CURATED PAST EXAM ITEMS
- Questions -

RET 201 – Retirement Plan Valuation

Important Information:

- These curated past exam items are intended to allow candidates to focus on past SOA fellowship assessments. These items are organized by topic and learning objective with relevant learning outcomes, source materials, and candidate commentary identified. We have included items that are relevant in the new course structure, and where feasible we have made updates to questions to make them relevant.
- Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.
- Candidate solutions other than those presented in this material, if appropriate for the context, could receive full marks. For interpretation items, solutions presented in these documents are not necessarily the only valid solutions.
- Learning Outcome Statements and supporting syllabus materials may have changed since each exam was administered. New assessment items are developed from the current Learning Outcome Statements and syllabus materials. The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.
- Thus, while we have made our best effort and conducted multiple reviews, alignment with the current system or choice of classification may not be perfect. Candidates with questions or ideas for improvement may reach out to education@soa.org. We expect to make updates annually.

RET 201 Learning Objective 2 Curated Past Exam Questions

RETFRC, Fall 2020, Q2

(*8 points*) Your client sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal retirement benefit:	2% of final year's earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Early retirement benefit:	5% reduction for each year prior to age 65
Termination benefit:	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Salary increase rate:	4% per year
Retirement age:	Age 65
Pre-retirement decrements:	None
Actuarial cost method:	Entry Age Normal

Participant Data at January 1, 2020:

	Member A	Member B	Member C
Age:	40 years	50 years	60 years
2020 Salary:	$60,000	$70,000	$80,000
Service:	10 years	20 years	25 years

Annuity Factors:

$\ddot{a}_{65}^{(12)} =$ 13.5 $\ddot{a}_{61}^{(12)} =$ 15.0

Additional Information:

Market value of assets as at January 1, 2020: $1,000,000

(a) (*2 points*) Calculate the total normal cost and the unfunded actuarial liability as at January 1, 2020.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

You are given:

- The fund earns a rate of return of -10% during 2020.
- A contribution of $50,000 is made to the plan on December 31, 2020.
- At December 31, 2020, Member B receives a 10% salary increase.
- At December 31, 2020, Member A terminates employment and elects to defer their accrued pension to age 65; and
- At December 31, 2020, Member C retires.

(b) (*2 points*) Calculate the unfunded actuarial liability as at January 1, 2021.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

(c) (*4 points*) Calculate the gains and losses by source for 2020.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Fall 2020, Q8

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

You are given:

Plan Provisions:

Normal retirement benefit:	2% of each year's earnings
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Termination benefit:	Monthly pension deferred to normal retirement age

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Salary increase rate:	3.5% per year
Retirement age:	Age 65
Termination rates:	5% at age 48, 5% at age 49 and 5% at age 50
Pre-retirement mortality:	None
Actuarial cost method:	Unit Credit

Participant Data at January 1, 2020:

	Member A	**Member B**
Age:	55	45
Service in years:	15	10
2020 Salary:	\$80,000	\$60,000
Annual accrued benefit at January 1, 2020	\$20,000	\$10,000

Annuity Factor:

$\ddot{a}_{65}^{(12)} =$	13.5

(a) (*2 points*) Calculate the total actuarial liability and normal cost as at January 1, 2020.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

(b) (*5 points*) Calculate the total actuarial liability and normal cost as at January 1, 2020, using the Projected Unit Credit method, prorated on service.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Spring 2021, Q2

(11 points) Your client sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal retirement benefit:	2% of final year's earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Optional forms of payment:	Actuarially-equivalent to normal form
Normal retirement age:	Age 65
Early retirement benefit:	5% reduction for each year prior to age 65
Termination benefit:	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan Retirement from age 55 possible on an actuarially equivalent basis

Actuarial Assumptions and Methods:

Interest rate:	5% per year	
Salary increase rate:	3% per year	
Retirement rates:	**Age**	**Rate**
	60	25%
	63	50%
	65	100%
	All other ages	0%
Termination rates:	**Age**	**Rate**
	40	3%
	45	2%
	All other ages	0%
Pre-retirement mortality:	None	
Timing of decrements:	Beginning of year	
Actuarial cost method:	Aggregate	
Asset valuation method:	Market Value	

Participant Data at December 31, 2020:

	Member A	Member B	Member C
Age	40	55	64
2020 Salary:	$55,000	$65,000	$80,000
Service:	10	10	13

Annuity Factors:

$\ddot{a}_{55}^{(12)}$	15.6
$\ddot{a}_{60}^{(12)}$	14.8
$\ddot{a}_{63}^{(12)}$	14.1
$\ddot{a}_{64}^{(12)}$	13.6
$\ddot{a}_{65}^{(12)}$	13.3

Additional Information:

Market value of assets as at December 31, 2020:	$450,000

(a) (*5 points*) Calculate the accrued liability and estimated normal cost of the plan, in dollars, as at December 31, 2020.

