# RET FRC Model Solutions
# Spring 2017

## 1. Learning Objectives:

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

**Learning Outcomes:**

(5g) The candidate will be able to describe and apply regulation pertaining to reporting requirements.

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

**Sources:**

Canadian Pensions and Retirement Income Planning Chpt 6, 10,11; Morneau Chpt 7.

**Commentary on Question:**

*A well prepared candidate will be able to correctly calculate pension adjustments, a past service pension adjustment and pension adjustment reversal, as well as identify the principles underlying the PA calculation.*

**Solution:**

(a) Calculate the member's 2016 Pension Adjustment (PA).

Show all work.

**Commentary on Question part (a)**:

*Overall, candidates performed very well on this part of the question. A few candidates did not correctly calculate the DB accrual.*

2016 PA formula = (9 x 2016 DB accrual) – 600

2016 DB accrual = min ($60 / month x 2016 credited service, ITA limit x 2016 credited service)

= min (60 x 8, 2,890 * 8/12)

= 480

2016 PA = 9 x 480 – 600 = 3,720

## 1. Continued

(b) Describe the principles behind the PA calculation.

**Commentary on Question part (b)**:
*To get full marks a candidate needed to identify a number of the points below. However, many candidates only identified one or two relevant points, or otherwise failed to answer the question*

- PA is the deemed value of the RPP or DPSP benefit accrual for the calendar year.
- PA's are used to reduce the total registered retirement savings plan (RRSP) room for the following year for individuals with employer sponsored registered pension plans.
- For DC RPPs and DPSPs, the PA is the actual contributions made to the plan in a year, and is a representation of the value of the plan participation to the individual
- A principle is that $9 of contributions should be enough to buy each $1 of target pension for a representative individual over an earning career.
- PA = (9 times Benefit Entitlement) - $600
- The Benefit Entitlement for an individual in a year is the portion of the individual's "normalized pension" under the DB provision at the end of the year that can be reasonably to have been accrued in respect of the year.
- The "normalized pension" represents the individuals' annual accrued lifetime pension that would be paid as if the individual were retiring at the end of the year at age 65, based on credited service to date.
- For PA purposes, to determine the "normalized pension", for a year the individual's pensionable earnings and the YMPE (if applicable), for that year, are used.
- The factor of 9, used to convert the Benefit Entitlement into a value that can be compared to money-purchase contribution is based on certain assumptions:
  - Retire at age 63 with an unreduced pension, after 35 years of plan membership
  - Pension is indexed in line with the Consumer Price Index less 1%
  - The pensioner has a spouse, and the pension reduces on the first death to 60% of the initial benefit
- For the early years of an individual's career, the factor of 9 will result in a PA that reduces RRSP room by more than what is required for target pension accumulation.

## 1. Continued

(c) Calculate the Past Service Pension Adjustment for this member assuming there are no qualifying transfers or excess money purchase transfers for this member.

Show all work.

**Commentary on Question part (c)**:
*There were a number of candidates who were able to correctly calculate the past service pension adjustment. However, there were quite a few other candidates who correctly identified the exclusion rules, but did not correctly implement them.*

| Effective date | Mthly Ben/ yr service | Tot Ind Wage incr to 2017 |
|---|---|---|
| January 1, 2010 | $56.50 | 19% |
| January 1, 2011 | $56.50 | 16% |
| January 1, 2012 | $56.50 | 12% |
| January 1, 2013 | $60.00 | 10% |
| January 1, 2014 | $60.00 | 7% |
| January 1, 2015 | $60.00 | 5% |
| January 1, 2016 | $60.00 | 2% |

To determine if the benefit rate improvement triggers a PSPA, review exclusion rules, max of:

(i)AIW increase from any year, or
(ii)$1.50 per year since last upgrade

Choose the benefit rate that produced the highest revalued benefit rate based on AIW

$56.5 x 1.19 = $67.24

$1.5 x 4 years of service for benefit increase = $60 + 1.5 x 4 = $66.00 (4 years from 2017 – 2013 since it was the last upgrade)

Take the greater of (i) and (ii) above. Max ($66, $67.24) = $67.24

Benefit increase = $70 - $60 = $10

maximum excluded amount = $67.24 - $60 = $7.24

amount subject to PSPA = $10 – 7.24 = 2.76 per month

PSPA = A – B –C + D

## 1. Continued

A – B = $2.76 x 12 x 9 x 6.67 = $1,988
C = 0
D = 0
PSPA = $1,988 (the answer may be off due to rounding)

(d) The member terminated on June 30, 2017 after having earned 6 months of credited service in 2017. The member received a commuted value payment of $40,000 in full settlement of the benefit entitlement from the plan.

Calculate the Pension Adjustment Reversal.

Show all work.

**Commentary on Question part (d)**:
*Candidates appeared to have a bit more difficulty correctly calculating the pension adjustment reversal. In particular, candidates had difficulty correctly calculating the historical PAs.*

2017 PA = 70*6* 9 – 600 = 3,180

PSPA for $70 increase = 1,988

2016 PA = $3,720

2010 PA = ($56.50 x 12 x 9 – 600) = $5,502
2011 PA = $5,502
2012 PA = $5,502
2013 PA = ($60 x 12 x 9 – 600) = 5,880
2014 PA = $5,880
2015 PA = $5,880

Total PA = $5,502 x 3 + $5,880 x 3 + 3,720 + 3,180 + 1,988 = $43,034

PAR = ($43,034 - $40,000) = $3,034

## 2. Learning Objectives:

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

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

**Learning Outcomes:**

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

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

**Sources:**

Pension Mathematics for Actuaries, Anderson, 3rd Edition

**Commentary on Question:**

*Most candidates performed well on this question. For candidates who did not receive full marks, most candidates lost marks on the gain and loss portion – forgetting to do a balance test.*

**Solution:**

(a) Calculate the total normal cost and the unfunded accrued liability of the plan at January 1, 2017.

Show all work.

Both Member A and B entered the plan at the same age
w = age at plan entry

PVFB = 1.0% * service at 65 * $\ddot{a}_{65}^{(12)}$ * $1.03^{(64-w)}$ * $1.05^{-(65-w)}$

| | **Member A** | **Member B** |
|---|---|---|
| PVFB | 1.0% * 35 * 13.5 * $1.03^{(34)}$ * $1.05^{-(35)}$<br>= 2.3401408 | |
| PVFS | $a_{35\|j} = (1-(1+j)^{-35})*(1+j)/j$ = 25.7183888, where j = 1.05/1.03 – 1 | |
| PVFB / PVFS | 2.3401408 / 25.7183888<br>= 9.0991% | |
| NC | 9.0991% * 2016 Salary<br>= 9.0991% * 50,000<br>= **$4,550** | 9.0991% * 2016 Salary<br>= 9.0991% * 100,000<br>= **$9,099** |
| AL | Accumulated normal costs | |
| | NC * $S_{5\|j}$ = $4,550 * 5.29891358<br>= **$24,108** | NC * $S_{20\|j}$ = $9,099 * 24.6259969<br>= **$224,074** |

## 2. Continued

Total normal cost at January 1, 2016 = $4,550 + $9,099 = $13,649
Total liability at January 1, 2016 = $24,108 + $224,074= $248,182
Unfunded actuarial liability at January 1, 2016 = $248,182 - $200,000 = $48,182

(b) Calculate the unfunded accrued liability of the plan at January 1, 2018.

