RET FRC Model Solutions
Fall 2014

1. Learning Objectives:

1. The candidate will understand how to analyze data for quality and appropriateness.

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.

Sources:

ASOP 23 – Reliance on Data Supplied by Others

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List the professional standards requirements to consider in reviewing the data.

Commentary on Question:

Candidates generally did well on this question. A few candidates confused this question with part (b). Marks were also awarded for specific examples of data checks

Review data for reasonableness.
Identify questionable data
Should review prior data and current data for consistency if similar work has been previously performed
Should disclose reliance
The actuary should take into account the extent of any checking, verification, or auditing that has already been performed on the data
Should make an effort to determine the definition of data used in the analysis

Ensure the data is relevant for the valuation purposes

1. Continued

(b) Describe the appropriate actions when working with defective data.

Commentary on Question:
Most candidates were able to list out the broad approaches – eg. Request new data where possible, make assumptions and adjustments, and decline if no reasonable data can be procured. They generally missed out on the applicable disclosure requirements.

Request additional data if it is practical
Apply judgmental adjustments or assumptions
Should arrange for a more extensive review
Obtain different data or decline to complete the assignment if data are inadequate
Describe and disclose any modifications or adjustments made to the data, including the rationale for making those adjustments/modifications
Disclose any limitations on the results due to the uncertainty about the quality of the data
Disclose any unresolved concerns on the data that may have a material impact on the results
Disclose any deviations from standard
Disclose any potential bias
Describe any material defects in the data

c) List the information required to perform the funding valuation in addition to the membership data.

Commentary on Question:
Note that the question asks for "information" required to perform the valuation. Some candidates spend time writing about things like cost methods and assumptions needed for the valuation instead.

Asset data and elaborate (e.g. trust statements, market value, etc.)
Plan provisions (including all amendments)
Prior valuation report
Other miscellaneous – SIP&P, reciprocal transfer agreement, prior partial windup report etc

2. Learning Objectives:

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

Learning Outcomes:

(5d) The candidate will be able to describe and apply regulation pertaining to plan termination/wind-up.

Sources:

FR-112-13: Filing Requirements and Procedure on Full or Partial Wind up of a Pension Plan.

Application by Employer for Payment of Surplus on Full Wind Up of a Pension Plan

Commentary on Question:

Part A of the question was generally well answered. Part B was not answered very well, as candidates instead explained things that dealt with surplus other than how the employer would obtain approval from the Financial Services Commission of Ontario (FSCO) to distribute all of the surplus to ABC.

Solution:

(a) Describe the process for winding up a registered pension plan in Ontario.

Commentary on Question:

This part of the question was well answered in general. Some candidates did not address funding of the deficits, as the question was to describe the process in general as opposed to with respect to ABC.

The process for winding up a registered plan in Ontario is:

- First the employer must declare the wind up of the pension plan
- Give notice of intention to wind up the pension plan
- Prepare and file wind up report and other wind up documentation within 6 months of the wind up date
- Send Wind up benefit statements & wind up option election forms to members
- No benefits payments should be made to affected members until the wind up report is approved by the Superintendent
- Approval of the wind up report by the Superintendent for the payment of basic benefits
- If the pension plan has a funding deficit on the wind up date, full funding of the deficit
- File annual reports and make special payments until the plan is fully funded
- If there is a surplus issue to address, the Superintendent will approve only the payment of basic benefits until surplus disposition has been determined
- Distribution of benefits in accordance with the wind up report and the options elected

2. Continued

- Address surplus issue to address, if there is any surplus remaining in the pension plan
- De-registration of the pension plan within 30 days of final distribution of the assets

(b) Describe the process to obtain approval from the Financial Services Commission of Ontario (FSCO) to distribute all of the surplus to ABC.

Commentary on Question:
This part was not well answered in general. Many candidates discussed the process for providing the members with the surplus, or described the process for determining the surplus, as opposed to the distribution of the surplus.

First the employer must demonstrate they have surplus entitlement. They can do this by providing documents that create and support the pension plan and pension fund govern the entitlement of the employer. The employer would also need to demonstrate that the plan has a surplus based on reports provided to the Superintendent.

The employer would also need to transmit notice of the application members, former members and any unions.

Lastly the employer would need to transmit notice of application with prescribed information to the Superintendent by personal delivery, first class mail or advertisement.

The materials to be included with the application:

- a list of the names of members, former members or other persons affected by wind up
- certified copy of the Surplus Notice
- a statement that the employer has complied with PBA
- complete copy of all plan and trust documentation from
- proposed surplus distribution agreement between employer and members
- copy of the most recent collective agreements
- disclosure as to whether or not the surplus application affects members, former members or other persons with employment other than a jurisdiction Ontario

3. 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.

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, 4th Edition

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

Commentary on Question:

A well prepared candidate will be able to calculate the pension amount and commuted value, as well as the portion of the commuted value that can be transferred to a registered vehicle. They will also be able to describe the implications of deferring retirement one year (or demonstrate this by calculation).

Solution:

(a) The member retires on December 31, 2014.

Calculate the member's immediate pension amount and the commuted value of the pension.

Show all work.

Commentary on Question:

Most candidates were able to correctly determine the immediate pension amount (some candidates did not calculate the maximum pension correctly and some only calculated the maximum pension and not the Plan's pension). However, many candidates did not calculate the commuted value properly, as they did not use the age which produces the maximum value.

3. Continued

ITA years of reduction = min [years to age 60, years to 30, years to 80 points]
= min [4, 10, 2] = 2

ITA max pension = \$2,770 × 20 × (1 – 3% × 2 years) [since 2% HAE > DB \$limit] = \$52,076

Immediate pension = min [1.5% × \$260,000 × 20 × (1 – 6% × 6 years), ITA max]
= min [\$49,920, \$52,076]
= \$49,920

Commuted Value – determined at retirement age which produces maximum value

Age	Formula Pension	Max Pension	Min	Factor $v^{(x-56)} \times \ddot{a}_x^{(12)}$	Value (Min×factor)	
56	\$49,920	\$52,076	\$49,920	18.50	\$923,520	
57	\$54,600	\$53,738	\$53,738	17.58	\$944,958	
58	\$59,280	\$55,400	\$55,400	16.62	\$920,554	Over max
59	\$63,960	\$55,400	\$55,400	15.78	\$874,433	thereafter

Maximum value at age 57 = \$944,958

(b) Calculate the portion of the member's commuted value that could be transferred to a registered tax-sheltered vehicle.

