RET FRC Model Solutions
Fall 2013

1. Learning Objectives:

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

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

Learning Outcomes:

(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

(5h) The candidate will be able to describe and apply regulation pertaining to members' rights.

Sources:

Pension Benefits Act and Regulations, Ontario

Canadian Institute of Actuaries - Standards of Practice

Commentary on Question:

This question focuses on the following areas:

(1) Knowledge of Ontario regulations on grow-in criteria under both voluntary and in-voluntary terminations

(2) Ability to perform commuted value calculations, by taking into consideration applicable laws, CIA guidance and actuarial principles

Solution:

(a) Calculate the commuted value for each employee's termination benefit.

Commentary on Question:

Most candidates did very well on this part. To score maximum points, candidates need to present correct commuted value calculations for both employees, with clear intermediate steps.

1. Continued

For Employee A
Age plus continuous service: 35+3=38, less than 55, so not entitled to grow-in benefits. Not entitled to bridge either.

Normal retirement annual benefit: \$50/month*12 months * 3 years of service = \$1,800

Retirement Age: 65

Life benefit commuted value:
$B_r * a_r * v^{(r-a)}$ = 1,800*14.6*1.024^(-10)*1.037^(-20) = \$10,024.22

Commuted value for Employee A is therefore \$10,024.22

For Employee B
Age plus continuous service: 25+52=77, greater than 55, entitled to grow-in and bridge.

Benefits will commence at the age that provides optimal benefits for the employee (i.e. "best age"). Since the plan gives unreduced pension at 30 years of service, this means the unreduced age for Employee B is 57. A quick test would show that this is the best age for B.

Normal retirement annual benefit: \$50/month*12 month*25 years of service = \$15,000

Early retirement annual benefit at 57 = \$15,000*1 (unreduced at 57)

Life benefit commuted value:
$B_r * a_r * v^{(r-a)}$ = 15,000*18.1*1.024^(-5) = \$241,140

Bridge Benefit = \$10/month*12 months*25 years of service = \$3,000

Bridge Benefit Commuted Value = \$3,000*7.1*1.024^(-5) = \$18,918

Commuted value for Employee B = \$241,140 + \$18,918 = 260,059

(b) Describe in words how the commuted value calculation would change if the employees terminated voluntarily.

1. Continued

Commentary on Question:
To score maximum points, candidates need to provide specific answers on how Commuted values of each employee will change, supported with explanations. Partial credits are given if only provided generic answers.

If the member terminates voluntarily there is no activating event, therefore grow in rights (and 55 points rule) do not apply. This means:

For Employee A
Employee A does not have 55 points so whether or not grow in applies does not impact the commuted value calculation.

Therefore, his commuted value would not change.

For Employee B
His 25 years of continuous service would not grow in for early retirement eligibility. Therefore, he would not reach the 30 years continuous service at age 57 – i.e. would only be entitled to actuarial equivalent reduction if commenced early.

Consequently, the commuted value would decrease due to the deferral of pension commencement and no entitlement to bridge benefits.

2. Learning Objectives:

6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

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

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.).

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

Sources:

CIA Consolidated Standards of Practice - Practice Specific Standards for Pension Plans 3100-3500

Commentary on Question:

The question tests whether the candidate knows the relevant standards of practice in relation to providing advice on funding of a pension plan (CSOP 3200). Candidates who did well mentioned the majority of points in CSOP 3200. Candidates that did not do well may have missed the majority of points, went into too much detail on specific sections such as data or assumptions, or went into detail on the code of professional conduct or qualification standards.

Solution:

Describe the pension specific professional standards that need to be addressed in preparing an actuarial valuation for funding purposes.

The actuary needs to take into account the circumstances of the work and consider the terms of the appropriate engagement under which the work is being performed

The actuary must select an actuarial cost method and an asset valuation method that is consistent (appropriate) with the circumstances of the work.

The actuary must provide the date of the next valuation date, taking into account the law and the terms of the appropriate engagement.

There must be a minimum of three types of valuations (going concern, solvency, hypothetical wind-up)

With regards to a Going concern valuation, the actuary must consider the plan goes on indefinitely, use best estimate assumptions with or without margins for adverse deviation, and consider all benefits of which the actuary is aware.

2. Continued

With regards to a Hypothetical wind-up valuation ("HWU"), the actuary must describe the funded status of plan if plan wound up at calculation date, use prescribed assumptions, determine benefit entitlements based on scenario for which HWU is based, assume the Wind-up date, Calculation date, and settlement date are coincident, if necessary can make appropriate assumptions regarding data, and take wind up expenses into consideration.

For the Solvency valuation, it should take the form of HWU valuation unless excludes benefits or uses smoothing as permitted by law.

For all three types of valuations, the actuary must consider subsequent events, and test and make assumptions on data if insufficient or unreliable.

The external user report should have the report date, calculation date, sources of data, limitations of data, tests on data, plan provisions, subsequent events, terms of engagement, describe methods and assumptions.

For the Going Concern valuation, the external user report should detail the cost method, asset valuation method, assumptions, any margins included in assumptions, funded status, current service cost, contingent benefits, gain/loss analysis, discount rate sensitivity.