AL for Member A:
*Member A terminated at December 31, 2016, with final salary of $50,000 and 6 years of credited service. Age at December 31, 2016 = 36*
AL = 1% * final salary * service * $\ddot{a}_{65}^{(12)}$ * $1.05^{-(29)}$
AL = 1% * 50,000 * 6 * 13.5 * $1.05^{-(29)}$
AL = $9,839

AL for Member B:
PVFB = 2.3401408 (from part a)
PVFS = 25.7183888 (from part a)

| | **Member B** |
|---|---|
| NC | 9.0991% * 2017 Salary |
| | 9.0991% * 100,000 * 1.05 = **$9,554** |
| | |
| AL | Accumulated normal costs |
| | NC * $S_{21|j}$ |
| | $9,554 * 26.1235891 = **$249,586** |
| | |
| | OR alternative solution: Expected AL at Jan 1, 2017 * 1.05 / 1.03<br>(since member's actual salary increase was 5% compared to assumption of 3%). |
| | where Expected AL = (224,074 + 9,099) * 1.05 = $244,832 |
| | Therefore, Actual AL = $244,832 * 1.05 / 1.03 = $249,586 |
| | |

Total liability = $9,839 + $249,586 = $259,425
Unfunded actuarial liability = $259,425 - $220,000 = $39,425

(c) Calculate the gains and losses by source for 2017.

Show all work.

**Commentary on Question**:
*Candidates who did not receive full marks forget to perform the balance test.*

## 2. Continued

Gain on contribution:

Gain = 20,000 * 1.05 – 13,649*1.05
= $6,668

Loss on fund return:

Expected Assets at January 1, 2017 = 200,000 * 1.05 + 20,000 * 1.05
= $231,000
Actual Assets at January 1, 2017 = 200,000 + 20,000
= $220,000
Loss = $11,000

Gain on termination of Member A:

Expected AL at January 1, 2017 = ( 24,108 + 4,550 ) * 1.05
= $30,091
Actual AL at January 1, 2017 = $9,839
Gain = $20,252

Loss on salary experience for Participant B:

Expected AL at January 1, 2017 = (224,074+ 9,099) * 1.05
= $244,832
Actual AL at January 1, 2017 = $249,586
Loss = $4,754

Check:

Expected UAL at January 1, 2017 = 48,182 * 1.05
= $50,591
Actual UAL at January 1, 2017 = $39,425
Gain = **$11,166**

Check: $6,668 - $11,000 + $20,252 - $4,754 = **$11,166**

## 3. Learning Objectives:

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

**Learning Outcomes:**

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

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

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

**Sources:**

ASOP 27, ASOP 35, FR – 102- 15, Anderson Chapter 6

**Commentary on Question:**

*The goal of the question was to assess the appropriateness of the 2016 valuation assumptions for the 2017 valuation. A major component of evaluating the appropriateness is reviewing the experience of the plan through gain/loss analysis. Candidates who did not do well mentioned that an analysis should be done, as opposed to reviewing the gain loss and providing commentary.*

**Solution:**

(a) Describe the considerations in assessing the appropriateness of the following January 1, 2016 going concern assumptions for use in the January 1, 2017 funding valuation:

(i) Termination

(ii) Retirement

(iii) Salary increases

Termination

Termination has a small loss of 2,700 in year 2016. There are also small gains/losses in the past few years.

This suggests that the 1/1/2016 termination assumption is pretty reasonable and can be used for 1/1/2017 valuation.

However, from the case study, turnover for the past 5 years has been greater than desired due to market competition, and the current assumption is developed based on experience from 1996 to 2006. Should monitor the experience closely and be prepared to update assumption in the future if turnover remains higher than it was historically.

## 3. Continued

Retirement

Retirement has a gain of 9,700 in 2016 and gains have been observed for the past three consecutive years.

There is also a spike in in the last year in retirements which suggests that retirement patterns may be changing. This shows that retirement assumption may need to be updated for 1/1/2017 valuation.

Currently a flat retirement age of 62 is assumed. Consider using a retirement scale by age with associated probability of retirement, instead of a single age.

However, since the gain/loss is only 2.5% of the total pension liability, it is not very material. Moreover, there are no significant cumulative gains/losses. It may be worthwhile to hold off the update until for experience data is available.

Actuarial standards on materiality: the actuary needs to establish a balance between refined methodology and materiality.

Salary

3 components for salary scale - Inflation, productivity growth and merit. Inflation has not been updated for many years, it should reflect current economic data.

Salary gain of 25,000 in 2016– i.e. the actual salary increase is less than the assumption of 3.5% as at 1/1/2015.

In fact, persistent gains have been observed for the past several years. Gains continued to increase despite the assumption being revised from 4% to 3.5% in 2014.

The assumption was revised to 3.0% in 2016 but actual increases in average earnings in the past two years have been closer to 1% only. This suggests the assumption might need to be further revised for 1/1/2017.

Whenever possible, the actuary should get input from the plan sponsor on current salary increase practice (by age/service if applicable) and expectations for future salary increase levels.

Nearly 50% of the active population have more than 15 years of service and 25% of active population are more than 55 years old.

The plan had no new hires/new entrants in the last year. So in combination with large turnovers, the workforce may age over time if this trend continues.

Salary growth potential for the older and long service groups is more limited.

## 3. Continued

1/1/2016 valuation uses a single rate of compensation increase for all employees often skews results. Consider using different scales for different age/svc groups for productivity components and merit components

Inflation component can also be modified to use a select/ultimate scale to reflect a smaller select rate that corresponds to short-term economic conditions of low inflation.

(b) Explain the impact of these changes on the following going concern assumptions for the January 1, 2017 valuation:

(i) Termination

(ii) Retirement

(iii) Salary increases

**Commentary on Question**:
*Students who did not do well on part b put comments as to whether the assumptions should be adjusted or not, but did not put reasons or validation why.*

Termination

With the plan closed to new entrants and with employees age<45 carved out from the active population, termination rates are expected to drop for the overall plan.

Most terminations occur for young people who are

- Not very loyal to the company
- Enjoys greater mobility

On the other hand, older employees are not as likely to leave due to

- They are closer to retirement and would like to enjoy the early retirement subsidies and the rich benefit offering of DB plan
- They prefer work stability and are less likely to be recruited by competitors

Therefore, termination assumptions needs to be revised based on more current experience data associated with people age>45 years only, without giving undue weight to recent experience data if the plan closure affects future expectations.

Retirement

With all members age<45 exiting the plan, there is no immediate impact to the plan's retirement experience. Hence the retirement assumption can stay unchanged.

## 3. Continued

In the long run, the active population will decrease to none and retirement assumption is therefore not needed.

However, with the reduced plan size due to the conversion, any gains and losses due to inappropriate retirement assumption will become more material.

Now with a large portion of the active population gone who are all younger, there are more retirement-eligible members percentage wise, therefore the retirement assumption can become more important to the plan.

Salary

Roughly 1,450 employees will exit DB plan. The remaining groups are older employees with very limited salary growth.