Show all work.

Commentary on Question:
Overall, candidates performed quite well on this part of the question. However, some candidates did not use the 'normalized' pension in this calculation.

Transfer value = 'normalized pension' × maximum transfer value factor

where 'Normalized pension' = min [1.5% × \$260,000 × 20, \$2,770 × 20]
= min [\$78,000 , \$55,400]
Max Registered Transfer value = \$55,400 × 10.6
= \$587,240

(c) Describe the implications to the member of deferring retirement to December 31, 2015 assuming no change in salary or tax limits during 2015.

3. Continued

Commentary on Question:
Candidates did not perform quite as well on this part of the question. Some candidates' responses contained only one or two points or omitted this section entirely.

- Deferring retirement results in higher pension amount due to an additional year of service and a lower reduction for early retirement
- (increase in average earnings doesn't impact this, since already over ITA maximum by 2015)

- The value of the pension is also higher, if the member defers retirement for a year, since the increase in the pension amount more than offsets the reduction in the annuity factor (due to fewer years of payments)

- The member has to assess the tradeoff of working another year (and receiving an additional year of salary and an increase in pension amount and value) versus not working (and receiving a lower pension)

- The actual cost of not working is higher than just one year of earnings, since the increase in pension value is more than one year of pension payments

4. Learning Objectives:

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

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

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.

(7c) Explain and apply relevant qualification standards.

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

Sources:

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

CIA CSOP 1220

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List your professional obligations with respect to the application of educational notes.

Commentary on Question:

The majority of candidates did not score well on this part of the question. Many candidates discussed general professional obligations (for example that it is important to ensure that the work is not misleading, and to act with professional integrity, etc.) as opposed to addressing an actuary's application of educational notes specifically.

As outlined in subsection 1220 of the CIA Standards of Practice:

- The actuary should be familiar with relevant Educational Notes and other designated educational material.
- Educational Notes and other designated educational material describe but do not recommend practice in illustrative situations.

4. Continued

- A practice that the Educational Notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation.
- The Educational Notes are intended to illustrate the application (but not necessarily the only application) of the standards, so there should be no conflict between them. By comparison, research papers and task force reports may or may not be in compliance with the standards. In any case, the Educational Notes are not binding.

(b) Describe the considerations for selecting an appropriate mortality assumption consisting of:

- the base table;
- the projection scale; and
- any other adjustments.

Commentary on Question:
The majority of candidates were able to list several considerations for selecting appropriate mortality assumptions. However, many candidates did not elaborate or provide more in-depth discussion about the listed considerations. In addition, many candidates commented on generational projection scales, without making mention that there are two-dimensional as well as one-dimensional generational projection scales.

When selecting a mortality table assumption, should select best estimate for plan under review (as there is no one standard mortality table that would apply to all plans). Two key components to the selection of best estimate mortality assumption (the two are usually considered separately):

- Best estimate of current rates of mortality for the plan; and
- Appropriate adjustments for future improvements in mortality

Considerations for current levels of mortality:

- Plan's actual mortality experience (where available)
  - Weighting experience based on benefit amount vs. number of lives yields more appropriate results
  - Effect of base year – when assessing gain/loss, consider effect of any projections built into the mortality rates
  - Basis of comparison – in comparing plan experience with a published mortality table, the analysis of the plan under review would mimic, to the greatest extent possible, the development of the published mortality table

4. Continued

- Credibility of plan experience
- Experience of similar plans
- Published mortality studies
  - Most helpful if plan experience is not credible
  - In general, it would normally be inappropriate to use mortality tables derived from general population or from individual annuitant data
- Possible adjustments for plan characteristics such as:
    - Collar type (higher rates of mortality for blue collar vs. white collar)
    - Industry (higher rates of mortality for private sector vs. public sector)
    - Pension size (higher rates of mortality for pensioners receiving smaller pensions)
  - No adjustments required if
    - Characteristics of the plan are not significantly different from the composite data used to prepare the published mortality table
    - No credible plan experience which suggests that actual experience is different from underlying base tables
    - Plan mortality rates are set based on fully credible experience weighted based on benefit amount or liability, as the impact of these characteristics would be implicit in the experience study results
  - Adjustments to published tables for plan characteristics typically considered if no credible experience is available and the attributes of the plan are significantly different from the composite data used to prepare the published mortality table
  - Caution when deriving adjustments for variations in more than one plan characteristic at the same time, as the combined effect may overstate or understate the actual relationship – should instead look at characteristic separately
  - Graduation of rates may be useful for purposes of smoothing mortality rates so that rates progress in a reasonable pattern from age to age
- If best estimate of current levels of mortality is derived from analysis of actual experience, appropriate adjustments would be made to project the mortality rates to the valuation date

Considerations for adjustments for future improvements in mortality:

- Three elements in development of best estimate of future mortality improvements
  - Short-term rate based on recently observed improvement rates and ultimate long-term improvement rate, which is highly uncertain
  - Transition from short-term to ultimate improvement rates over a certain period and based on a particular pattern

4. Continued

- Three common methods of providing adjustments for future improvements:
  - Two-dimensional (2-D) generational mortality tables
    - Vary by year and age
    - Typically appropriate in absence of credible information to the contrary, such as publication of a successor table by CIA
  - One-dimensional (1-D) generational mortality tables
    - Vary by age only
    - Simplifies calculations required under valuation systems and acceptable if it satisfactorily approximates the financial effect of an appropriate 2-D scale
    - May also be appropriate if actuary believes that no transition is required
  - Static mortality tables with a fixed projection period
    - This is the historical approach, and with advances in technology, static projections no longer needed, as shortcomings include
    - Current service costs and/or allocation of actuarial liabilities by cohort or membership category may be inappropriate
    - Assumption will generally need to be updated at each subsequent valuation to reflect new base year mortality rates and revised projection periods to reflect any change in liability duration
- Actuary would give consideration to emerging mortality improvement trends and studies on a regular basis, and to whether future improvements are expected to differ from past trends

Special situations include
- Pre-retirement mortality
- Disabled life mortality

(c) Recommend changes to the going concern mortality assumptions for the Full-Time Hourly Union Pension Plan and the Full-Time Salaried Pension Plan.

