Exam RETFRC

MORNING SESSION

Date: Wednesday, November 1, 2017
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).

   a) The morning session consists of 7 questions underlined numbered 1 through 7.

   b) The afternoon session consists of 5 questions underlined numbered 8 through 12.

   The points for each question are indicated at the beginning of the question. Questions 5 and 12 pertain to the Case Study, which is enclosed inside the front cover of this exam booklet.

2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.

3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.

2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.

3. The answer should be confined to the question as set.

4. When you are asked to calculate, show all your work including any applicable formulas.

5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam RETFRC.

6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

1. (*6 points*) Your client established a new non-contributory defined benefit pension plan as at January 1, 2017. You are given:

Plan Provisions:

Retirement benefit:	1.5% of the final earnings times years of service from date of hire
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Unreduced retirement age:	Later of age 60 or 10 years of service

Actuarial Assumptions and Methods:

Interest rate:	5% per annum
Salary increase rate	4% per annum
Retirement age:	75% at unreduced retirement age, remainder at age 65
Pre-retirement decrements:	None
Timing of decrements:	Beginning of year

Annuity Factors:

Age	60	61	62	63	64	65
$\ddot{a}_x^{(12)}$	14.8	14.6	14.3	14.1	13.8	13.5

Participant Data at January 1, 2017:

Member	A	B
Age	50	55
Service from date of hire	10	2
2016 Earnings	$100,000	$75,000

1. **Continued**

Your client makes an immediate contribution of $100,000 to the new plan at January 1, 2017.

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

(i) (*3 points*) Individual Level Premium (percent of pay) cost method.

(ii) (*3 points*) Aggregate cost method.

Show all work.

2. (*10 points*) ABC Company sponsors two single-employer defined benefit pension plans registered in Ontario.

(a) (*1 point*) List the factors to be considered when determining the margin for adverse deviations for a going concern valuation of a pension plan.

(b) (*4 points*) Compare the perspectives of the financial economics framework to conventional actuarial practice for the following:

   (i) The recognition of the equity risk premium when setting a going concern discount rate developed by reference to a pension plan's assets; and

   (ii) The consistency of asset and liability valuations.

You are setting the going concern discount rate assumption for the actuarial valuations as at January 1, 2017.

You are given:

| Plan | Open or Closed to new entrants | Target asset allocation at January 1, 2017 | | Additional information |
		Equity	Fixed Income	
Plan 1	Open	60%	40%	Target asset allocation is to be maintained indefinitely.
Plan 2	Closed	60%	40%	The plan is 80% funded on a going concern basis as at January 1, 2016. With each 5% increase in the going concern funded ratio, the target asset allocation will change, increasing the bond allocation by 10% each time.

(c) (*2 points*) Describe the two approaches outlined in the CIA Standards of Practice for selecting the best estimate assumption for the going concern discount rate for Plan 1.

(d) (*3 points*) Describe the considerations for selecting the best estimate assumption for the going concern discount rate for Plan 2.

3. (*8 points*) You are the actuary for ABC Company. You have been asked to perform a 10-year projection of the going concern funded position of their pension plan.

You have performed your projections under a single set of deterministic assumptions.

(a) (*1 point*) List the limitations of using a single set of deterministic assumptions for your projections.

In order to address the limitations of your deterministic projections, you propose to perform stochastic projections.

(b) (*3 points*) Describe the process to perform stochastic projections.

(c) (*4 points*) Explain how performing stochastic projections would address the limitations in (a).

4. (*11 points*) You are the actuary performing a funding valuation for ABC Company's defined benefit pension plan registered in Ontario. You are considering using a different asset valuation method for this funding valuation.

(a) (*2 points*) List the desirable characteristics of an asset valuation method in accordance with the Canadian Institute of Actuaries' revised Educational Note Guidance on Asset Valuation Methods.

The plan sponsor would like you to use a smoothed asset value instead of the market value for the valuation, with the objective of moderating the volatility of contributions to the pension plan. You have decided to use the Unit Method to smooth the assets.

Description of Unit Method for asset smoothing

The smoothed actuarial value of assets at the valuation date is equal to the average of the unit value at that date and at the 3 preceding years, multiplied by the number of units at the valuation date.

At the beginning of Year 1, the unit value is $1,000 and there are 200 units.

The unit value at the beginning of each following year is determined as follows:
- Net cash flow is used to purchase additional units based on the value at the beginning of the year.
- The unit value at the beginning of the year changes in accordance with the actual rate of return in the previous year.
- The actual rate of return is calculated assuming that net cash flow is in the middle of the year.

You are given:

	Year 1	Year 2	Year 3	Year 4
Number of Units at Beginning of Year	200			
Value of a Unit	$1,000			
Fair Market Value at Beginning of Year	$200,000	$241,000	$255,000	$307,000
Net Cash Flow	$30,000	$40,000	$14,000	
Interest, Realized and Unrealized Gains/(Losses)	$11,000	($26,000)	$38,000	
Fair Market Value at End of Year	$241,000	$255,000	$307,000	

4. **Continued**

(b)   (*4 points*) Calculate the smoothed actuarial value of assets at the valuation date (beginning of Year 4).