[Salary scale can be reduced – potentially to be equal or very close to inflation (i.e. merit and productivity growth components will drop to very minimal)

With no more new entrants and only members age>45 years who remain, the active population will shrink over time until none is left.

Salary scale can reflect this grade-in to 0 over time

When there are no active participants, the plan might be wind-up. Salary scale can reflect potential plan termination.

## 4. Learning Objectives:

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

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

**Learning Outcomes:**

(1a) Identify data needed.

(1b) Assess data quality.

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

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

(7a) Apply the standards related to communications to plan sponsors and others with an interest in an actuary's results (i.e., participants, auditors, etc.).

(7b) Explain and apply the Professional Conduct Guidelines.

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

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

**Sources:**

FR – 100 -13 (ASOP 23); CIA Consolidated Standards of Practice

**Commentary on Question:**

*A well prepared candidate will be able to analyze the quality and appropriateness of the data for the purposes of a valuation. As well, they will be able to describe the relevant professional standards and other considerations for certification of a valuation report.*

**Solution:**

(a) Describe how you would use the Age/Service table to verify the active going concern liabilities and normal cost.

**Commentary on Question part (a)**:

*Many of the candidates were able to generally describe this type of analysis, but only mentioned a few of the relevant considerations.*

## 4. Continued

- using the economic (including the actuarial cost method and discount rate, etc.) assumptions
- and demographic (including turnover and retirement rates, etc.) assumptions
- review plan provisions to calculate the benefits including:
  - the lifetime benefit formula,
  - the bridge benefit formula,
  - provisions for an unreduced pension (need to look at members' age plus service),
  - eligibility for bridge benefit (need to look at members' age plus service)
- value estimated liabilities and normal cost by each group varied by age and service. For example for the group with ages 25-35 and 5-10 years of service, without any other more specific data, the actuary could make a rough estimate and value these estimates using an average age of 30 and average years of service of 7.5.
- then multiply these individual estimates by the number of participants in each group
- sum them all up – the result should roughly be in the same ballpark as the active member valuation results.

(b) List the other active and inactive data items in addition to age and service that would be required to verify the total going concern liabilities and normal cost.

**Commentary on Question part (b)**:
*Overall, candidates performed better on this part of the question, identifying several of the requirements.*

Actives:
portion of male/female

Inactives
Age/benefit summary, gender distribution, pension amounts, age difference between pensioners and spouses

(c) Explain if you would be prepared to certify the valuation report, taking into consideration professional standards.

**Commentary on Question part (c)**:
*To get full marks a candidate needed to discuss several of the points below. However, many candidates only identified one or two relevant points, or otherwise failed to answer the question*

## 4. Continued

I would be able certify the results, subject to satisfying the following items, if it was not possible to obtain detailed data:

- able to reasonably verify the valuation results by performing tests such as that as described in (a), as well as using the data summary to roughly approximate the inactive liability
- verify the prior valuation results based on the same steps described in (a)
- review the general reasonableness and consistencies compared to prior years' data summaries
- assess the sufficiency of the data provided for the purpose of the work (page 1041 – 1530.06); it does not mean that the data are reliable
- confirm with NOC that the data supplied for the purpose of the valuation is sufficient and reliable (page 1047)
- able to review working papers of the prior actuary
- if able to verify the reasonableness of the results, more comfortable that the prior actuary followed the professional standards to perform the valuation
- should disclose that the actuary has not done such a review and should disclose any resulting limitation on the use of the actuarial work product

## 5. Learning Objectives:

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

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

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

**Learning Outcomes:**

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

(6a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and the participants.

(6b) Evaluate funding restrictions imposed by regulations.

(7a) Apply the standards related to communications to plan sponsors and others with an interest in an actuary's results (i.e., participants, auditors, etc.).

(7b) Explain and apply the Professional Conduct Guidelines.

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

**Sources:**

Guidance on asset valuation methods ( CIA educational note), FR – 125 – 15, FR-126-15, CSOP 3000, PBA and regs

**Commentary on Question:**

*Candidates were encouraged to provide answers that moved beyond simply writing down lists and to provide answers in the context of the information provided in the question. Full marks were provided for answers that directly referenced the specifics of the question.*

**Solution:**

(a) Calculate the Adjusted Value of Assets at the beginning of Year 4.

Show all work.

**Commentary on Question**:

*Candidates that received full marks showed all calculations. Partial marks were given to candidates that provided the correct formulas but made calculation errors.*

## 5. Continued

* Calculate Preliminary AVA at end of Year 3

MVA at end of Year 3 - (1/4)*(Year 1 Realized Gains) - (2/4)*(Year 2 Realized Gains) - (3/4) *(Year 3 Realized Gains)
= 5,800 - (1/4)*(500) - (2/4)*(-600) - (3/4)*(-800)
= 6,575

* Apply corridor to Preliminary AVA

Lower corridor = 95% of MVA at end of Year 3
= 0.95 * 5,800
= 5,510

Upper corridor = 110% of MVA at end of Year 3
= 1.1 * 5,800
= 6,380

AVA at beginning of Year 4 = 6,380

(b) Assess the appropriateness of the above smoothing asset valuation method, taking into consideration the Canadian Institute of Actuaries' guidance on asset valuation methods.

**Commentary on Question:**
*Candidate should be prepared to discuss the high-level considerations in the CIA guidance note and discuss most of them in detail. Points were awarded for successful listing of majority of considerations and referencing each point to the question's given asset smoothing method.*

- *Achieves objectives:* primary objective is to moderate the volatility of contribution rates through the deferral of investment gain and loss recognition, the asset valuation method would facilitate this result.
- *Tracks to market value:* the asset valuation method includes current market value as a component and ensures that the asset value is expected to track to market value over time.
- *Does not unduly deviate from market value:* In cases where the smoothed asset values significantly deviates from market value, the corridor would take effect.
- *Has a reasonable and logical relationship to market value:* smoothing method makes reference to market value
- *Not free of bias:* the current method's corridor is biased (95% vs 110%)
- *Influences investment transactions as method only smooths realized gains and losses*

## 5. Continued

- *Is consistent with the length of typical economic cycles:* An asset valuation method that delays recognition of investment-related gains or losses over a period of more than five years typically would not be appropriate, but the current method's 4 year schedule would be appropriate.
- Methods that differentiate between realized and unrealized capital appreciation may be overly sensitive to asset turnover and may actually hinder the objective of dampening volatility

(c) Describe the regulatory and professional standards that need to be considered when implementing asset smoothing for solvency purposes.

**Commentary on Question**:
*Commentary on part (c), if appropriate. Click here to enter text.*

- CIA Guidelines allow for solvency asset smoothing methods, if permitted by law and stipulated by the terms of engagement
- The method should have the effect of stabilizing the short-term fluctuations in the market value of the plan assets [FSCO Q&A]
- Implementing asset smoothing would also necessitate smoothing the solvency liabilities. This is an added complexity to the solvency valuation.
- "The method should be appropriate for the circumstances of the plan" [FSCO Q&A]: this FSCO note coincides with the Standards of Practices that states the terms of an appropriate engagement will dictate which asset valuation to use going forward.
- Market value approach is more easily understood by clients, plan members and end users. Lack of smoothing method would result in solvency asset values equal to assets values for hypothetical wind-up valuations.
- "Once an asset smoothing method is adopted for a valuation, it must be applied consistently in future valuations unless otherwise justified by the circumstances of the plan (e.g., where the plan is merged with another plan)" [FSCO Q&A]
- Standards of practice allow asset values that differ from market value for solvency purposes depending on the circumstances of the work (i.e. it would be appropriate to introduce smoothing method to moderate volatility of funding contributions).