For a HWU/Solvency valuation, the external user report should detail the asset and liability valuation method, assumptions, description of wind-up scenario, excluded benefits, inclusion of letter of credit, funded status, incremental cost, discount rate sensitivity.

The report should also include the minimum required and maximum permitted contributions in accordance with applicable legislation and a statement of opinion.

3. Learning Objectives:

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

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

Learning Outcomes:

(4a) Describe the principles and motivations behind pension legislation and regulation.

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

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

Sources:

Towers Watson, Canadian pensions and Retirement Income Planning, Fourth Edition, 2010, Ch. 17

Ontario Pension Benefits Act, R.S.O. 1990

Commentary on Question:

In this question, the candidate is asked to apply his/her knowledge of the maximum allowable benefits under the Income Tax Act and the minimum required benefits under provincial regulation to critique a set of proposed plan provisions. A well-prepared candidate not only identified provisions that violated the standards, but also outlined the rules that relate to that provision.

A well prepared candidate was expected to discuss the provisions that were offside and explain the correct restriction under the legislation.

Solution:

Critique the proposed plan provisions from a regulatory perspective. Describe the applicable regulatory restrictions for each provision.

Normal Retirement Benefit per year of credited service:

The maximum lifetime retirement benefit at the date of pension commencement is limited to pensionable service multiplied by the lesser of:

- 2% of the highest average compensation indexed to the year of commencement; and
- The defined benefit limit in the year of commencement.

In addition, the benefit accrual rate per each year of pensionable service is limited to a maximum of 2% on any portion of pensionable earnings.

The proposed provision is not allowed because the accrual on a portion of the benefit is greater than 2%. Even though the overall accrual rate may be less than 2%, the plan can't have an accrual rate over 2% for any portion of pensionable earnings.

3. Continued

Vesting:
Benefits for members employed in Ontario must vest immediately.
As the plan is provided for an Ontario company, the proposed vesting rules do not comply with provincial legislation for Members employed in Ontario.

Normal Form of Payment:
The maximum normal form that can be provided is:

- Single life annuity can be guaranteed for up to 15 years; or
- Joint and survivor pension is a 66 2/3% pension with a 5 year guarantee.

The proposed normal form is not allowed by regulation.

Unreduced Early Retirement Age:
A lifetime retirement benefit can be paid without reduction at the earliest of:

- The date the member attains age 60;
- 30 years of service; or
- Age plus service total 80.

The proposed unreduced early retirement provision is permissible as the member's age plus service total 80.

Early Retirement Reduction if not eligible for unreduced pension:
A lifetime retirement benefit must be reduced by 0.25% for each month prior to the earliest of:

- The date the member attains age 60;
- The date the member has at least 30 years of service if he had remained employed until that date;
- The date the member's age plus service total 80 if he had remained employed until that date.

As the proposed provision has a 0.20% reduction, the proposed early retirement reduction is not allowed.

Post Retirement Annual Indexation:
Lifetime retirement benefits may be adjusted using one of the following approaches:

1) a fixed annual increase of 4% per annum or less;
2) an adjustment that reflects changes in the Consumer Price Index;
3) an adjustment based on an excess earnings approach;
4) any combination of the above.

If approach 3) or 4) is used, an additional restriction applies. The additional restriction requires that the actuarial present value of the additional pension provided may not exceed the actuarial present value of the additional pension provided under either the first or the second method.
As the proposal is a combination of approach 1) and 2), it can't satisfy the additional restriction.

3. Continued

Pre-Retirement Death Benefit:

Allowed pre-retirement death benefits are:

- A survivor pension equal in value to the benefits accrued to date of death; or
- Lump sum, payable to one or more beneficiaries, equal to the commuted value of the benefits accrued to date of death.

The proposed pre-retirement death benefits are allowed by provincial regulation.

4. 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:

Sources:
R-D112-10

R-D117-07

R-D126-09

Commentary on Question:
This question was intended to test candidates' knowledge of the differences in setting assumptions for closed and open group valuations. Credit was not awarded for discussing the basics of setting assumptions in general. A good candidate was expected to explain what considerations are made specific to open groups and closed groups and clearly identify them as specific to these groups. A good candidate would also identify specific situations that need to be considered under open group projections as well as which assumptions may be more material in either group.

Solution:
Compare and contrast setting the following assumptions for a point-in-time closed group valuation versus a 10-year open group projection valuation:

(i) salary increases;

(ii) termination scale;

(iii) retirement scale; and

(iv) new entrant profile.

(i) Salary increases:
- Valuation: only merit/seniority portion varies by age
- Valuation: assumption will vary by age but not year
- Projection: inflation/productivity assumption should reflect real world expectations
- Projection: assumption will vary by age and calendar year
- Projection: when multiple scenarios run, inflation/productivity portion will change

4. Continued

- Projection: assumptions used to get from one valuation date to the next

(ii) Termination scale:

- Valuation: based on experience if sufficient
- Valuation: often an ultimate expectation
- Projection: age and duration based assumption may be more accurate
- Projection: should take into account near future real world expectations
- Projection: example of event to take into account: layoffs
- Projection: example of event to take into account: recessive economy

(iii) Retirement scale:

- Valuation: often single age
- Valuation: could be graded rates by age
- Valuation: when early retirement is actuarial equivalent, no significant impact on liability
- Projection: near future real world expected events should be recognized
- Projection: near future expected events could have large impact on cash flows
- Projection: unexpected retirements affect cash flow greatly but not liability
- Projection: event that should be taken into account: early retirement windows

(iv) New entrant profile:

- Valuation: not required
- Projection: need to consider sex, age, starting salary, anything else material
- Projection: starting salary assumption varies each year
- Projection: new member profile can be extracted from data (young member averages)
- Projection: new member profile should not just be based on current data if recent events might have impacted like layoffs (i.e. based on real world expectations)
- Projection: has large impact on long term projection as existing members will decrement and population will be largely from this assumption

5. Learning Objectives:

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

Learning Outcomes:

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

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

(3c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding 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) Multi-employer pension plan valuations

Sources:

Pension Forum 9/2002 Asset Valuation Methods under ERISA, Chapters 1, 3, 4 and 5

CIA Education Note: Guidance on Asset Valuation Methods, November 2007

R-D614-11: CIA Consolidated Standards of Practice – Practice Specific Standards for Pension Plans 3100 – 3500 December 2010

Commentary on Question:

Candidates were expected to understand how to calculate a smoothed value of assets given two of the methods outlined in the reading. As well, they were expected to understand the reasons why a client would choose to use a smoothed asset value or fair market value of assets in their going concern valuations.

This question was answered moderately well. Most candidates received full marks for part (b) which was a list straight from the reading. It was, however, worth only 1 of the 10 total marks. Candidates did moderately well on part (a). Part (c) was very poorly answered. The majority of candidates did not understand the nature of the smoothing methods and did not have a firm grasp of how to employ them. The majority of candidates also spent time calculating amounts that were provided in the case study.

5. Continued

Solution:

(a) Describe the advantages and disadvantages of using a smoothed market value of assets ("SMVA") versus a fair market value of assets ("FVA") for the going concern valuation in light of your client's concerns.

Commentary on Question:
Many candidates provided the first advantage of a SMVA and expanded upon it at length without adding further advantages and disadvantages, not gaining any extra marks.
Some candidates discussed the contributions in recent years without considering what will happen going forward. However, the question specifically asked candidates to address the client's concern over future volatility of contributions. Points were given in cases where the candidate noted that the client's contributions in the near future are being driven by solvency concerns and special payments unless changes to the solvency rate occur.
It is understood that advantages of one asset valuation method could be listed as disadvantages of the other and gain equal marks.

Advantages

- SMVA moderates volatility of contributions because it defers investment gains and losses and so does not react as closely with short term fluctuations in investment values. FVA incorporates investment gains and losses as they occur as so reacts more acutely.
- SMVA can be helpful to measure value of those asset types with no viable market. In these cases, FVA would not be easily attained and may not be relevant.
- SMVA is more consistent with long term nature of a pension plan and should perform more consistently over the length of an economic cycle.
- SMVA can be applied at asset class level as appropriate.

Disadvantages

- FVA requires less disclosure in reporting.
- FVA is much easier to calculate in most cases and requires less administration.
- FVA more easily understood by clients, plan members and users of reports. Particularly, since the use of FVA means that going concern asset values will be the same as for solvency valuations.
- SMVA may not be appropriate for all asset types.

(b) Identify the desirable characteristics of an asset valuation method.

5. Continued

Commentary on Question:
This question required recall of a list straight from the material.

Desirable characteristics of an asset valuation method would include the following.

- The method should achieve the objectives desired by the sponsor for setting asset values at a level other than Fair Value of Assets.
- The method would develop numbers that have a reasonable and logical relationship to market value without unduly deviating from true market value. It should also track to market value over the long term.
- The method should generally be free from any ongoing bias.
- Employing an actuarial value of assets should have no undue influence on investment transaction decisions or vice versa,
- The method should take into account the length of a typical economic cycle, thereby acknowledging the long term nature of a pension plan.

(c) Calculate the 3-year smoothed market value of assets as at January 1, 2013 using:

(i) the Smoothed Market Value Without Phase-In asset valuation method; and
(ii) the Average Market Value Without Phase-In asset valuation method.
Assume all cash flows occur mid-year.

Commentary on Question:
For the Smoothed Market value, the majority of candidates unnecessarily calculated the gain/(loss) for each year. These values were provided in the case study and, while some calculated them correctly, a fair number of candidates made mistakes in the calculations (using an incorrect discount rate or making calculation errors) thereby losing marks for values that were given.
For Average Market Value, the majority of candidates used interest to develop the adjusted value of assets for each year. The basis of this method is that the market values be adjusted for actual cash flows paid into and out of the plan only, not that they be rolled forward. They are adjusted values, not expected values. Candidates that rolled forward the values were not awarded many points since they misunderstood the nature of the method.
Part (c)(i) of the English exam required "Without phase-in" whereas, the French exam required with phase-in. Either methodology was accepted.

FVA 1.1.2013 = $ 817,919 - *From Case Study (in 000's)*

5. Continued

Smoothed Market Value Without Phase-In
SMVA method incorporates a portion of each year's gain or loss into the actuarial value of assets. The portion incorporated is prorated based on the number of years since the gain or loss occurred and the number of years over which the AVA is averaged.