Justify your recommendations.

Commentary on Question:
The question asked candidates to provide their mortality assumption recommendations, however many candidates simply made general comments about a variety of different mortality assumptions without providing a clear recommendation. Other candidates made a recommendation, however the recommendation was not specific enough, for example recommending simply the CPM base table and not specifying which one (i.e., private, public, or combined). Note that candidates received marks for providing their recommendations with appropriate justification, regardless of what the recommendation was (i.e., the recommendations outlined in this model solution are just an example of what would have earned a candidate full marks).

4. Continued

Some candidates stated that there were mortality gains seen over the past few years, however did not elaborate on what conclusions were drawn from these observations.

<table>
<tr><th></th><th>Hourly Plan</th><th>Salaried Plan</th></tr>
<tr><td>Credibility – size of plan</td><td>Mid-size plan with 1,000+ retirees – mortality experience would generally not be fully statistically credible however significant trends may be observed to select appropriate published mortality tables, develop broad adjustments to such tables, or different adjustment factors may be used for a range of ages.

Since lacking fully-credible experience, the actuary may consider using experience from other similar plans to adjust the base table.</td><td>Small plan with 100+ retirees – insufficient to conduct a credible mortality experience study but useful to examine mortality experience gain/loss.

Since lacking fully-credible experience, the actuary may consider using experience from other similar plans to adjust the base table.</td></tr>
<tr><td rowspan="2">Past valuation mortality gains/losses</td><td>Past four valuations revealed gains, demonstrating more members died than expected, indicating that the GAM94 table’s mortality rates are better than exhibited by the Hourly plan participant population.

As seen through the past valuation mortality gain/loss figures, there are consistent gains year over year, however they are of varying sizes relative to the retiree liability, so no real trend can be seen</td><td>Past four valuations revealed small gains and losses, demonstrating that the UP94 generational table has been a good approximation for the mortality rates for the Salaried plan participant population.</td></tr>
<tr><td colspan="2">Actuary should continue to monitor future mortality gains/losses whether or not new mortality table is recommended.</td></tr>
</table>

4. Continued

Recommendation of Base Table	As seen through the past valuation mortality gain/loss figures, GAM94 has been underestimating the mortality rates for Hourly participants, and therefore seems to indicate that we would expect a similar underestimation from CPM2014 base tables (since the CPM2014 mortality tables were built to reflect better mortality since the 1994 base tables). For the 2014 valuation, the actuary changed the mortality table assumption from GAM1994 to UP94 generational, which may have been an appropriate change. Since lacking fully-credible experience, cannot base recommendation on past experience recommend updating to CPM Private table given the characteristics of this group of participants (blue collared) with appropriate adjustments but actuary should monitor gains/losses closely	As seen through the past valuation mortality gain/loss figures, UP94 generational seems to be a good approximation for mortality rates for the Salaried plan, so the UP94 base table may still be appropriate (although not fully credible to base on past experience). Since lacking fully-credible experience, cannot base recommendation on past experience recommend updating to CPM Public table given the characteristics of this group of participants (educated, white collared) with appropriate adjustments but actuary should monitor gains/losses closely

4. Continued

Size adjustment factors	Most precise method for using size adjustments is to group pensioner data by pension amount bands (use of pension size is a proxy for socio-economic status). Before applying size adjustments, the actuary would consider whether to reflect factors such as: • above average mobility; or • below average pension size due to plan design when adjusting for pension size. If the majority of NOC retirees have very long service, i.e., a significant portion of their retirement income will be paid from their respective NOC pension plan, then size adjustment factors may be appropriate.
Improvement scales	The study suggests that the continued use of Scale AA would typically be an inappropriate measure of future mortality improvements, unless supported by credible mortality improvement experience. Regardless of the recommendation, the actuary should monitor gains/losses closely as the adjustment for future improvements in mortality is normally considered separately from the current level of mortality. The use of the CPM-B (two-dimensional scale) allows for improvement rates that vary by year and age, and would typically be an appropriate assumption in the absence of credible information. However the CPM-B1D2014 (one-dimensional scale – varies by age only) was designed to be a reasonable substitute for using the CPM-B scale for valuations with effective dates in 2014 or 2015, and simplifies calculations (compared to the CPM-B scale).

4. Continued

Before the 2014 valuation, no improvement scale was used for the GAM94 table. Now, Scale AA (a one-dimensional projection scale) is currently used to project the UP94 generational table. Recommend CPM-B1D2014 (simplifies calculations compared to CPM-B)	Scale AA (a one-dimensional projection scale) is currently used to project the UP94 generational table. Recommend CPM-B1D2014 (simplifies calculations compared to CPM-B)

5. 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:

(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

Sources:

Assumptions for hypothetical Wind-Up and Solvency Valuations with Effective Dates between December 31, 2012 and December 30, 20123, CIA Educational Note

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

Solution:

(a) Calculate the annuity purchase rate that would be used to calculate the liabilities assumed to be settled though the purchase of annuities for:

(i) the solvency valuation; and

(ii) the hypothetical wind-up valuation.

Show all work.

5. Continued

Commentary on Question:
A well prepared candidate would have a good understanding of the actuarial standards behind calculating an annuity purchase based on the duration of the liabilities assumed to be settled by annuity purchase, including the methodology to calculate the duration described in the standard.

Some candidates used a different approach to determine the duration that would also have given a reasonable answer even if this is not the method described in the actuarial guidance. If the candidate showed all work and applied the same method to determine the annuity purchase rate, this alternate method was also accepted.

A well prepared candidate would also have a good understanding of the actuarial standards behind calculating an annuity purchase on a hypothetical wind-up basis for a partially-indexed plan using the appropriate formula provided in the guidance.