(d) Describe the actuarial professional standards you must consider when changing asset valuation methods from one actuarial valuation report to the next.

**Commentary on Question**:
*Candidates did not receive marks for simply listing professional standards considerations.*

## 5. Continued

- Professional Integrity: Act with skill and care
- Control of Work Products: Take reasonable steps to ensure that services are not used to mislead. Changing valuation method repeatedly may mislead unsophisticated audiences.
- Justification of methods: Need to justify why the change in the asset valuation method is warranted – in this case, biased valuation method may be the reason for a slight tweak to corridor.
- Reporting: change in asset smoothing methods requires that an actuary disclose the nature of the change and its impact.
- Repeated changes in the asset valuation method over a short period of time would result in the method being biased.

## 6. Learning Objectives:

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

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

**Learning Outcomes:**

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

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

(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:**

Report of the Task Force on Target Benefit Plans, CIA

**Commentary on Question:**

*In this question, the candidate must demonstrate an understanding of the funding of target benefit plans, the mechanisms used to reduce benefit risk and the potential regulatory framework for target benefit plans.*

*In general candidates scored poorly on this question.*

**Solution:**

(a) Explain how the funding of a target benefit pension plan is impacted by the following features:

(i) Contribution rate

(ii) Investment policy

(iii) Benefit/funding policy

**Commentary on Question:**

*Full credit is obtained where the candidate outlines the impact on the funding requirements of each item and provides a rational for the impact.*

## 6. Continued

(i) Contribution rate
- contribution rate is set in advance within a predefined range
- can be adjusted up or down within a narrow range
- benefits are derived from what can be afforded by the contribution level

(ii) Investment policy:
- the funding of the plan is not affected by the investment policy

(iii) Benefit/funding policy:
- the collection of rules that govern periodic assessment of affordability and the method of varying benefits relative to the target
- triggers for action: specific thresholds defined in terms of the outcomes of the affordability test, at which point a correction needs to be made
- actions to be taken: an explicit list of contribution/investment/benefit changes to be made when specific triggers are hit

(b) Explain how each of the following can impact the funding of a target benefit pension plan and reduce the risk of negative accrued benefit adjustments:

(i) Contribution flexibility

(ii) A countercyclical risk buffer

(iii) Dynamic margins

(iv) Projection valuation methods

**Commentary on Question:**
*Full credit is obtained where the candidate outlines how each identified tool affects the plan's funding policy and stated risk management goal.*

(i) Contribution flexibility
- contribution rates can be increased within a prescribed range to avoid negative benefit adjustments
- in order to reduce the risk of reducing future benefits, the current generation may contribute more within the prescribed range

(ii) Countercyclical risk buffer (PfAD)
- the countercyclical buffer creates a "no-action" range for benefits, adjustments are not made to the plan unless the size of the buffer exceeds a predetermined maximum or minimum
- having a buffer reduces both upside and downside risk of accrued benefit adjustments

**6. Continued**

(iii) Dynamic Margins

- margins can vary based on prescribed circumstances
- this impacts the level of affordable benefit in the plan thereby reducing the frequency of benefit decreases

(iv) Projection valuation methods

- instead of using a "closed group", a target benefit plan is often considered on an "open group" basis, so that future contributions and benefit accruals of both existing and new members are taken into account over some fixed horizon
- projection valuation methods can give stakeholders a more realistic depiction of the future course of the plan
- if necessary, contributions may be increased within the prescribed range to avoid future negative benefit adjustments

## 7. 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.

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

**Sources:**

Pension Asset Transfers Made Easier Hicks Morley

Ontario regulations 310/13

Ontario PBA Section 80

Asset Transfer FAQs – Actuarial

**Commentary on Question:**

*This question was well answered by most candidates. Part a) and b) were simple calculations of an asset transfer and the tests to meet the Superintendent's requirements, so most candidates received marks in part a) and b) and the best candidates were also able to get full marks for part c).*

**Solution:**

(a) Calculate the amount of assets to be transferred under the Asset Transfer Regulation at the effective date.

Show all work.

Transfer assets = 150 * (450 / 520) = 129.81

$129.81M is to be transferred from Plan A to Plan B

(b) Assess if this transfer meets the requirements to obtain the Superintendent's consent.

Show all work.

## 7. Continued

**Commentary on Question**:
*Candidates were usually aware of the conditions to meet the Superintendent's requirements because we could see where they were going with their calculations, but some didn't explicit name the requirements and clearly mention if the conditions were met. Some candidates also misinterpreted the second requirement. The successor plan's solvency ratio after transfer must be within 0.05 of the original plan and successor plan's solvency ratio. Some candidates interpreted that the successor plan's solvency ratio after transfer must be within 0.05 of the successor plan's solvency ratio and the original plan's solvency ratio after transfer must be within 0.05 of the original plan's solvency ratio.*

| | Before Transfer (in $millions) | | | After Transfer (in $millions) | | |
|---|---|---|---|---|---|---|
| | Plan A | Plan B | Transfer | Plan A | Plan B | |
| | Original Plan | Successor Plan | liabilities | Original Plan | Successor Plan | |
| Solvency liabilities | $520 | $300 | $150.00 | $370.00 | $450.00 | |
| Going concern liabilities | $500 | $220 | $140.00 | $360.00 | $360.00 | |
| Market value of assets | $450 | $250 | **$129.81** | **$320.19** | **$379.81** | to be calculated by candidate |
| Solvency ratio | 0.865 | 0.833 | | 0.865 | 0.844 | |
| .05 of solvency ratio | 0.050 | 0.050 | | | | |
| Minimum solvency ratio permitted after transfer | 0.815 | 0.783 | | | | |

After transfer:

| | | |
|---|---|---|
| 1. Solvency ratio of successor plan after transfer must be at least 0.85 | 0.844 | not met |
| 2i. Solvency ratio of successor plan after transfer is no more than 0.05 below the solvency ratio of the original plan before the transfer | 0.815 | met |
| 2ii. Solvency ratio of successor plan after transfer must be no more than 0.05 below the solvency ratio of the successor plan before the transfer | 0.783 | met |

**Before Asset Transfer**
Plan A Calculations (Original Plan):
Solvency Ratio before transfer = 450/520 = 0.865
Minimum solvency ratio permitted after the transfer = 0.865 – 0.05 = 0.815

Plan B Calculations (Successor Plan):
Solvency Ratio before transfer = 250/300 = 0.833
Minimum solvency ratio permitted after the transfer = 0.833 – 0.05 = 0.783

**After Asset Transfer**
Plan A Calculations (Original Plan):
Market Value of Assets after Transfer = 450 – 129.81 = $320.19
Solvency Ratio after transfer = 320.19 / 370 = 0.865

## 7. Continued

Requirements for Superintendent consent

1) The solvency ratio of the successor pension plan after the transfer is at least 0.85.
   Not satisfied (0.844 < 0.85)

   OR

2) The solvency ratio of the successor pension plan after the transfer is,
   a. no more than 0.05 below the solvency ratio of the original pension plan before the transfer, and
      Satisfied (0.844 > 0.815)
   b. no more than 0.05 below the solvency ratio of the successor pension plan before the transfer. O. Reg. 310/13, s. 10 (1).
      Satisfied (0.844 > 0.783)

(c) Describe the conditions that must be met with respect to the members' benefits transferred to Plan B.