Year	**2011**	**2012**
Gain/(Loss) on investment - *From Case Study (in 000's)*	(32,670)	4,973

Actuarial Value of Assets = FVA 2013 - (1/3 x G/(L) 2011 + 2/3 x G/(L) 2012)

G/(L) incorporated in current year's AVA	(10,890)	3,315

AVA at 1.1.2013= $825,493

Average Market Value Without Phase-In
Average MV of assets averages the market values for past 3 years adjusted for actual cash flows between date of MV and valuation date.

Actuarial Value of Assets = (FVA 2013 + Adjusted VA 2012 + Adjusted VA 2011)/3
Adjusted VA = FVA at beg of year + All cash flows from then to current point

Year	**2011**	**2012**
MVA at beg of year - *From Case Study (in 000's)*	606,421	693,567
Adjustment to Fair Value of Assets to get to 1.1.2013	(156,500)	75,500
Adjusted VA at 1.1.2013	762,921	769,067

Actuarial Value of Assets at 1.1.2013 = $ 783,302

6. Learning Objectives:

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

6. The candidate will understand how to apply the regulatory framework in the context of plan funding.

Learning Outcomes:

Sources:
Canadian Pensions and Retirement Income Planning, Towers Watson, 4th Edition, Chapters 5, 7, 8 and 16

Morneau Sobecco: Chapter 7, 12

Commentary on Question:
This question tested candidate's knowledge of the Income Tax Act and the features that could be applied to encourage retirement savings while mitigating potential decreases in revenue. A well prepared candidate explained how the various tax sheltered options available under the Income Tax Act function as a means to encourage saving through their tax structure. While many candidates touched on the pre-tax vehicles, the majority of candidates did not mention the after tax vehicles available under the Income Tax Act. Many candidates also struggled to describe the limits imposed by the Income Tax Act in mitigating decreases in tax revenue.

Solution:
Describe the features of the Income Tax Act (Canada) that the government of ABC could adopt in order to meet these objectives.

Some of the features of the Income Tax Act in Canada that the government of ABC could adopt in order to encourage retirement savings are:

The current Canadian structure offers pre-tax vehicles such as a RPP DB or DC pension plans and RRSPs to provide tax advantages on retirement savings to both employer and employees

- Employer contributions to the plans are tax deductible
- Employee contributions to the plans are tax deductible
- Employer contribution to members' retirement accounts are not considered taxable benefits/income
- Investment income is tax-free until withdrawal is made
- Unused tax-free contribution room can be carried over to future years to provide more flexibility
- Funds can be transferred into other tax-sheltered vehicles or used to purchase annuities on a tax-free basis

6. Continued

The current structures also encourage people to save on after-tax income through Tax Free Savings Accounts (TFSA).

- Investment income does not attract any tax
- Unused TFSA room is carried over to future years
- Withdrawals are added back to TFSA room (i.e.: room is restored)

Some of the features of the Income Tax Act in Canada that the government of ABC could adopt in order to mitigate potential decreases in tax revenue are:

For tax-sheltered vehicles / pre-tax vehicles:

- Set limit on the maximum deductible employer contribution and maximum employee contributions to limit tax revenue losses and to avoid company use of pension as a "tax deferral" tool
- Set limits on maximum tax deferral room/RRSP room (full credit also given for candidates who mentioned PAs reduce RRSP room)
- Set limits on the maximum benefit accrued in tax-sheltered vehicles to limit the pension payable to high-earners
  - Limit the maximum pension accrual per year (dollar limit or % of pay)
- Set limits on the maximum value that can be transferred on a tax-free basis

For TFSA:

- Set limits on the maximum contributions that can be remitted to after-tax saving vehicles/TFSAs to encourage saving, while avoiding using the TFSA as a tool to defer tax

7. 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, Third Edition, 2006, Chapter 2.

Commentary on Question:

A well prepared candidate will be able to calculate unfunded accrued liability and normal cost using the Unit Credit cost method. They will also be able to calculate and reconcile the gain/loss resulting from various experience items and be able to identify the sources of change in the normal cost from one valuation to the next.

Solution:

(a) Calculate the normal cost and the unfunded actuarial liability as at December 31, 2013.

Commentary on Question:

Overall, candidates performed quite well on this part of the question. Some candidates confused the Unit Credit method with the Projected Unit Credit Method and/or didn't understand the career-average benefit formula.

$$\text{UC } AL_x = B_x \times [0.5 \times \ddot{a}_{55}^{(12)} \times v^{(55-x)} \times (1\text{-Early ret reduction}_{55}) + 0.5 \times \ddot{a}_{65}^{(12)} \times v^{(65-x)}]$$

$$\text{UC } NC_x = \Delta B_x \times [0.5 \times \ddot{a}_{55}^{(12)} \times v^{(55-x)} \times (1\text{-Early ret reduction}_{55}) + 0.5 \times \ddot{a}_{65}^{(12)} \times v^{(65-x)}]$$

$$AL_{2013} = 10{,}000 \times 0.5 \times [15.0 \times v^{15} \times 0.7 + 12.5 \times v^{25}]$$
$$= 43{,}710$$

$$NC_{2013} = .015 \times 100{,}000 \times 1.03 \times 0.5 \times [15.0 \times v^{15} \times 0.7 + 12.5 \times v^{25}]$$
$$= 6{,}753$$

$$UAL_{2013} = AL - F$$
$$= 43{,}710 - 50{,}000 = (6{,}290)$$

(b) Calculate the unfunded actuarial liability as at December 31, 2014.