The areas many candidates did not do well were in not properly understanding how to apply the actuarial standards regarding the annuity purchase for the hypothetical valuation for a partially indexed plan. Based on the standard of practice, the calculation should be based on the annuity purchase calculated in i) . However, if the candidate recalculated the duration using the wind-up liability, and applies the same method to determine the indexed annuity purchase rate, the candidate was not penalized.

(i) Candidate must calculate duration using only liabilities assumed to be settled by annuity purchase:
((40,785,000 + 62,250,000)/(40,755,000 + 62,180,000)-1)/0.01% = 9.7

Candidate must interpolate based on the illustrative table:
(9.9-9.7)/(9.9-7.6) * 50 bps + (1-(9.9-9.7)/(9.9-7.6)) * 70 bps = 68 bps

Candidate must combine the information to provide the final answer:
Cansimv39062 + spread: 3.13% +0.68%= 3.81%

(ii) Candidate must determine the fully CPI indexed pension
1.25%-1.10%=0.15%

Candidate must apply the formula for the partially indexed annuities
= (Indexation %) * fully indexed proxy + (1-indexation %) * Non-indexed proxy
= 50% * 0.15% + (1-50%) * 3.81%
= 1.98%

5. Continued

or alternate method was used (i.e. windup liability was used to determine the duration)
= 50% * 0.15% + (1-50%) * 3.85%
= 2.00%

Alternate method:
Calculation of duration using the wind-up liabilities:
((46,905,000 + 79,060,000)/(46,870,000+78,965,000)-1)/0.01%=10.3

Interpolation based on the illustrative table:
((12.1-10.3)*0.7+(10.3-9.9)*0.8)/(12.1-9.9)=72 bps

Combined information:
3.13% + 0.72% = 3.85%

(b) Describe in words how to calculate the solvency incremental cost.

Commentary on Question:
A well prepared candidate would also have a good understanding of the actuarial standards behind calculating a solvency incremental cost, including the methodology to be used and the approximations allowed. A well prepared candidate would also understand the purpose of the solvency incremental cost, the reporting requirements and timing.

All points were given if the candidate was able to contrast and elaborate on all the assumptions that can be made. Providing the general formula only with no additional comments was not enough to get the full credit.

Very few candidates talked about the use of windup liabilities instead of solvency liabilities in determining the solvency incremental cost. This plan is indexed; therefore windup liabilities could have been used in the solvency incremental calculation as well depending on the client preference. Candidates did well in general on this question.

- Present value (PV) of expected benefit payment + projected solvency/windup liability discounted to valuation date – windup/solvency liability at valuation date allowing for, if applicable expected decrements and related change in membership during the inter-valuation period accrual of service to time t expected changes in benefits to time t (such as grow in) a projection of pensionable earnings to time t

5. Continued

- Solvency Incremental Cost represents the present value at the valuation date of the expected change in windup/solvency liability between the valuation date and the next calculation date adjusted upwards for expected benefit payments during the period.

- Solvency incremental cost calculated based on a hypothetical wind-up or solvency basis

- Incremental cost must be reported between the current valuation date until the next calculation date (January 1, 2017).

(c) Compare and contrast the solvency incremental cost and the going-concern normal cost.

Commentary on Question:
In this question, the candidate was asked to contrast the differences between the normal cost and the solvency incremental cost. A well prepared candidate would elaborate in detail on the differences in methodology and assumptions.

In general, candidates did well on this question and were able to identify the main differences between service cost and solvency incremental cost. To obtain full credits, candidates had to show that they had a broad understanding of each measure, although they didn't have to discuss each single point mentioned below. For example, many candidates did not discuss how the expected return on assets and the ad-hoc indexing affect the solvency incremental cost and the going concern normal cost but if the candidates covered the other points correctly with an appropriate level of details, it was still possible to receive full credits.

- Service Cost: represents change in liability due to service rendered during the period

- Solvency Incremental Cost: represents the expected change in liability due to all factors, other than the expected benefit payments.

- Service cost: interest rate used to calculate the service cost may reflect the expected return on the plan assets.

- Solvency Incremental Cost: independent of the expected return on assets

- The Going Concern service cost does not include the ad-hoc indexing at the next valuation date, while the Solvency Increment Cost includes it.

5. Continued

- The SIC in a given year could include the full impact of grow-in benefits for a member who reaches 55 points and becomes entitled to subsidized early retirement.

- Service cost affects the funding of the plan while the Solvency Incremental Cost is used for disclosure purposes.

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:

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

(6b) Evaluate funding restrictions imposed by regulations.

Sources:

Canadian Pensions and Retirement Income Planning, Towers Watson, Chapter 18;

FR-114-13: Ontario Pension Benefits Act R.R.O. 1990, Reg 909;

FR-115-13: Ontario Pension Benefits Act, R.S.O. 1990, Ch. P.8

Commentary on Question:

In this question, candidates were asked to perform a funding valuation and determine contribution requirements for a contributory pension plan registered in Ontario and analyze the gains and losses by source. A well prepared candidate would have been able to calculate the funded position on a going concern and solvency basis to determine the minimum and maximum contribution requirements in part (a) in accordance with the ITA and PBA for Ontario registered plans, calculate the required employee contributions and the applicable limit in part (b), and perform gain and loss by source in part (c).

Solution:

a) Calculate the minimum required and maximum permissible employer contributions for 2014. Assume the plan sponsor does not elect the one year deferral of new special payments.

Commentary on Question:

Candidates generally did well in part (a). Some candidates didn't realize that the Normal Cost for the active member is zero since the member has reached the assumed retirement age. Points were given for showing all work.