**Commentary on Question**:
*Commentary on part (c), if appropriate. Click here to enter text.*

- DB assets must be used to provide DB benefits under the successor plan
- Commuted value of the accrued benefits determined as of the effective date of the asset transfer cannot be less than the commuted value of the benefits under the original plan (adjusted for any payments from the original plan to a prescribed retirement savings arrangement or directly to the members)
- The amount of a transferred beneficiary's accrued basic pension benefits under the successor plan (i.e. without regard to ancillary benefits) must equal 85% of the amount of his or her basic accrued pension benefits under the original plan.
- The transferred member is entitled in the successor plan for the period of membership in the original pension plan for purposes of determining eligibility of membership and benefit entitlements in the successor plan.

## 8. Learning Objectives:

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

**Learning Outcomes:**

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

(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, Third Edition, 2006, Chapter 2.

**Commentary on Question:**

*Candidates generally performed well on this question.*

**Solution:**

Calculate the accrued liability and normal cost as at January 1, 2017 using the following cost methods:

(i) Projected unit credit, pro-rated on service

(ii) Individual Level Premium

Show all work.

**Commentary on Question**:

*Aside from general calculation mistakes, candidates who did not receive full marks forgot to include the early retirement reduction factor.*

a) PUC $AL_x = \sum l_y \times q_y \times B_y \times \ddot{a}_y^{(12)} \times v^{(y-x)} \times [(x-w) \div (y-w)]$ ; x-current age; y-decrement age; w-hire age; $l_y$ -prob'ty of survival to y; $q_y$ -prob'ty of decrement at y; $B_y$ -accrued benefit at y

PUC $NC_x = \sum B_y \times \ddot{a}_y^{(12)} \times v^{(y-x)} \times [1 \div (y-w)]$

Member A

$AL_{term} = 10\% \times 50{,}000 \times 1\% \times 5 \times 13.5 \times v^{636} = 583$

$AL_{ret\ 55} = (1\text{-}10\%) \times 50\% \times 50{,}000 \times 1.04^{26} \times 1\% \times 5 \times 16.0 \times v^{26} \times 0.7 = 9{,}825$

$AL_{ret\ 65} = (1\text{-}10\%) \times (1\text{-}50\%) \times 50{,}000 \times 1.04^{36} \times 1\% \times 5 \times 13.5 \times v^{36} = 10{,}761$

$AL_{tot} = 21{,}169$

$NC = (21{,}169 - 583) \div 5$
$= 4{,}117$

## 8. Continued

Member B

$AL_{term} = 0$

$AL_{ret\ 55} = 50\% \times 100{,}000 \times 1.04^5 \times 1\% \times 10 \times 16.0 \times v^5 \times 0.7 = 53{,}384$

$AL_{ret\ 65} = (1\text{-}50\%) \times 100{,}000 \times 1.04^{15} \times 1\% \times 10 \times 13.5 \times v^{15} = 58{,}474$

$AL_{tot} = 111{,}858$

$NC = 111{,}858 \div 10$
$= 11{,}186$

$AL_{2017} = 133{,}027$

$NC_{2017} = 15{,}303$

b) ILP NC $= \sum (PVFB_x - AL_x) / PVFS_x \times S_x$ for each member

$PVFB_x = \sum l_y \times q_y \times B_y \times \ddot{a}_y^{(12)} \times v^{(y-x)}$

$PVFS_x = \sum l_y \times q_y \times S_x \times v^{(y-x)}$

At January 1, 2017, $AL_{2017} = 0$

Employee A:

$PVFB_{term} = 10\% \times 50{,}000 \times 1\% \times 5 \times 13.5 \times v^{36} = 583$

$PVFB_{ret\ 55} = (1\text{-}10\%) \times 50\% \times 50{,}000 \times 1.04^{26} \times 1\% \times 31 \times 16.0 \times v^{26} \times 0.7 = 60{,}912$

$PVFB_{ret\ 65} = (1\text{-}10\%) \times (1\text{-}50\%) \times 50{,}000 \times 1.04^{36} \times 1\% \times 41 \times 13.5 \times v^{36} = 88{,}244$

$PVFB_{tot} = 149{,}739$

$[\ \ddot{a}_{y-x\rceil}^{(j)} = (1-(1+j)^{-(y-x)})/(1-1/(1+j))$ & $j = (1.05/1.04)-1$ ]; so $\ddot{a}_{26\rceil}^{(j)} = 23.1282$ and $\ddot{a}_{36\rceil}^{(j)} = 30.5997$

$PVFS_{term} = 10\% \times 50{,}000 = 5{,}000$

$PVFS_{ret\ 55} = (1\text{-}10\%) \times 50\% \times 50{,}000 \times \ddot{a}_{26\rceil}^{(j)} = 520{,}385$

$PVFS_{ret\ 65} = (1\text{-}10\%) \times 50\% \times 50{,}000 \times \ddot{a}_{36\rceil}^{(j)} = 688{,}493$

$PVFS_{tot} = \$1{,}213{,}878$

$NC_{2017} = (149{,}739 - 0) / 1{,}213{,}878 \times 50{,}000$
$= 6{,}168$

Employee B:

$PVFB_{ret\ 55} = 50\% \times 100{,}000 \times 1.04^5 \times 1\% \times 15 \times 16.0 \times v^5 \times 0.7 = 80{,}075$

$PVFB_{ret\ 65} = 50\% \times 100{,}000 \times 1.04^{15} \times 1\% \times 25 \times 13.5 \times v^{15} = 146{,}186$

$PVFB_{tot} = 226{,}261$

**8. Continued**

$\ddot{a}_{5\overline{|}}^{(j)} = 4.9057$ and $\ddot{a}_{15\overline{|}}^{(j)} = 14.0401$

$PVFS_{ret\ 55} = 50\% \times 100{,}000 \times \ddot{a}_{5\overline{|}}^{(j)} = 245{,}285$
$PVFS_{ret\ 65} = 50\% \times 100{,}000 \times \ddot{a}_{15\overline{|}}^{(j)} = 702{,}005$
$PVFS_{tot} = \$947{,}290$

$NC_{2017} = (226{,}261 - 0) / 947{,}290 \times 100{,}000$
$= 23{,}885$

Total NC = 30,053

## 9. Learning Objectives:

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

**Learning Outcomes:**

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

**Sources:**

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

**Commentary on Question:**

*The question asked candidates to describe how you would set the mortality assumptions, however, some candidates provided recommendations rather than providing descriptions. It was important for candidates to recognize that the considerations were different for each plan due to membership size. Few candidates described considerations for how to adjust a standard mortality table.*

**Solution:**

Describe how you would set the going concern pre-retirement and post-retirement mortality assumptions for the January 1, 2017 valuation for:

(i) The Salaried plan; and

(ii) The Hourly plan, assuming an experience study has been completed.