Commentary on Question:

Overall, candidates performed quite well on this part of the question.

7. Continued

AL_{2014} = (10,000 + .015 x 101,000) x 0.5 x [15.0 x v^{14} x 0.7 + 13.9 x v^{19} x 0.85]
= 57,453

F_{2014} = 50,000 + 10,000 = 60,000

UAL_{2011} = 57,453 – 60,000 = (2,547)

(c) Calculate the gains and losses by source for 2014.

Commentary on Question:
Many candidates were able to identify and calculate most of the sources of gain and loss. A number of candidates missed some sources of gain/loss and/or failed to check that these reconciled with the change in the unfunded accrued liability.

Exp'd UAL = (6,290) x 1.05 = (6,605)

Gains/(Losses)= (6,605) – (2,547) = (4,058)

Gain on contribution:
Gain = 10,000 – 6,753 x 1.05
= 2,909

Loss on fund return:
Exp'd F_{2014} = 50,000 x 1.05 + 10,000
= 62,500
Loss = 62,500 – 60,000 = 2,500

Loss on assumption change:
AL_{2014} (old ass) = 57,453 x 0.5 x [15.0 x v^{14} x .7+12.5 x v^{24}]/[15.0 x v^{14} x 0.7+13.9 x v^{19} x .85]
= 52,848
Loss = 57,453 – 52,848 = 4,605

Gain on salary increase:
Exp'd AL_{2014} = (57,453 + 6,753) x 1.05
= 52,986
Gain = 52,986 – 52,848 = 138

Check:
Gains/(Losses)= 2,909 – 2,500 – 4,605 + 138
= (4,058)

8. Learning Objectives:

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

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

Learning Outcomes:

(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.

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

(5k) The candidate will be able to describe and apply regulation pertaining to coordination of individual and employer sponsored retirement plans.

Sources:

Canadian Pensions and Retirement Income Planning, 4th Edition, Towers Watson, Chapter 18, pgs. 390 – 393

CIA Consolidated Standards of Practice – Practice Specific Standards for Pensions Plans 3100-3500

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Identify the criteria that would cause a plan to be a designated plan under the Income Tax Act (Canada).

Commentary on Question:

Good responses identified the Income Tax Act definition and noted some, but not all, of the exemptions, and noted that exemptions were subject to approval of the minister.

A general error was a materially incorrect or incomplete definition of the Income Tax Act definition. A general omission was identifying that an exemption exists and several of the exemption criteria.

8. Continued

A designated plan is a defined benefit registered pension plan that is:

- Not maintained pursuant to a collective bargaining agreement, and
- The total of the pension credits of all:
  - Connected persons, or
  - For persons whose income for the year exceeds 2.5 times the YMPE,

under all defined benefit provisions of the plan for the year is more than 50% of the total of the pension credits of **all** individuals under the defined benefit provisions of the plan for the year.

The ITA contains a provision that allows a "normal" defined benefit plan to be exempted, with approval of the Minister, from being considered a designated plan, where "normal" means:

- The benefit formula does not vary by member
- There is no member involvement in the decision making regarding the amount of contributions made in respect of the members
- There is no member control over the investment of any portion of the plan assets
- Surplus is not tracked individually for each member

(b) The following are some of the prescribed assumptions for a Maximum Funding Valuation. Describe how you would evaluate the appropriateness of these assumptions for the purpose of a going concern funding valuation.

Commentary on Question:
Good responses identified that going-concern assumptions are to be best estimate and provided considerations for each assumption (i.e., describe how you would evaluate).

General errors were to: evaluate the assumptions (e.g., the discount rate of 7.5% is too high), state that margins are required in the discount rate without acknowledging that margins are only included if required by law or by the terms of the engagement. General omissions were to not identify:

- *The best estimate requirement*
- *The plan's definition of pensionable earnings in evaluating the salary scale*
- *Measures of inflation other than Bank of Canada target range*
- *Early retirement subsidies*
- *Contingent benefits*

8. Continued

When conducting a funding valuation on a going concern basis, as per CSOP, the actuary should

- Select best estimate assumptions, modified to incorporate margins for adverse deviations, to the extent, if any, required by law or by the terms of an appropriate engagement. Best estimate means without bias, neither conservative nor unconservative.
- Consider all benefits of which the actuary is aware, including contingent benefits, payable under the plan and should include provision for all such benefits expected to be paid while the plan is ongoing unless: the law requires the valuation to exclude such benefits; or the law permits the exclusion of such benefits and the terms of an appropriate engagement stipulate that the actuary exclude such benefits.

At the date of the valuation, I would evaluate the appropriateness of each assumption for the purpose of a going concern funding valuation as follows:

<u>Discount rate of 7.5% per annum</u>

A best estimate discount rate assumption may either:

- Take into account the expected investment return on the assets of the plan at the valuation date and the expected investment policy after that date; or
- Reflect the yields on fixed income investments, considering the expected future benefit payments of the pension plan and the circumstances of the work.