Calculate going concern (GC) and solvency (solv) liabilities:

<u>Employee A (EE A)</u>

Accrued Benefit = min (1.5% * 2013 Earnings * SVC, 2%* 2013 Earnings *SVC, Dollar DB Limit*SVC)

= min($250,000 * 15 * 0.015, $250,000 * 15 * 0.02, $2,770 * 15

6. Continued

= min ($56,250, $75,000, $41,550)
= $41,550

EE A GC liab = $41,550 * 11.9 = $494,445
EE A solv liab = $41,550 * 15.6 = $648,180

Employee B (EE B)
EE B GC liab = $2,000 * 12 * 7.0 = $168,000
EE B solv liab = $2,000 * 12 * 9.7 = $232,800

Total GC liab = $662,445
Total Solv liab = $880,980

GC deficit = $550,000 - $662,445 = $112,445
Solv deficit = $550,000 - $50,000 - $880,980 = $380,980

PV(6%,180) = 10.0
PV(6%,168) = 9.5
PV(3.2%,60) = 4.6
PV(3.2%,48) = 3.8
PV(3.2%,36) = 2.9

Note: Present value factor formulas are not a key component to answering part (a). Present value factors calculated as compounded monthly, annually, certain or immediate were all accepted. Full marks were awarded as long as candidate clearly identified the intent of their factor (i.e. 6% for 180 months).

Existing GC amort PV = $5,000 * 9.5 = $47,500
New GC amort pmt = (112,445 – 47,500) / 10.0 = $6,495 for 15 years starting Jan. 1, 2014
Existing Solv amort PV = $5,000 * 4.6 + $6,495 * 4.6 + $10,000 * 2.9 + $25,000 * 3.8 = $176,877
Stat Solv Deficiency = Solvency Deficit - PV of existing GC and solvency schedules = $380,980 - $176,877 = $204,103
New Solv Amort = $204,103 / 4.6 = $44,370 for 5 years starting Jan. 1, 2014

2014 NC = $0 since EE A assumed to retire at Jan. 1, 2014

Total 2014 Min ER conts = NC + GC amortization payments + Solvency amortization payments = $0 + $5,000 + $10,000 + $25,000 + $6,495 + $44,370 = $90,865
Total 2014 Max ER conts = $0 + max (Going concern deficit, solvency/wind up deficit) = $380,980

6. Continued

(b) Calculate Employee A's required employee contributions in 2014.

Commentary on Question:
A well prepared candidate should demonstrate understanding of the ITA maximum employee contributions limit by correctly calculating the limit and identify that the employee contribution required by the plan formula is below the ITA limit.

2014 Employee Contribution based on plan rules = $257,500 * 0.06 = $15,450

ITA Max formula = min (9% of earnings, $1000 + 70% of PA credit) = min (0.09 * 257,500 , $1,000 + ($2,770 * 9 – 600) * 0.7) = $18,031

2014 Employee Contribution is not capped by ITA and is $15,450.

(c) Calculate the going concern experience gains and losses by source as at January 1, 2015.

Commentary on Question:
The majority of the candidates realized that there was investment gain and loss but missed the contribution gain and loss calculation. Some candidates failed to reflect the retiree pension payment in the calculation of the asset calculations as at January 1, 2015. Most of the candidates identified the mortality gain/(loss) correctly but some candidates did not capture the retirement gain/(loss) correctly.

A well prepared candidate should be able to complete gain/loss reconciliation and demonstrate that all sources of gains/losses have been explained.

Compound or simple interest may be used.

<u>Going Concern Deficit @ 1.1.2015</u>

EE A Accrued Benefit = min (1.5% * 2014 Earnings * SVC, 2%* 2014 Earnings *SVC, Dollar DB Limit*SVC)
= min($250,000 * 1.03 * 0.02 * 16, $2,770* 1.03 * 16) = $45,650

EE A GC liab = $45,650 * 11.7= $534,105
EE B GC liab = $2,000 * 12 * 6.7 = $160,800
Total GC liab @ 1.1.2015 = $694,905
MV assets = $550,000 * 1.04 + ($90,865 + $15,450) * 1.04 – $2,000 * 12 * 1.04^0.5 = $658,092

Total GC deficit @ 1.1.2015 = $36,813

6. Continued

Liability gain and loss
Expected GC liability = $662,445 * 1.06+ $0 - $2,000 * 12 * 1.06^0.5 = $677,482
Liability gain/(loss) = $677,482 - $694,905= $(17,423)

Expected EE A GC liab = $494,445 * 1.06 = $524,112
Retirement Gain/(loss) = Expected Liability – Actual liability = $524,112 - $534,105= ($9,993)

Expected EE B GC liab = 168,000 * 1.06 - 24000 * 1.06^0.5 = 153,370
Mortality Gain/(loss) = $153,370 - $160,800= ($7,430)

Misc Liability Gain/(Loss) = (17,423) – (9,993) – (7,430) = $0

Asset gain and loss
Actual MV assets = $658,092

Expected MV assets = $550,000 * 1.06 + ($90,865) * 1.06– $2,000 * 12 * 1.06^0.5 = $654,607

Asset gain/(loss) = Actual assets – Expected assets = $658,092 - $654,607= $3,485

There is a loss on return but gain on unexpected EE contributions.

Note: Candidates were also awarded full marks if actual employee contributions were included in the Expected MV calculation but a separate contribution gain/(loss) calculation was completed that captures the total gain/(loss) on assets.

Surplus/(Deficit) Reconciliation Check

Deficit @ 1.1.2015 = Deficit @ 1.1.2014 with interest + amortization payments with interest + asset gain/(loss) + liability gain/(loss)
= $(112,445) * 1.06 + 90,865 * 1.06 + 3,485 – 17,423 = $36,813 (matches Deficit @ 1.1.2015)

7. 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:

(3e) Calculate actuarially equivalent benefits.

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

Sources:

CSOP Section 3500 - Pension Commuted Values, particularly sections:
3520: .04, .09
3530: .04, .06
3540: .02-.11, .13

FR-105-13: Actuarially Equivalent Benefits, particularly sections: II B, III C

Pension Mathematics for Actuaries, Anderson, 3rd Edition, particularly sections: 2.2, 4.2, 4.5, 4.8

Canadian Pensions and Retirement Income Planning, TowersWatson, 4th edition – Chapter 17, particularly sections: 1710, 1720, 1725, 1726, 1741, 1743, 1765, 1770

Commentary on Question:

Candidates generally performed well on this question. The most common mistakes related to calculation of early retirement factors in the calculation of the benefits payable under the normal form), two of which were:

- *Not calculating time until member reaches 80 points correctly*
- *Not applying early retirement factors to plan benefit and maximum benefit separately before comparing*

Solution:

Calculate the benefits payable under the normal form and each optional form of payment.