The response for this part is to be provided in the Excel spreadsheet.

You are given:

Fund rate of return during 2021:		10%
Contribution made on December 31, 2021	$	50,000
Member A earned the following salary in 2021:	$	56,000
Member B earned the following salary in 2021:	$	79,000
Member C retired at January 1, 2021 and started collecting his monthly pension effective January 1, 2021		

(b) (*6 points*) Calculate the gains and losses by source for 2021.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Fall 2021, Q6

(*10 points*) Your client sponsors a newly established non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal retirement benefit:	$100 per month, times years of service (including past service)
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 60
Termination benefit:	Deferred pension payable at age 60
Postponed retirement benefit:	Continued accrual

Actuarial Assumptions and Methods:

Interest rate:	5.00% per year	
Retirement age:	Later of: Age 60; or 1 year after the valuation date	
Termination rate (BOY):	Prior to age 45:	5% per year
	At or after age 45:	0% per year
Pre-retirement mortality	None	
Actuarial cost method:	Attained Age Normal	

Participant Data at January 1, 2021:

	Member A	**Member B**	**Member C**
Age:	43	50	59
Service:	13 years	15 years	19 years

Annuity Factors:

$\ddot{a}_{60}^{(12)}$ = 14.8 $\ddot{a}_{61}^{(12)}$ = 14.5

Additional Information:

Market value of assets at January 1, 2021: $0

(a) (*4 points*) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2021.

Show all work.

The response for this question is to be provided in the Excel spreadsheet.

You are given:

- A contribution of $150,000 is made to the plan on December 31, 2021.
- Member C does not retire as expected on December 31, 2021.

(b) (*3 points*) Calculate the unfunded actuarial liability and the total normal cost as at January 1, 2022.

Show all work.

The response for this question is to be provided in the Excel spreadsheet.

(c) (*3 points*) Calculate the impact of demographic experience, by source, between January 1, 2021 and January 1, 2022, on the normal cost **per active member**.

Show all work.

The response for this question is to be provided in the Excel spreadsheet.

RETFRC, Spring 2022, Q9

(*11 points*) Your client sponsors a non-contributory defined benefit pension plan. You are given:

Plan Provisions:

Normal retirement benefit:	1% of each year's earnings
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 62
Termination benefit:	Monthly pension deferred to normal retirement age

Actuarial Assumptions and Methods:

Discount rate:	5% per year
Salary increase rate:	4% per year
Retirement rates:	Age 60 - 25% Age 61 - 33.33% Age 62 - 100%
Pre-retirement decrements:	None
Actuarial cost method:	Individual Level Premium

Participant Data at January 1, 2021:

	Member A	**Member B**	**Member C**
Age:	40	50	60
Service:	15 years	20 years	25 years
2021 Salary:	$70,000	$90,000	$100,000

	Member A	**Member B**	**Member C**
Actuarial Liability at January 1, 2020	$150,000	$240,000	$330,000
Normal Cost at January 1, 2020	$7,000	$10,000	$8,000

Annuity Factors:

$\ddot{a}_{60}^{(12)} =$	14.8	$\ddot{a}_{61}^{(12)} =$	14.5	$\ddot{a}_{62}^{(12)} =$	14.3

Additional Information:

Market value of assets at January 1, 2021:	$750,000

(d) (*5 points*) Calculate the unfunded actuarial liability and total normal cost as at January 1, 2021.

The response for this question is to be provided in the Excel spreadsheet.

You are given:

- The fund earns a rate of return of 10% during 2021.
- At December 31, 2021, Member A receives a 10% salary increase, and Members B and C receive 4% salary increases.
- A contribution of $50,000 is made to the plan on December 31, 2021.

(e) (*4 points*) Calculate the unfunded actuarial liability and total normal cost as at January 1, 2022.

The response for this question is to be provided in the Excel spreadsheet.

(f) (*2 points*) Calculate the impact of demographic experience, by source, between January 1, 2021 and January 1, 2022, on the normal cost.

