specific situation.

10. Continued

Solution:

(a) Describe the considerations for setting the wind-up expense assumption for purposes of the wind-up valuation report.

- An explicit provision for all expected expenses related to the wind up would be made; these expenses may include (but not limited to):
  o Actuarial fees/fees related to the wind up report
  o Fees imposed by the regulator
  o Legal fees
  o Administration fees
  o Custodial/investment fees
- The actuary may rely on historical data of other plan terminations while making an allowance for difference in plan size and complexity.
- The assumed wind up expense assumption may either be netted against the plan's assets or added to the plan's liabilities.
- An exception may be made for future custodial and investment fees which may be netted against future investment returns.
- The actuary must be thorough in setting the expense assumption and may consider provisions for additional expenses particular to any special situations of the plan ie. parties contesting the wind-up, surplus issues etc.

(b) Describe how these considerations differ when setting the wind-up expense assumption for a hypothetical wind-up valuation.

- W/U expense on HWU would exclude the expense for resolution of surplus or deficit
- The actuary should make an assumption as to the solvency of the employer. The assumption with respect to the payment of expenses and the assumption with respect to the solvency of the employer should be consistent.

(c) At the time of the approval of the wind-up report, interest rates have increased significantly. It is determined that there is a wind-up surplus in the XYZ pension plan that is to be shared between the employer and the members.

Describe the surplus distribution process.

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10. Continued

- Since the initial wind-up report did not address a surplus situation, a supplement to the wind-up report proposing how the surplus will be distributed must be filed with the regulator for approval.
- A surplus application must be filed with the regulator when the surplus is to be shared between the employer and members
  - o To expedite payment of basic benefit the best practice is to file the surplus application after receiving approval to pay basic benefits

- The surplus application will contain the following accompanying documents/information:
  - o The employer must file a Surplus Notice with superintendent and provide to all impacted persons providing notice that the employer has applied for a partial refund of the surplus – The employer must satisfy the superintendent that all impacted parties have received full and fair notice that the requirements of the PBA (information in the notice) have been satisfied
  - o Written agreement must be obtained from the collective bargain agents addressing how the surplus will be split between the ER and members
  - o The administrator must provide a statement to all affected persons containing prescribed information on the surplus after the superintendent has approved the w/u and distribution of the surplus

11.

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.

Sources:

CIA Revised Educational Note: Selection of Mortality Assumptions for Pension Plan Actuarial Valuations – March 2014

FR-124-15 - Selecting Mortality Tables: A Credibility Approach

ASOP 25 – Credibility Procedures

Selecting and Documenting Mortality Assumptions, American Academy of Actuaries

Commentary on Question:

This question tested candidates' knowledge of setting mortality assumptions for various plan types. Candidates were expected to incorporate credibility theory and were expected to discuss considerations for both setting the current mortality table and the improvement scale. Candidates did very well overall on this question. However many candidates provided specific recommendations which did not receive credit as considerations were asked for.

Solution:

Describe considerations in setting the going concern mortality assumption for the following pension plans:

(i) A private sector pension plan for a small mining company

(ii) A large public sector pension plan covering teachers

(iii) The Canada Pension Plan (CPP).

The following considerations apply to all plan types
- Mortality Table and Improvement scale assumptions to be looked at separately.
- First determine the best estimate of current mortality levels
    - Consider plan's actual mortality experience
    - Consider credibility of that experience
    - Consider experience of similar plans
    - Look at published tables

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11. Continued

- The level of credibility to lend to a plan's experience depends on the plan size
- Consider whether any adjustments for plan characteristics are needed i.e. an adjustment for blue collar or a private sector adjustment
- Adjustments are preferably only when there is credible experience
- Secondly determine the future mortality improvement scale to apply
  - If data not credible consider using a published improvement scale.
  - Consider using the 2D generational mortality improvement scale

(i) Considerations specific to a Small Mining Company

- Consider the size of the retiree group. Given that it is a small private mining company the number should be small and thus their mortality experience would not be credible.
- Consider the actual mortality gains and losses over the last few valuations. Look for trends or validity of current assumptions
- Look at any mining industry specific mortality studies published that may have an industry specific table.
- Adjustments for plan characteristics not preferable as there is not credible experience
- For mortality improvement scale since the data is not credible consider using a published improvement scale.

(ii) Considerations specific to a Large Public Sector Plan

- May have fully or at least partially credible experience
- Consider creating their own mortality table or adjusting a published table with partial credibility
- Prepare experience studies to validate experience and make adjustments
- For the Improvement scale consider whether the plan's experience is credible and over long enough period of time.
- Consider using published tables if not enough experience to justify an adjustment

(iii) Considerations specific to the CPP

- There should be a lot of mortality experience at least more than 10,000 retiree lives
- There are likely frequent experience studies done, consider using the results from the experience studies to determine past gains and losses and whether mortality is tracking to the current assumptions.