Show all work.

7. Continued

(i) Determine the Normal Form pension payable from the Plan at November 1, 2014

Normal Retirement Benefit = 1.75% * FAE3 * credited service * early reduction factor
= 1.75%*165,000*14 years*(1-3%*(63.5-61)) = $37,393.13 per annum

ERF: Member has >10 years of service : 80 points comes at age 63.5 so reduced from 63.5 (63.5 years of age and 16.5 years of service).

Check for ITA maximums
2014 ITA limit = DB limit * credited service * (1 - ITA ERF)
= 2770 * 14 * [1- (0.25% per month for each year member would have attained earliest of age 60, 30 years of service and 80 points)]
= 2,770 * 14 * (1 - 0) = $38,780 per annum

Therefore the member received $37,393.13 per annum under the normal form.

(ii) Determine the J&S 66&2/3% optional form

J&S 66&2/3% pension
= (Reduced Annual Lifetime Pension * $\ddot{a}_{61}^{(12)}$) / [$\ddot{a}^{(12)}_{61}$ + (2/3) * ($\ddot{a}^{(12)}_{55}$ - $\ddot{a}^{(12)}_{61:55}$)]
= (37,393.13*13.4) / [13.4 + (2/3)*(16.8-13.9)] = $ 32,678.34 per annum

(iii) Offset benefit pays top up until 65 of the value of CPP/OAS at 65

CPP/OAS at 65 = (1038+551)*12 = $19,068

Candidates typically used one of two formulas, which led to different answers, but were both correct.

Formula A
Formula to determine lifetime benefits:
PV of Normal Form Pension = (X + 19,068) * $\ddot{a}^{(12)}_{61:41}$ + X * $\ddot{a}^{(12)}_{61}$ Deferred to age 65
(37,393.13*13.4) = (X + 19,068) * 4.2 + 7.2 X
X = 36,928.28

Therefore, employee receives 36,928.28 for life plus 19,068 until 65 or death (whichever is earlier)

7. Continued

Formula B

Formula to determine lifetime benefits:

PV of Normal Form Pension = $X * \ddot{a}^{(12)}_{61} + 19{,}068 * \ddot{a}^{(12)}_{61:41}$

$(37{,}393.13*13.4) = X * 13.4 + 19{,}068 * 4.2$

$X = 31{,}416.59$

Therefore, employee receives 31,416.59 for life plus 19,068 until 65 or death (whichever is earlier)

Other formulas could also have been used to get full credit for this portion of the question (e.g. determining the total amount paid to a member before a reduction of 19,068 at age 65).

8. **Learning Objectives:**

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.).

(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.

(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 the Guides to Professional Conduct.

(7g) Recommend a course of action to repair a violation of the Standards or the Guides to Professional Conduct.

Sources:

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

Commentary on Question:

In this question, the candidate is asked to apply his/her knowledge of a situation where Rule 13 of the CIA Rules of Professional Conduct applies. A well-prepared candidate should be able to outline the appropriate course of action that is required to be taken and outline the possible outcomes.

Candidates who understood that Rule 13 applied, generally scored well. Candidates who scored poorly did not apply Rule 13.

Solution:

Describe:

- an appropriate course of action, and
- possible outcomes,

with respect to your review, taking into consideration professional standards.

8. Continued

Rule 13 applies in this situation. As such, you are required to discuss the situation with the previous actuary and resolve the apparent noncompliance.

Outcome 1:
After discussion with the previous actuary it is determined that the previous actuary applied the Standard of Practice properly. As such, the noncompliance did not occur and no further action is required.

Outcome 2:
After discussion with the previous actuary it is determined that the previous actuary did not apply the Standard of Practice properly. If the previous actuary agrees to prepare a revised report, resolution accomplished. However, if the previous actuary will not prepare a revised report, you are required to report the noncompliance to the Committee on Professional Conduct.

Outcome 3:
The previous actuary will not discuss the apparent noncompliance with you or after discussion the previous actuary disagrees with you and believes that the Standards of Practice were applied properly. You are required to report the noncompliance to the Committee on Professional Conduct.

9. Learning Objectives:

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

Learning Outcomes:

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

(4b) Describe sources and framework of government regulation.

Sources:

IOPS Principals of Private Pension Supervision, August 2006

Commentary on Question:

Full marks would be credited to candidates who displayed knowledge of the IOPS principles and how they may affect different stakeholder groups. No marks were given for a description of the principles themselves.

In general, the candidates who performed well on the question were able to think objectively about how a pension regulatory body would best promote the stability, security and good governance of pension funds and plans, and protect the interests of pension fund members and beneficiaries. In some cases, candidates confused some of the principles and applied them to the wrong stakeholders (i.e. plan sponsors receiving adequate powers to perform their duties).

Solution:

Describe the benefits of implementing the following principles as described in the "IOPS Principles of Private Pension Supervision":

(i) Independence;

(ii) Adequate powers; and

(iii) Proportionality and consistency,

from the perspectives of the following stakeholders:

- Pension plan members;
- Pension plan sponsors; and
- Pension regulatory authorities.

(i) **Independence**

(a) Plan Sponsor

- Plan sponsor does not need to worry about political interference with regulator's authority or ; "fairness", "unbiased"
- While regulators actions can be over-ruled by judicial decision or parliamentary process if regulators actions deemed to be "unfair" to plan sponsors

9. Continued

(b) Plan Member
- Regulators actions can be over-ruled by judicial decision or parliamentary process
- Independent regulators may preside over pro-member decisions (at the expense of plan sponsors) and less favourtism for big business; member interests independent from external influences

(c) Regulator
- Allows regulator to conduct duties without fear of political or commercial interference
- While regulators actions can be over-ruled by judicial decision or parliamentary process, they can have meaningful impact on the creation of policy
- Explicit procedures and transparent mechanisms for the nomination, appointment or removal of head of the pension supervisory authority avoids political games.