**<u>Comments that apply to the Salaried plan and Hourly plan</u>**

**General Comments**

- There are two key components to the selection of an appropriate best estimate mortality assumption:
- The best estimate of the current rates of mortality for the plan; and
- Appropriate adjustments for future improvements in mortality.

**Pre-Retirement Mortality**

- Same assumption as for post-retirement mortality will generally be satisfactory

- Pre-retirement mortality assumptions are not of great significance to the calculation of actuarial liabilities, since
    - Rates of mortality at pre-retirement ages are generally very low; and
    - In many cases, benefits payable on death are equal to the commuted value of a deferred pension entitlement.

## 9. Continued

- Give greater consideration to the selection of the pre-retirement mortality assumption in particular cases where:
    - Benefits payable on member death are significantly different from the commuted value of accrued pensions; and/or
    - Actual observed rates of mortality for active members are significantly different from those expected based on the standard mortality tables.

**Improvement Scale**

- Insufficient data for salaried workers or hourly workers to develop improvement table for either group.

- Future mortality improvements, generational (2-D or 1-D), are normally based on published mortality studies

- Development of a best estimate of future mortality improvement rates typically comprises three elements:
    - A short-term rate based on recently observed improvement rates;
    - An ultimate long-term improvement rate, which is highly uncertain; and
    - A transition from the short-term to the ultimate improvement rates over a certain period and based on a particular pattern.

**Salaried Workers Base Table – Very Small Group**

- Number of retirees is insufficient to conduct a credible mortality experience study
- Select an appropriate published mortality table
- Adjust mortality table for characteristics of the plan if warranted
- Since lacking credible experience, may consider using experience from other similar plans to adjust base table

**Hourly Workers Base Table – Large Group**

- Should have enough data to use credible mortality experience to adjust a standard table

When Should You Consider Changing a Valuation Mortality Table

- Experience studies would typically be prepared every three to five years

- When assessing whether to change a valuation mortality table based on the results of an experience study, begin by comparing the observed deaths weighted by benefit amount to the expected deaths weighted by benefit amount.

- If the current mortality table is a good representation of the actual underlying mortality rates of plan members and former members, the ratios of actual to expected deaths should closely track 1

## 9. Continued

- Consider the characteristics of plan members and former member:
  - 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)

- Use 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

Adjusting a Standard Table

- A more practical approach is often to rate a version of a standard table up or down based on the total death amounts from the experience study.

- Multiply mortality rate at each age x by the ratio of actual to total expected death amounts for all ages

- For ages close to the maximum age to which a plan member is assumed to live, mortality rates should be adjusted, if necessary, so that there is a reasonable progression from the mortality rates close to the maximum age to the mortality rate of 1 at the maximum age

- If there are ages or age bands where Plan B has insufficient data for the adjustment to a standard table to be fully credible, a more appropriate approach would be to assign partial credibility to the results of the mortality study.

- Credibility weighting assigned to experience study = square root(actual number of deaths / expected number of deaths) or square root (actual dollars of death / expected dollars of death)

- Credibility approach outlined above assumes the shape of the standard table is appropriate for the plan being valued and all that is required is a proportional adjustment (either up or down) to the standard table.

- If the underlying shape of the mortality curve for a plan differs significantly from all available standard tables, the actuary may choose to build a table from scratch using experience data from the plan, even if a credible amount of experience data is not available.

## 10. Learning Objectives:

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

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

**Learning Outcomes:**

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

(6a) Evaluate retirement funding alternatives for the plan sponsor, shareholders and the participants.

(6b) Evaluate funding restrictions imposed by regulations.

**Sources:**

Morneau Shepell, Handbook of Canadian Pension and Benefit Plans, 15th edition, Ch. 5 (exclude pp. 133-142)

FR-119-14: CAPSA Guideline No. 7: Pension Plan Funding Policy Guideline

Report of the Task Force on Target Benefit Plans, CIA, June 2015

FR-127-15: Rebuilding New Brunswick: The Case for Pension Reform

**Commentary on Question:**

*The candidates were expected to consider the similarities and the differences of elements found in **funding policies** for the two plan types. No points were awarded for simply listing elements. Most candidates showed that they knew the differences and similarities of the two plan types, but not from a funding policy point of view. Only few candidates were able to describe what should be part of the funding policies.*

**Solution:**

Compare and contrast the elements of a funding policy established in accordance with CAPSA Guideline No. 7 for the following:

(i) a traditional defined benefit pension plan

(ii) a target benefit pension plan

**<u>Similarities and elements of a best practice funding policy</u>**

When plan sponsors document their funding objectives, they should outline their understanding of the risk factors that influence future financing obligations, their risk tolerance, and specific policies related to matters that affect the funding of the pension plan.

## 10. Continued

The following are best practice elements of a funding policy under the CAPSA guideline:

- 1. Plan Overview: The funding policy should include an overview of the features of the plan, related financial information and characteristics of the plan sponsor that are relevant to the establishment of the funding policy.

- 2. Funding Objectives: The funding policy should indicate how the funding objectives integrate with the plan's investment policy, as well as the plan sponsor or plan objectives.
- These objectives can be stated as they relate, for instance, to benefit security, stability of contributions, and to contribution or benefit levels.

- 3. Key Risks Faced by the Plan: The funding policy should describe the key risks that are faced by the plan from the perspectives of various stakeholders.
- These risks can include the extent to which the plan's assets are mismatched against its liabilities and the demographic characteristics of the plan beneficiaries.
- Idiosyncratic mortality risk, Residual mortality risk, Intergenerational risk, Plan termination risk, Experience differing from expectations, Liquidity risk, Investment risk, Inflation risk, Demographic risk.
- Due consideration should be given to how these risks may affect the security of beneficiaries' benefits.

- 4. Funding Volatility Factors and Management of Risk: The funding policy should document the structure of the plan's liabilities as it affects funding risk. It should describe the plan's tolerance for volatility in funding requirements.
- The policy should also take into account the characteristics of the plan's liabilities and the link of the plan's liabilities to the performance of the plan assets.
- The policy could include any scenario testing practices that are used as a tool to evaluate the effect of different hypothetical situations on the plan's funding position and requirements.
- Use of asset/liability smoothing can be discussed.

- 5. Funding Target Ranges: The funding policy should describe any funding targets, contribution target levels and established cost sharing arrangements (if they are relevant to the plan's structure). Funding targets can be expressed in relation to liabilities for a going concern, solvency, wind-up, or some other measure, depending on the plan's funding objectives.
- The funding policy can also describe any mechanisms that would allow flexibility in funding and accommodate potential short term operational requirements.

## 10. Continued

- 6. Cost Sharing Mechanisms: If relevant, the funding policy could include considerations for cost sharing mechanisms between plan beneficiaries and the employer.

- 7. Utilization of Funding Excess: While utilization of funding excess is subject to the terms of applicable plan documents and legislative requirements, the funding policy should describe the plan sponsor's policy on using funding excess for an ongoing entity, and if appropriate, could cover its use in the event of plan termination. If funding excess can be used for contribution holidays or benefit improvements, the policy should establish the factors that may be considered in deciding how and when to use the funding excess. This includes any desired margins that the plan sponsor wishes to keep before using the funding excess.