Show all work.

(c)   (*5 points*) Critique the above smoothing asset valuation method taking into consideration the Canadian Institute of Actuaries' revised Educational Note Guidance on Asset Valuation Methods.

5. (*9 points*) DPC passed a resolution to amend the DPC Plan effective January 1, 2017 as follows:

    (i)   The definition of pensionable earnings is amended to retroactively include bonuses.

    (ii)   Members can purchase authorized periods of leave as a past service buy-back.
- The pensionable earnings used for the past service buy-back will be the same pensionable earnings (including bonuses) as earned during the 12-month period prior to the commencement of the applicable leave.
- For each year of service bought back, the member must contribute an amount equal to 5% of the pensionable earnings in that year to the pension fund.

You are given the following member data as at January 1, 2017:

Year	Base Pay	Bonus	Service (months)	Note
2011	$72,800	-	12	
2012	Nil	Nil	0	Leave of absence
2013	Nil	Nil	0	Leave of absence
2014	$80,000	$6,400	12	
2015	Nil	Nil	0	Leave of absence
2016	$85,000	$8,500	12	

The member will make a qualifying transfer from a personal RRSP account to fund the buy-back. Prior to the qualifying transfer, the member has $35,000 in the member's personal RRSP account and unused RRSP contribution room of $40,000.

(a)   (*3 points*) Explain the principles behind Past Service Pension Adjustment (PSPA) calculations.

(b)   (*4 points*) Calculate the provisional PSPA if the member decides to buy back all leaves of absence.

Show all work.

(c)   (*2 points*) Describe the PSPA certification process.

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6. (*8 points*) Your client sponsors a non-contributory defined benefit pension plan.

You are given:

Plan provisions:

Retirement benefit:	2.00% of final average earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Postponed retirement benefit:	Greater of:

        (a) the pension accrued as of the date of postponed retirement based on earnings and service at the date of postponed retirement, or

        (b) the actuarial equivalent of the normal retirement pension determined at age 65.

Pre-retirement death benefit:	None beyond age 65

Actuarial assumptions:

Interest Rate:	4.0% per year
Mortality table:	2014 Canadian Pensioners' Mortality Table (CPM2014) combined with CPM Improvement Scale B (CPM-B)
Unisex basis:	50% male/50% female

Member's data:

Final average earnings at age 65:	$51,000
Final average earnings at age 67:	$54,000
Service at age 65:	24 years
Service at age 67:	26 years
Postponed retirement age:	67

Annuity and survival factors:

$\ddot{a}_{65}^{(12)}$	$\ddot{a}_{67}^{(12)}$	p_{65}	p_{66}
15.0	14.1	0.994	0.993

(a) (*3 points*) Calculate the member's annual pension benefit under the normal form of pension at the member's postponed retirement age.

Show all work.

6. Continued

(b) (*2 points*) Explain, in words, the impact on the member's postponed retirement pension if mortality rates are improved.

You are given:

- The member's spouse is the same age as the member.
- A joint and 60% survivor form of pension is equal to 92% of the postponed retirement pension payable under the normal form.
- The member elects a joint and 60% survivor form of pension with a pop-up provision that restores the pension to the amount of pension payable under the normal form if the spouse predeceases the member.

(c) (*3 points*) Calculate the member's annual pension benefit under the elected pop-up optional form of payment at the member's postponed retirement age.

Show all work.

7. (*8 points*) The XYZ Company has requested the following benefits to be provided to its CEO, who is retiring January 1, 2017, through a defined benefit registered pension plan:

Requested Plan Provisions:

Retirement benefit:	3% of final salary for each year of credited service
Bridge:	Bridge benefit of $80,000 per year payable to age 70
Post-retirement indexation:	Pension and bridge indexed at 5% per year
Early retirement reduction:	Unreduced at January 1, 2017
Payment form:	Joint and 100% survivor pension where the survivor pension is payable to the CEO's daughter given the CEO's single status

CEO Member Data as at January 1, 2017:

Age:	57 years
Credited Service:	7 years
Service from Hire:	20 years
Final Salary:	$1,000,000
Status:	The CEO is <u>not</u> a connected person

Additional Information:

C/QPP Maximum Pension Benefit for 2017:	$1,114.17 per month
Maximum OAS payable January 2017:	$578.53 per month
Income Tax Act Defined Benefit Dollar Limit for 2017:	$2,914.44 per year of service
Three-year average YMPE at January 1, 2017:	$54,600

7. Continued

(a)   (*5 points*) Assess whether or not each of the requested plan provisions are permitted under the Income Tax Act for a registered pension plan.

Justify your response.

(b)   (*3 points*) Calculate the maximum lifetime pension and bridge benefits payable to the CEO under a registered plan as at January 1, 2017.

Show all work.

END OF EXAMINATION
Morning Session

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