(ii) **Adequate Powers**

(a) Plan Sponsor
- Helps benefit security by imposing strong funding requirements with adequate power to enforce rules; may provide sponsor with funding policy flexibility
- Enables fair play by ensuring regulator can fairly discipline competition
- Less reporting involved if regulators have adequate powers and no other parties (e.g. government) are involved

(b) Plan Member
- Better benefit security: possible answers include imposing minimum capital requirements, financial control via investments, expose fraud
- Provision of adequate disclosure and information to members

(c) Regulator
- Regulators better able to perform their legally charged duties through the capacity to exercise their powers
- Regulator does not have to rely on external influences to achieve objectives

(iii) **Proportionality and Consistency**

(a) Plan Sponsor
- Protects against over-enforcement for a given risk being mitigated: "consistency"
- Ensures objective/unbiased decisions made by regulators
- Pension funds/sponsors given flexibility where appropriate
- Pension funds/plans should only be demanded to comply based in accordance with value expected to be derived

9. Continued

(b) Plan Member

- Member's feel secure that regulator will choose mitigating actions based on seriousness of problem; not one-size-fits-all solution
- Consistent actions means one plan's members not treated different than another plan's members
- Regulator may impose risk-based assessments of pension plans to ensure high-risk plans are investigated in a timely-manner

(c) Regulator

- Consistency allows all supervisors to have adequate procedures (ex.documentation, training) to ensure similar decisions being made
- Principle of proportionality should be carried out in accordance with "Risk Orientation" principle as outlined in the same IOPS document
- Allows regulator to focus on important issues

10. Learning Objectives:

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

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

Learning Outcomes:

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

(7c) Explain and apply relevant qualification standards.

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

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

Sources:

FR-102-13: Selection of Actuarial Assumptions, Consultant Resource Manual, SOA Version, Mercer (excluding pp. 13-31, 34-37 and 63-64)

FR-103-13: ASOP 27, Selection of Economic Assumptions for Measuring Pension Obligations

Determination of best Estimate Discount Rates for Going Concern Funding Valuations, CIA Educational Note

Provisions for Adverse Deviations in Going Concern Actuarial Valuations of Defined Benefit Pension Plans, CIA Research Paper

CIA CSOP 1000-1800, January 1, 2013

CIA Consolidated Standards of Practice - Pension Plans 3100-3500

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) State the goals and limitations of provisions for adverse deviations when establishing the assumptions for the going concern valuation.

Commentary on Question:

Successful candidates demonstrated that they know the goals and limitations of provisions for adverse deviation. Most candidates knew the goals but struggled in stating limitations.

10. Continued

Goals

- enhances the security of plan benefits
- enhances the stability of plan benefits or contributions
- strikes a balance among the conflicting interests of those affected by the calculation

Limitations

- it promotes financial security to the members at the expenses of the employers
- increases the likelihood of surplus emerging later in the plan that may be unavailable to the contributor
- does not necessarily mean it will be sufficient to ensure that all accrued benefits could be covered were the plan actually to wind up
- it can create intergenerational inequity
- the funding of the plan may be driven by the solvency valuation so it may not meet its objectives

(b) Recommend a discount rate assumption using the building block approach. Justify your recommendation.

Commentary on Question:
Successful candidates calculated a discount rate using the building block approach but also justified their step by step calculations using CSOPs and common practice. Most candidates performed well with respect to the calculation portion of the question, although many candidates did not include a pfad or did not indicate why they were not including any pfad. In addition, many candidates did not justify their recommendation.

- calculate the expected return on long-term horizon with the investment policy mix (should not use the average portfolio mix)
  0.30 * 4.0% + 0.10 * 4.5% + 0.40 * 0.5% + 0.20 * 3.5% = 2.55%
- add the expected inflation increase
  2.55% + 2.50% = 5.05%
- add return for rebalancing or diversification effect (generally anything between 0.10% and 0.50% is acceptable)
- 5.05% + 0.30% = 5.35%
- add additional return for active management over the active management fees (between 0% and 0.20% is acceptable)
  5.35% + 0.20% = 5.55%
- -subtract the active management fees
  5.55% - 0.35% = 5.20%
- subtract the administration fees
  5.20% - 0.20% = 5.00%

10. Continued

- subtracts margin for adverse deviation (generally anything between 0.25% and 0.50% is acceptable)
  5.00% - 0.25% = 4.75%
- round to the nearest 0.25%
  4.75%

Justification for the above calculation:

- the assumption for the interest rate return must be a best-estimate assumption
- the best-estimate assumption must include provision for adverse deviations to take account of the effect of the uncertainty of the assumptions and data for the calculation
- the assumption should take into account the objectives of funding specified by the terms of engagement which may include provisions for adverse deviations
- the assumption should take into account any provisions for adverse deviations requirement in the legislation, if any
- the assumptions for a calculation for a periodic report should in the aggregate be consistent with those of the prior calculation
- assumes that the plan continues indefinitely
- takes into account the expected investment return on the assets of the pension plan at the calculation date and the expected investment policy after that date
- In establishing the discount rate assumption, the actuary would 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 the actuary has reason to believe, based on relevant supporting data, that such additional returns will be consistently and reliably earned over the long term
- The actuary may assume that the investments of the pension plan's assets will be guided by the investment policy indefinitely
- In addition to the expected investment return, portfolios which have some allocation to multiple asset classes (diversification effect) would typically gain additional return
- The actuary would take into account appropriate allowance for future plan expenses that are expected to be paid from the pension fund
- If an allowance for value added returns due to active management has been utilized in setting the best estimate discount rate, the actuary would make an allowance for the expected active management investment expenses
- Typically, rounding such a discount rate to the nearest 0.10% or 0.25% would be appropriate. However, to be consistent with previous years, should round to the nearest 0.25%
- The provision for adverse deviations must take into account the following factors: financial strength of the entity making the contributions, risk tolerance of the plan members, uncertainty of future plan experience, appropriate time horizon, maturity of the plan's liabilities and asset mix of the plan.

10. Continued

- If the return deviates too much from last year's return, candidate should do an adjustment or comment if it is acceptable

(c) Describe how your selection of the provisions for adverse deviations would differ if you were setting the going concern discount rate assumption for the NOC Full-Time Hourly Union Pension Plan.