I would also assume that there will be no additional returns achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy except to the extent that I have reason to believe, based on relevant supporting data, that such additional returns will be consistently and reliably earned over the long term.

<u>Salary Scale of 5.5% per year</u>

A best estimate salary scale assumption considers:

- The pension plan's definition of pensionable earnings, which may include:
  - Base earnings/salary,
  - Overtime,
  - Commissions,
  - Bonuses,
  - A cap on pensionable earnings,
  - Etc.

8. Continued

- The pension plan's treatment of pensionable earnings for different classes of active members
  - Executive vs. non-executive
  - Salaried vs. hourly
  - Long-term disability
  - Leave of absence
  - Etc.
- The building-block approach, which consists of:
  - General inflation; plus
  - Increase in real wages in the general population; plus
  - Merit/promotional increases expected to be provided to the active members

Inflation of 4.0% per year

A best estimate inflation rate assumption considers 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)

Post-Retirement Mortality of 80% of GAM83 rates

A best estimate post-retirement mortality assumption that considers published base mortality tables and mortality improvement scales, adjusted for:

- Sector adjustments: Adjusting for public vs. private sector employment
- Collar adjustments: Adjusting for blue collar vs. while collar employment

Retirement age 65

A best estimate retirement age assumption may consider the retirement pattern of former active members (i.e., experience) and the anticipated retirement pattern of the active members, and consider the following:

- The normal retirement age of the plan (which could be different than age 65)
- The early retirement subsidies provided in the plan (e.g., bridge benefits, reductions for commencement of pension prior to normal retirement age that are less than actuarial equivalence)
- The impact of contingent benefits, if any, that grant the administrator or employer the right to improve the benefits payable to a member retiring from active employment above those that would otherwise be paid under the plan; and the past experience and future expectations relating to the administrator or employer granting such benefits

8. Continued

(c) Calculate the minimum and maximum employer contributions for 2013 assuming immediate commencement of special payments.

Commentary on Question:
Good responses determined the minimum contributions as if the designated rules did not apply (e.g., going concern and solvency special payments), and determined the maximum contribution amounts given the designated plan status.

General errors were to: exclude the present value of 5 years of going concern special payments in determining the solvency special payments, and incorrectly apply the maximum funding valuation rules. General omissions were to not show all work.

Summary of Financial positions

Financial Position at January 1, 2013	Going-concern	Solvency	Maximum Funding
Market value of assets	$1,050,000	$1,050,000	$1,050,000
Liability	$1,100,000	$1,500,000	$900,000
Surplus (deficit)	($50,000)	($450,000)	$150,000

Determination of Maximum contribution for 2013

Maximum contribution under GC
= GC normal cost for 2013 plus GC deficit at January 1, 2013
= $73,000 + $50,000
= $123,000

Maximum contribution under MFV
= MFV normal cost for 2013 plus MFV deficit at January 1, 2013
= $60,000 + $0
= $60,000

Maximum contribution
= lesser of maximum contribution under GC and maximum contribution under MFV
= min($123,000 , $60,000)
= $60,000

8. Continued

Determination of Minimum contribution

Minimum contribution
= GC normal cost for 2013
+ GC unfunded liability special payments funded in monthly installments over 15 years (see determination below)
+ solvency special payments funded in monthly installments over 5 years (see determination below);
the total of which cannot exceed the maximum contribution

= Minimum ($73,000 + $4,854 + $92,972 , $60,000)
= Minimum ($170,826 , $60,000)
= $60,000

GC unfunded liability special payments funded in monthly installments over 15 years

= GC deficit / $a^{(12)}_{15\ (going\text{-}concern)}$
= $50,000 / 10.3
= $4,854

solvency special payments funded in monthly installments over 5 years

= Solvency deficit less present value on a solvency basis of 5 years of GC unfunded liability special payments / $a^{(12)}_{5\ (solvency)}$
= ($450,000 – $4,854 x 4.6) / 4.6
= $92,972

9. Learning Objectives:

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

Learning Outcomes:

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

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

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

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

(5f) The candidate will be able to describe and apply regulation pertaining to plan merger or spin-off.

(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.

(5k) The candidate will be able to describe and apply regulation pertaining to coordination of individual and employer sponsored retirement plans.

Sources:

FSCO Policy

R-D101-07

R-C6060-07

Commentary on Question:

This question asked candidates to demonstrate an understanding of the key issues to be considered when converting a DB plan to a DC plan. While it was not necessary to know the particular rules of particular jurisdictions, the candidate was expected to know that some considerations did not apply to all jurisdictions. Note that some considerations were worth more points in the grading than others, depending on their significance.

9. Continued

Solution:
Describe the regulatory considerations for converting a defined benefit pension plan to a defined contribution pension plan.