11. Continued

- The data would be very credible as social security plans would be considered a very large plan
    - Create a customized mortality table.
    - Weight the table by pension amount or liability as it is more appropriate than using number of lives
    - Must adjust base year to counteract Base Year affect
- If have data over long periods of time could also create their own mortality improvement scale.

12. 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:

(3d) 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) Multi-employer pension plan valuations

(6b) Evaluate funding restrictions imposed by regulations.

Sources:
FSCO policy T800-402 CV

Commentary on Question:
In part a), the candidates were asked to project the assets and liabilities to June 30th using the information provided. Parts b) asked the candidate to interpret the results from a) from a regulatory viewpoint. Part c) was a list question asking the candidates to identify the items which must be identified in the Actuarial Certificate that accompanies the application to the regulator.

Solution:

(a) Calculate the estimated transfer ratio of the plan as at June 30, 2016 assuming mid-period cash flows.

   Show all work.

   Commentary on Question:
   Candidates seemed to have an easier time understanding the components of the asset roll forward than the liability roll forward.

   The key component of the liability roll forward was to identify that the active and inactive liabilities were valued using different discount rates and had different discount rate sensitivities and so should be rolled forward separately.

   Full marks were awarded for either simple interest or compound interest. The question showed the a $50,000 solvency incremental cost (SIC) for 2016 under the title "You are given the following for the period January 1, 2016 to June 30, 2016" and so full marks were awarded if candidates used $50,000 or $25,000 in the liability roll forward.

12. Continued

Asset Rollforward

		Comments
Assets BOP	1,337,043	
Contributions	45,000	
Benefit Payments	(33,250)	{13,250 + 20,000)
Investment Return	(73,860)	{1,337,043*-5.50% + (45,000-32,250)*-5.50%/2}
Expenses	-	
Assets EOP	1,274,933	

Liability Rollforward

	Total	Act	Ret	Comments
Solv liab BOP	1,470,167	1,023,974	446,193	
SIC growth (boy)		25,000	-	
Benefit Payments		(20,000)	(13,250)	
Interest Cost		9,870 { (1,023,974 + 25,000)*1.90%/2 – 20,000*1.90%/4 }	6,813 { 446,193*3.1%/2 - 13,250*3.1%/4 }	Interest rate used to roll forward liabilities based on beginning of year assumption
Solv liab EOP (old assumptions)	1,478,601	1,038,844	439,756	
Interest		1.9%	3.1%	Beginning of year
1% DR Sensitivity		24.06%	11.42%	
DR Change		-0.50%	-0.30%	Change at Jun 30th
Solv liab EOP (new assumptions)	1,611,350	1,157,094 { 1,038,844*1.2406^0.5 }	454,255 { 439,756*1.1142^0.5 }	

12. Continued

Transfer Ratio

		Comments
Assets	1,274,933	
Liabilities	1,611,350	
Surplus / Deficit	(336,417)	
Transfer Ratio	79%	{1,274,933 / 1,611,350}

(b) Explain why NOC may not be able to immediately pay out 100% of the commuted values to the terminated members.

Commentary on Question:
A lot of candidates answered this question incorrectly. A plan sponsor is able to payout 100% of commuted values even when the transfer ratio is below 100% as long as the sum of the transfer deficiency payments is below the threshold.
A plan sponsor is not allowed to payout any commuted values though if the transfer deficiency ratio drops by 10%.

- No, they will not be able to immediately payout the commuted values since the transfer ratio has declined by 13%, which is more than the 10% threshold (Note: the threshold is based on the prior funded i.e. 79% / 91% - 1 = -13%)

- Where the transfer ratio set out in the most recently filed valuation report was less than 1.0 and the administrator knows, or ought to know, that the transfer ratio has dropped by 10% or more of that ratio, the administrator shall not transfer any part of the commuted value of a pension, deferred pension or ancillary benefit in respect of a terminating member without obtaining the prior approval of the Superintendent.

- Cannot even pay out a commuted value at the new transfer ratio without approval from Superintendent

(c) List the items that must be included in the Actuarial Certification that accompanies the application to the regulator for approval to pay out 100% of the commuted values.

- the effective date of the updated transfer ratio calculation (the "determination date")
- the market value of the plan assets as of the determination date
- the prior year credit balance, if any
- the solvency liabilities of the plan
- the liabilities for benefits, other than pension benefits and ancillary benefits payable under qualifying annuity contracts, that were excluded in calculating the solvency liabilities

12. Continued

- the updated transfer ratio
- a statement of opinion from the actuary certifying that the updated transfer ratio has been determined in accordance with accepted actuarial practice
- The Request for Approval form is to be signed by both the Actuary (actuarial certification) and the Plan Administrator (declaration of the plan administrator)
- The administrator must indicate a proposed method to address the transfer deficiencies resulting from the decline in the transfer ratio of the plan