Commentary on Question:
Successful candidates compared the main plan provisions, membership and asset allocation to determine whether a different would be appropriate. This question was intended to test whether candidates know the factors that can have an effect on setting the pfad. Only few candidates performed well on this part of the question.

A larger provision for adverse deviations is appropriate (a smaller provision for adverse deviations is appropriate if the opposites are true) if:

- the actuary has less confidence in the best estimate assumption, **(no change in PfAD in this situation)**
- an approximation with less precision is being used, **(no change in PfAD in this situation)**
- the event assumed is farther in the future, **(no change in PfAD, similar membership composition in this situation)**
- the potential consequence of the event assumed is more severe, or **(slightly lower PfAD in this situation)**
- the occurrence of the event assumed is more subject to statistical fluctuation. **(lower PfAD since not FAE plan, less fluctuations. Has post-retirement indexing, but essentially a flat 1% which does not create much fluctuations)**
- the assets proportion invested in equities is higher **(no change in PfAD, same allocation in this situation)**
- The retirees proportion to the actives is lower **(no change in PfAD, similar membership in this situation)**

11. Learning Objectives:

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

Learning Outcomes:

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

Sources:

FR-110-13, regulation 308/13 and 310/13

Commentary on Question:

In this question, candidates were asked to demonstrate their knowledge on the asset transfer regulation in accordance with the PBA (Ontario). A well prepared candidate would have been able to list to restrictions as outline in the PBA (Ontario) and calculate the minimum one-time contribution required for the asset transfer.

Candidates did not do well in part (a). The 85% minimum requirement on transferred accrued benefit was often incorrectly identified as a requirement on funded ratio.

Candidates did not do well in part (b). Most candidates did calculate Plan A and Plan B transfer ratio but did not calculate the transfer ratio of the combination of the two plans. No candidates correctly calculated the one-time minimum contribution.

Solution:

(a) Describe the restrictions that could prevent the asset transfer.

- If successor plan would allow accrued pension benefits to be reduced in circumstances that were not permitted in the original plan.
- The amount of a transferred member's accrued pension benefits under the successor pension plan (calculated without taking into account ancillary benefits) must equal at least 85 per cent of the amount of his or her accrued pension benefits under the original pension plan (calculated without taking into account ancillary benefits) as of the effective date of the transfer
- A transfer of assets not completed within 120 days after the date on which the Superintendent consents to the transfer

(b) Determine the minimum one time contribution required at January 1, 2015 before the transfer could occur.

Show all work.

11. Continued

Calculate the solvency ratio of Plan A
Asset/Liability = $5,656/$7,980 = 71%

Calculate the solvency ratio of Plan B
Asset/Liability = $465/$530 = 88%

Calculate the solvency ratio of the merged plan
Asset/Liability = ($5,656 + $465)/($7,980 + $530) = $6,121/$8,510 = 72%

Conditions for the transfer to be authorized:
The requirement on solvency ratio of the successor plan is at least 1.0.
The merged plan's solvency ratio is less than 1.0.

The solvency ratio of the successor plan is no more than 0.05 below the solvency ratio of the original plan before the transfer and the solvency ratio of the successor plan is no more than 0.05 below the solvency ratio of the successor plan before the transfer

0.95 x the solvency ratio of Plan A = 67%
72% (the solvency ratio of the merged plan) is no more than 0.05 below the solvency ratio of Plan A
0.95 x the solvency ratio of Plan B = 84%
72% (the solvency ratio merged plan) is more than 0.05 below the solvency ratio of Plan B

The solvency ratio required = 0.84
One-time contribution = 0.84 x $8,510 - $6,121 = $1,027

12. 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.

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

Sources:

Pension Mathematics for Actuaries, Anderson, 3rd Edition, particularly sections: 2.2, 4.2, 4.5

Commentary on Question:

This question was fairly well answered. Successful candidates demonstrated that gain/loss over time may be attributed to several factors. However, many candidates ignored the gain/loss on salary.

Solution:

Calculate the gain and loss by source for each of these events as of January 1, 2015.

Show all work.

1. Salary:

Commentary on Question:

*Credit was also given if the candidate used the deferred to age 62 factors provided in the question. Students were expected to show the total gain due to salary for the two member*s.

Exp AL(A) = .02*(1.04)^29*50,000*11* 12.6*(1.06)^-29 = $79,774
AL due to Sal chg (A) = .02*(1.04)^28*50,000*11*12.6*(1.06)^-29 = $76,706

Gain (A) = Exp AL(A) - AL due to Sal chg (A) = Gain of $3,068

Exp AL(B) = .02*(1.04)^4*100,000*31* 12.6*(1.06)^-4 = $723,889
AL due to Sal chg (B) = .02*(1.04)^3*100,000*31*12.6*(1.06)^-4 = $696,047

Gain (B) = Exp AL(B) - AL due to Sal chg (B) = Gain of $27,842

Total Gain on Salary = $30,910

12. Continued

2. Termination
Exp AL(A) = $79,774
Act AL (A) = .02*50,000*11* 4.8 = $52,800
Total Gain (A) = Exp AL(A)- Act AL(A) = $26,974
Gain from Termination = Total Gain (A) - Salary Gain (A) = $ 23,906

3. Retirement
Commentary on Question:
Immediate factors were not provided for this calculation. Therefore, two options were accepted.

Version 1
If a candidate indicated that the immediate factor was not provided and stated that they were assuming that the plan reduction would be worse than the actuarial equivalence.

Exp AL(B) = $723,889
Act AL (B) = .02*100,000*31*10.0= $620,000
Total Gain (B) = Exp AL(B)- Act AL(B) = $103,889
Gain from Retirement = Total Gain - Salary Gain = $76,047

Version 2
If a candidate assumed that the factors provided were immediate rather than deferred to age 62. However, in this case, candidates were expected to: note that the calculation should check for actuarial equivalence, or make some attempt to check for actuarial equivalence.

Exp AL(B) = $723,889
Act AL (B) = .02*100,000*31*(1-(.06*4)) * 10.0= $471,200
Total Gain (B) = Exp AL(B)- Act AL(B) = $252,689
Gain from Retirement = Total Gain - Salary Gain = $224,847