1. Conversion does not create "portability" rights, i.e. into a locked-in vehicle (such rights are only available upon termination or wind-up).
2. Conversion cannot reduce benefits accrued up to date of conversion.
3. Commuted value of benefits converted from DB to DC cannot be less than value of benefits if member terminated at the date of conversion.
4. The actuary must prepare actuarial report outlining impact of the conversion on the funded status and future contributions.
5. Affected members must receive notice of the conversion.
6. Conversion is subject to approval by regulatory authorities.
7. For some provinces such as Alberta, plans whose members' benefits are based on a FAE and convert, plan sponsor must include a reasonable projection of salaries in conversion value. This salary increase must be consistent with economic assumptions used to calculate the conversion value.
8. Some jurisdictions do not allow employers to force members to convert DB benefits into DC account balances.
9. If the plan is in deficit, sponsors must fund deficit over specified amount of time which varies by jurisdiction.
10. In some jurisdictions, members who have not yet met the eligibility requirements for ancillary benefits, are entitled to receive the value of these ancillary benefits upon conversion based on assumed probability that they would have received such benefits had the plan not been converted.
11. The assumptions used to calculate CVs and to project salaries must be reasonable and acceptable to CRA.
12. If the CV of past service DB benefits exceed ITA maximum transfer limits, the excess amount must be paid in cash, and be subject to income taxes.
13. If there is no further DB accrual, the regulators may force a wind up of the legacy plan.
14. The plan sponsor still retains fiduciary duties in respect of the new DC plan.
15. The plan sponsor can purchase annuities in satisfaction of the accrued benefits for members choosing not to commute past service.

10. 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.

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

Learning Outcomes:

(1b) Assess data quality.

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

(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 Guides to Professional Conduct.

(7c) Explain and apply relevant qualification standards.

(7d) Demonstrate compliance with requirements regarding the actuary's responsibilities to the participants, plans sponsors, etc.

Sources:

ASOP 4, ASOP23, CIA Standards of Practice, SOA Code of Conduct

Commentary on Question:

Candidates should approach this question as if they were the client's actuary and make sure to consider all areas of concern that the client may have. Clients should be able to trust the actuary to always act within his professional code of conduct, and to clearly communicate to the client the implications upon uncovering significant data revisions. Clients would not just be interested in the implications on the liabilities, but also in how changes in valuation results could potentially affect their business operations, for example contribution requirements (which includes normal cost contributions) and frequency of valuation filings, etc. More specific commentary is provided for both parts (a) and (b) below.

Solution:

(a) Describe an appropriate course of action with respect to the January 1, 2013 funding valuation taking into consideration professional standards.

10. Continued

Commentary on Question:
Some candidates did not fully address the question asked, and instead recited lists related to general data review. Many candidates did not comment explicitly that communication with the client regarding the impact and materiality of the data changes on the valuation results was necessary. The question explicitly suggested considering professional standards in responding to this question, however some candidates did not address that they should act honestly and professionally, and ensure control of work product.

Act honestly and professionally and communicate to the client that the results are wrong and new valuations may be required based on the revised data.

Need to follow ASOP 23 and check new data and determine if such data appear reasonable and consistent for purposes of the assignment.

Reliance on Data Supplied by Others—The accuracy and comprehensiveness of data supplied by others are the responsibility of those who supply the data, however actuary should disclose such reliance in an appropriate actuarial communication and describe steps taken to assess appropriateness of data for purposes of the assignment.

Evaluate the reasonableness of the assumptions in light of the revised data.

Control of work product – take reasonable steps to ensure services are not used to mislead.

Look into source of error to avoid this happening again.

Address materiality of the data changes – should consider filing the valuation report to include revised results of the change are material, or include wording in the report disclosing that data revisions were received and because of its immateriality, were not reflected for purposes of this report and will be captured in subsequent valuations.

(b) Evaluate the potential impact of the revised data on the January 1, 2013 funding valuation results (no calculations required).

10. Continued

Commentary on Question:
Most candidates only addressed the impact of these data changes on the liabilities, and did not address the impact on normal cost or gain and loss. Candidates generally showed understanding of how the liabilities would be impacted. Some common mistakes were:

- *Candidates addressed that the gain and loss would need to be revised, but did not address the expected movement of the gain and loss due to each data change.*
- *Candidates attempted to quantify the percentage changes to expect, however it was specified in the question that no calculations were required so no additional marks for doing so were given.*
- *Candidates summarized the changes in the data statistics however it was only necessary for candidates to describe the impact on the valuation results of the changes.*

Overall reduction in headcount → lower liabilities and normal cost all else being equal as there are fewer members in the plan

Increases in average age and service for actives → all else being equal would result in higher liabilities and normal cost (higher accrued pensions, and closer to retirement (fewer years of discounting)).

Fewer retirements → would decrease liabilities. Retirement loss may become a retirement gain. Plan has early retirement subsidy so retirements are expected to be costly to the plan.

Decreases in average salary → all else being equal would result in lower liabilities and normal costs due to lower accrued benefits. Salary gain would increase.

Fewer non-vested terminations → would result in higher liabilities as there are fewer exits from the plan.

More lump sum cash outs → The amount of lump sum cash out is based on the prescribed CIA commuted value basis. Impact on liabilities is uncertain due to counterbalancing impact of removing salary escalation. For younger members with more years of salary projection liabilities may exceed lump sum cash out basis. For older members with fewer years of salary projection, lump sum basis may exceed liabilities.

Fewer retiree/beneficiary deaths → would increase liabilities. Mortality gain may become a mortality loss.

10. Continued

Average age of retirees increased → Decrease in liability due to fewer remaining payments.

Average annual benefit of retirees decreased → Decrease in liability due to lower benefit being paid out.