- 8. Actuarial Methods, Assumptions and Reporting: The plan sponsor can provide useful guidance to the plan actuary in selecting actuarial methods and assumptions that are appropriate for the plan sponsor's risk management approach. This guidance can include the going concern actuarial cost method, desired margins or provision for adverse deviations and acceptable asset valuation methods and ranges.
- Static margin in valuation assumptions vs. Dynamic margins

- 9. Frequency of Valuations: The plan sponsor may establish standards for the frequency of valuations, subject to any legislative requirements.

- 10. Monitoring: Management and implementation issues around the establishment and ongoing maintenance of the funding policy should be documented, including the circumstances or events that should trigger a review or amendment of the policy.
- This includes documenting the roles, responsibilities and oversight of the funding policy, as well as the frequency of review.

- 11. Communication Policy: The plan sponsor or plan administrator should consider what, to whom and when funding information would be available. A summary of the plan's funding policy that is accessible to plan members can help them understand a number of factors affecting their pension plans (security of benefits and the variability of funding costs, as well as the risks that are faced by both their pension plan and others).

## 10. Continued

**Differences**
**For target benefit plans**

- The funding policy is key to the design and successful maintenance of a TBP. It provides the transparency for stakeholders to identify the plan's unique balance of costs, risks, and intergenerational risk sharing, and documents the risk management strategies pursued to maintain this balance.

- Funding Objectives: The objectives will differ depending on the plan stakeholders' approach to risk sharing and risk management.
- One group of stakeholders may be most interested in minimizing intergenerational risk transfer. They may choose to have fixed contributions and be comfortable with a wide range of benefit variability.
- Another group may choose to make benefit stability the highest priority. They are more likely to adopt a policy with large margins and reserves and wide ranges where there is no adjustment to benefits, contributions, or investments.
- Yet another group of stakeholders may choose to adjust investment policy first. For example, they may reduce investment risk if an affordability trigger is met.

- Cost Sharing Mechanisms: For a target benefit plan, the funding policy would always include considerations for cost sharing mechanisms between plan beneficiaries and the employer, while cost may be fully paid by employer in a traditional DB plan or shared by fixed levels of employee contributions. This could include establishing total target contribution levels and determining the extent to which costs will be shared between both parties.

- Key Risks Faced by the Plan: Benefit levels rather than contribution levels, will typically need to be adjusted to reflect the funding level of the plan. Although contribution levels are fixed, volatility in the plan's financial position can translate into fluctuating benefit levels.
- The funding policy for a TBP should describe the approach followed to set benefit levels and issues relating to the use of fixed contributions. These issues could include how the plan's financial position affects benefit levels and in what manner benefit levels may be adjusted.
- These plans should also document the respective decision making roles of trustees, employers and collective bargaining agents (as applicable). The issues of how to apply an even-handed treatment of beneficiaries, both the current and future generations, in different circumstances and the policy on benefit reductions or restructuring (when applicable), should also be discussed.

## 10. Continued

- Address one of the biggest risks for a TBP being that stakeholders misunderstand the nature of risk-sharing, which can lead to parties taking actions that deviate from the plan's objectives, stakeholders losing sight of the plan's value, and disenchanted members or employers wanting to exit it.
- A TBP with a given level of target benefit must balance three elements: costs, risks, and the extent of possible intergenerational transfers. Reducing one element increases one or both of the other elements.

- Communication Policy: Transparency -Fundamentally, a TBP must operate with as much transparency as possible in order to maintain trust among participants. This distinguishes it from traditional DB plans, which are generally completely opaque to members. This opaqueness is acceptable if members are not bearing any risk but is not desirable in a TBP in light of the potentially significant risk transfers among members.
- Funding Target Ranges: the distinguishing feature of TBPs is that the contribution rules are set first, at a fixed level (or within a fixed range), while benefits are derived from what can be afforded by that contribution level, with the ability to adjust benefits as experience develops.

- Funding Volatility Factors and Management of Risk: The policy would consider the following rules for a TBP that govern periodic assessment of affordability:
  1. Affordability test: the valuation basis (consisting of methods and assumptions) that is used to decide if the target is affordable at the outset and continues to be affordable at each subsequent valuation date.
  2. Triggers for action: specific thresholds defined in terms of the outcomes of the affordability test (e.g., funded ratio <100%), at which point a correction needs to be made. On the downside, the correction would ensure that benefits remain affordable. On the upside, the correction would distribute any excess assets that are deemed not to be needed to keep the plan sustainable.
  3. Actions to be taken: also known as the "benefit ladder" or "policy ladder", this is an explicit list of contribution/investment/benefit changes to be made when specific triggers are hit.
- A TBP may adopt a policy where no margins for adverse deviation are applied and no reserve assets are held. Instead, best estimate experience gains and losses are immediately reflected in the benefit level.

- Utilization of Funding Excess: TBP policy may specify surplus level before a benefit increase or contribution decrease is made, with a higher focus on cost sharing. While a DB plan may only specify that surplus will be used to take employer contribution holidays.

## 11. Learning Objectives:

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

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

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

**Learning Outcomes:**

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

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

(5g) The candidate will be able to describe and apply regulation pertaining to reporting requirements.

(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, chapter 18,
Pension Benefits Act,
Morneau chapter 7

**Commentary on Question:**

*Commentary listed underneath question component.*

**Solution:**

(a) Calculate the minimum required and maximum permissible employer contributions for 2016.

**Financial Position:**

Going Concern (GC) = Assets - Liability = 840,000 - 900,000 = (60,000)
Solvency/Wind-up (WU) = Assets - WU Expense - Liability
= 840,000 - 50,000 - 1,000,000 = (210,000)

## 11. Continued

**Special Payments:**
GC SP = GC Deficit / Factor = 60,000 / 11.4 = 5,263.16
Solvency Asset Adjustment (SAA) = GC SP x Factor = 5,263.16 x 4.7 = 24,737
WU Deficit = WU Position - SAA = 210,000 - 24,737 = 185,263
WU SP = WU Deficit / Factor = 185,263 / 4.7 = 39,418

**Required Contributions:**
Current Service Cost (CSC) = 80,000
Minimim = CSC + GC SP + WU SP = 80,000 + 5,263 + 39,418 = 124,681
Maximum = CSC + max (GC Position, WU Position)
= 80,000 + 210,000 = 290,000

(b) Calculate the minimum required and maximum permissible employer contributions for 2017 to be presented on the December 31, 2016 valuation report.