Overall it's difficult to assess whether liabilities, gain and loss, and contribution requirements would increase as a result of the above items. Other valuation results to consider include the transfer ratio, solvency ratio (that determines the frequency of valuations), and Ontario Pension Benefits Guarantee Fund assessment fees.

11. 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, Third Edition, 2006

Commentary on Question:

In this question, candidates were asked to calculate going concern accrued liability and wind up liability. A well-prepared candidate would have been able to:

- *Determine going concern accrued liability*
- *Apply actuarial equivalency test to determine the maximum early retirement factor*
- *Recognize that under wind up, member who has 55 points and 10 years of service grows into bridge and early retirement subsidies and identify age 55 as best age*

Candidates did well on part (b) in calculating wind up liability, recognizing grow in and best age. However, most candidates failed to apply actuarial equivalency test to determine the maximum early retirement factor. A good paper would show all steps of the work and the formulas used in deriving the answers.

Solution:

(a) Calculate the accrued liability as at January 1, 2013.

Member A

$AL = 1.5\% \times 50{,}000 \times (1.03)^{(60-25-1)} \times 1 \times [85\% \times \max(90\%, {}_{35|}a_{25}/{}_{35|}a_{25:22}) \times {}_{35|}a_{25:22} + 15\% \times {}_{35|}a_{25}] \times (1 - 0.03 * 5) + 200 \times 1 \times {}_{35|}a_{25:5}$

$= 1.5\% \times 50{,}000 \times 1.03^{34} \times 1 \times [85\% \times 3.9/4.3 \times 4.3 + 15\% \times 3.9] \times 0.85 + 200 \times 2.0$

$= 7{,}192$

Member B

$AL = 1.5\% \times 75{,}000 \times (1.03)^{(60-45-1)} \times 10 \times [85\% \times \max(90\%, {}_{15|}a_{45}/{}_{15|}a_{45:42}) \times {}_{15|}a_{45:42} + 15\% \times {}_{15|}a_{45}] \times (1 - 0.03 * 5) + 200 \times 10 \times {}_{15|}a_{45:5}$

$= 1.5\% \times 75{,}000 \times 1.03^{14} \times 10 \times [85\% \times 90\% \times 9.5 + 15\% \times 8.5] \times 0.85 + 200 \times 10 \times 2.5$

$= 128{,}560$

Total AL = 7,192 + 128,560

= 135,752

11. Continued

(b) The plan was wound up on January 1, 2013. Determine the wind-up liability for each member as at the wind-up date assuming the wind-up discount rate is 4% per annum for all members.

Member A

Can't grow into early retirement subsidies/bridge since has less than 55 points

$AL = 1.5\% \times 50{,}000 \times 1 \times [85\% \times \max(90\%, {}_{40|}a_{25}/{}_{40|}a_{25:22}) \times {}_{40|}a_{25:22} + 15\% \times {}_{40|}a_{25}]$

$= 1.5\% \times 50{,}000 \times 1 \times [85\% \times 2.8/3.1 \times 3.1 + 15\% \times 2.8]$

$= 2{,}100$

Member B

55 points and more – can grow into bridge and age 55 is the best age

$AL = 1.5\% \times 75{,}000 \times 10 \times [85\% \times \max(90\%, {}_{10|}a_{45}/{}_{10|}a_{45:42}) \times {}_{10|}a_{45:42} + 15\% \times {}_{10|}a_{45}] \times (1 - 0.03 * 10) + 200 \times 10 \times {}_{10|}a_{45:5}$

$= 1.5\% \times 75{,}000 \times 10 \times [85\% \times 11.2/12.3 \times 12.3 + 15\% \times 11.2] \times 0.7 + 200 \times 10 \times 5.5$

$= 99{,}200$

12. Learning Objectives:

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

Learning Outcomes:

(3e) Calculate actuarially equivalent benefits.

Sources:

Pension Mathematics for Actuaries, Anderson, Third Edition, 2006

Commentary on Question:

In general this question was very well answered. Candidates should be able to calculate a joint survivor 50% factor, as well as a joint survivor factor with a pop up provision. Candidate should show understanding by writing out the formula of these factors.

Solution:

Calculate K.

Let $a_x = \ddot{a}_x^{(12)}$ – single life
Let $a_{xx} = \ddot{a}_{xx}^{(12)}$ – joint life
Then,
$\$2,000 * 12\ a_x = \$312,000$

We need to calculate the value of a_{xx}. From the 50% joint & survivor pension, we get that

$\$312,000 = \$1,800 * 12 * a_x + \$1,800 / 2 * 12 * (a_x - a_{xx})$
$= \$1,800 * 12 * 13 + \$1,800 / 2 * 12 * (13 - a_{xx})$
$a_{xx} = 10.111$

Then, for the pop-up provision we have:

$\$312,000 = (\$2,000 - K) * 12 * a_x + (\$2,000 - K) * 12 * (a_x - a_{xx}) + K * 12 * (a_x - a_{xx})$
$= (\$2,000 - K) * 12 * a_x + \$2,000 * 12 * (a_x - a_{xx})$
$= (\$2,000 - K) * 12 * 13 + \$2,000 * 12 * (13 - 10.111)$
$= \$312,000 - K * 12 * 13 + 69,333.33$
$K = \$444.44$