**Commentary on Question:**
*For the rollfoward of the GC Liability calculations, the solution is based on the CSC being made mid-year. Full credit was provided to candidates who assumed that CSC contributions were made at the beginning of the year.*

*The question did not clearly indicate that the adjustment to the liabilities due to the change in interest rates was effective as at the end of the year, and as such, full credit was provided to candidates who assumed that the liabilities were adjusted at the beginning of the year.*

**Rollforward Position:**
Contributions and Benefits are made mid-year.
Assets = Assets BOY x (1 + int) + (Contributions - Benefits) x (1 + int/2)
= 840,000 x (1.10) + (124,681 - 100,000) x (1 + .10/2) = 949,915

GC Liability = GC Liability BOY x (1 + int) + (CSC - Benefits) x (1 + int/2) + Assumption Adjustment
= 900,000 x (1.04) + (80,000 - 100,000) x (1+.04/2) - 100,000
= 815,600
WU Liability = WU Liability BOY x (1 + int) + (Solvency Incremental Cost - Benefits) x (1 + int/2) + Assumption Adjustment
= 1,000,000 x (1.03) + (130,000 - 100,000) x (1+.03/2) - 120,000
= 940,450

**Financial Position:**
GC = Assets - GC Liability = 949,915 - 815,600 = 134,315
WU = Assets - WU Expense - WU Liability = 949,915 - 50,000 - 940,450 = (40,535)

## 11. Continued

**Special Payments:**
No GC SP as there is a GC Surplus
Since there is a GC Surplus and the WU Position improved, the SAA = 0
Since there is a WU Deficit, the term of the WU SP may be reduced, however the payment amount must remain the same or 39,418 per annum

**Required Contributions:**
CSC = 2016 CSC adjusted with int + Assumption Adjustment
= 80,000 x (1.04) - 10,0000 = 73,200
Minimim = CSC + GC SP + WU SP = 73,200 + 0 + 39,418 = 112,618
Maximum = CSC + max (GC Position, WU Position)
= 73,200 + 40,535 = 113,735

(c) You were not able to file the valuation report until September 30, 2017. Calculate the minimum required employer contribution for 2017.
Show all work.

**Commentary on Question:**
*Candidates needed to determine the actual amount of contributions that were required to be made during the period January to September and the period October to December to receive full credit. No credit was given to candidates who merely identified the fact that contributions must continue to be made in accordance with the old report until the new report is filed.*

**Required Contributions January to September:**
Contributions must continue to be made in accordance with the 2015 Report until the 2016 Report is filed.
CSC = 2016 CSC adjusted with int x 9 /12 = 80,000 x (1.04) x 9/12 = 62,400
SP = 2016 SP x 9/12 = ( 5,263 + 39,418) x 9/12 = 33,511
Total January to September = 62,400 + 33,511 = 95,911

**Required Contributions October to December:**
Once the 20216 Report is filed the contributions for remainder of 2017 are made in accordance with it.
CSC = 73,200 - CSC made to date = 73,200 - 62,400 = 10,800
SP = 39,418 - SP made to date = 39,418 - 33,511 = 5,907
Total October to December = 10,800 + 5,907 = 16,707

The minimum contribution for 2017 = 95,911 + 16,707 = 112,618

## 12. 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:**

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

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

(5j) The candidate will be able to describe and apply regulation pertaining to individual savings plans.

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

(6b) Evaluate funding restrictions imposed by regulations.

**Sources:**

Canadian Pensions and Retirement Income Planning, Towers Watson, 5th Edition. Chapters 1,14, 17, 18, 19, PBA,

**Commentary on Question:**

*The question was asking for Regulatory considerations for 3 types of pooled retirement savings plans. Most candidates were able to correctly list some of the regulatory considerations, but not enough to get full credit. Many candidates were unclear of the contribution limits in part i) or confused contributions limits between plans..*

**Solution:**

Compare and contrast the following arrangements from a regulatory perspective:

- a Deferred Profit Sharing Plan
- a Group Registered Retirement Savings Plan, and
- a registered defined benefit pension plan,

with respect to the following:

(i) Maximum employer and employee contributions;

(ii) Ability to provide past service benefits;

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(iii) Tax-sheltered lump sum transfer limits; and

(iv) Locking-in requirements and allowable exceptions.

**Commentary on Question Part i)**:
*Candidates generally did poorly on this part. Many candidates did not recognize the maximum employer contributions for DPSPs correctly. Some candidates confused the employer maximum DB contributions with the DC plan limits, or did not show the complete formula for the Maximum employer contributions. Many candidates failed to mention "preceding year" in Group RRSP maximum contributions and lost credits.*

**Commentary on Question Part ii)**:
*Candidates generally did very well on this part.*

**Commentary on Question Part iii)**:
*Candidates generally did well on this part. Some candidates confused tax-sheltered transfer limits on Group RRSPs with the individual RRSP contribution room for the year. Most candidates correctly identified the Maximum Transfer limit for DB plans, but only a few provided additional details.*

**Commentary on Question Part iv)**:
*Candidates generally did very well on this part.*

i**) Maximum employer and employee contributions**
Deferred Profit Sharing Plan:

- The maximum employer contribution limits for a year are equal to the lesser of 18% of compensation and one-half the money purchase limit for the year
- Employee contributions are not permitted to a DPSP

Group Registered Retirement Savings Plan:

- Employee contributions are limited to the lesser of:
  a) 18% or the employees earned income for the preceding year,
  b) PA limit for the preceding year

Defined Benefit Pension Plan:

- Maximum employer contributions are limited to the current normal cost contributions plus the greater of going concern or wind-up deficiency as determined by the actuary
- Excess actuarial surplus also restricts the employer's contributions that can be made to the plan

## 12. Continued

- The maximum permitted employee contribution under a registered DB plan is the lesser of:
  a) 9% of the member's total compensation for the year from all employers that participate in the plan, and
  b) the sum of $1,000 and 70% of the member's pension credit for the year under the particular defined benefit provision
- It is possible to apply for a waiver of the employee contribution limit by applying to the Minister of National Revenue if the manner of determining the employee contributions is acceptable to the Minister and it is expected that the current service contributions made by the member will be no more than 50% of the related benefits

**ii) Ability to provide past service benefits**

Deferred Profit Sharing Plan:

- No past service benefits allowed

Group Registered Retirement Plan:

- No past service benefits allowed

Defined Benefit Pension Plan:

- Plan sponsor is allowed to provide past service benefits retroactively.

**iii) Tax-sheltered lump sum transfer limits**

Deferred Profit Sharing Plan:

- No tax-sheltered lump sum transfer limits on the DPSP payments. If contributions had been made under the prescribed limits, the entire DPSP benefits can be transferred on a tax-free basis to an RPP, RRSP, or another DPSP by a member

Group Registered Retirement Plan:

- No tax-sheltered lump sum transfer limits on the Group RRSP payments. If contributions had been made under the prescribed limits, the entire Group RRSP benefits can be transferred to another tax-sheltered vehicle.

Defined Benefit Pension Plan:

- The benefit used to calculate the maximum transfer value is based on the age 65 lifetime retirement benefit (or normalized pension)
- The maximum transfer value factors are prescribed and based on the age at determination.
- Pre-1991 excess member contributions may be transferred without limitation

## 12. Continued

**iv)** Locking-in requirements and allowable exception

Deferred Profit Sharing Plan:

- Funds cannot be locked-in after termination of employment

Group Registered Retirement Plan:

- Funds cannot be locked-in after termination of employment

Defined Benefit Pension Plan:

- As per the regulations, vested benefits earned are locked-in and can only be transferred to a locked-in vehicle on termination/retirement, except for some exceptions
- Amounts above the lump sum transfer limits can be taken as cash or deposited to a non-locked in retirement savings vehicle.
- Special rules allow unlocking of the transferred funds in case of:
  - financial hardship
  - shortened life expectancy
  - when the member ceases to be a Canadian resident
  - Under the small benefits rules, differing by province
  - If the employee has contributed more than 50% towards the benefit's commuted value