The response for this question is to be provided in the Excel spreadsheet.

RETDAU, Fall 2022, Q11

(*7 points*)

(a) (NOT RELEVANT TO RET 201) (*3 points*) Compare and contrast the advantages of a cash balance plan and a defined contribution plan from the following perspectives:

(i) Plan sponsor

(ii) Plan participant

ANSWER:

Company ABC sponsors a cash balance plan. You are given the following for a sample participant:

- The participant will be retiring December 31, 2022
- The historical salary has been provided in the Excel spreadsheet
- The cash balance plan grants a pay credit each year until retirement equivalent to 5.0% of pay (pay credits are assumed to be made at the end of the year)
- Interest crediting rates are based on actual rate of return on aggregate plan assets (which are provided in the Excel spreadsheet).

(b) (*2 points*) Calculate the value at the sample participant's retirement of the following:

(i) Enhanced money-back guarantee based on a minimum annual rate of 1%

(ii) Enhanced money-back guarantee based on a cumulative floor of 3% per year

The response to this part is to be provided in the Excel spreadsheet.

(c) (*2 points*) Describe considerations for setting assumptions to value embedded options in a cash balance plan for actuarial valuation purposes.

ANSWER:

RETFRC, Fall 2022, Q6

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

You are given:

Plan Provisions:

Retirement benefit:	$100 per month per year of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Unreduced early retirement age:	Later of age 60 and attainment of 30 years of service
Termination benefit:	Accrued pension deferred to age 65

Actuarial Assumptions and Methods:

Interest rate:	5% per year
Retirement rates:	75% at unreduced early retirement age and remainder at age 65
Termination rates:	10% per year for members with less than 5 years of service
Other pre-retirement decrements:	None
Actuarial cost method:	Entry Age Normal
Asset valuation method:	Market value of assets

Annuity factors:

$\ddot{a}_{65}^{(12)} = 12.5$ $\ddot{a}_{64}^{(12)} = 12.8$ $\ddot{a}_{63}^{(12)} = 13.1$ $\ddot{a}_{62}^{(12)} = 13.4$ $\ddot{a}_{61}^{(12)} = 13.7$ $\ddot{a}_{60}^{(12)} = 13.9$

Active participant data at December 31, 2022:

	Member A	Member B
Age	30	62
Service	3	30

Financial information:

Market value of assets at December 31, 2022:	$500,000

(g) (*4 points*) Calculate the unfunded accrued liability and normal cost of the plan at December 31, 2022.

The response for this part is to be provided in the Excel spreadsheet.

(h) (*2 points*) You are given the following for 2023:

- Member B retires on January 1, 2023 and starts receiving a pension from the plan under the normal form.
- A contribution of $10,000 is made to the plan on January 1, 2023.
- The plan's fund earns a rate of return of 10% during 2023.

Calculate the unfunded accrued liability at December 31, 2023.

The response for this part is to be provided in the Excel spreadsheet.

(i) (*4 points*) Calculate the gains and losses by source for 2023.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Spring 2023, Q3

(*32 points*) MNO Limited sponsors a non-contributory defined benefit pension plan registered in Ontario.

You are given:

Plan Provisions

Normal retirement age (NRA)	Age 65
Normal retirement benefit	1.8% of final 3-year average earnings (FAE3)
Normal form of payment	Life only, payable monthly in advance
Early retirement reduction	With 10+ years of service, benefit is reduced 3% per year from age 60. Otherwise, benefit is reduced 6% per year from NRA
Termination benefit	Monthly pension deferred to NRA. Deferred members can start their pension as early as age 55, but on an actuarially equivalent basis

For an actuarial valuation for funding purposes as at January 1, 2022, you are given:

Actuarial Assumptions and Method

Going Concern Assumptions

Discount rate	5.0%	(per year)
Provision for adverse deviation (PfAD)	10.0%	
Salary increase rate	3.0%	(per year)
Pre-retirement mortality	None	
Actuarial cost method	Projected unit credit, service prorate	
Retirement age	100% at age 60	
Termination rates	**Age**	**Rate**
	45	10%
	55	5%

Solvency Assumptions

Discount rate	2.5% (per year)
Pre-retirement mortality	None
Windup expense assumption	$100,000
Retirement age	As per the Standards of Practice

Liability Information

ID	Status	Age	Going Concern Liability ($)	Normal Cost (BOY) ($)	Solvency Liability ($)
1	Active	39	134,000	13,000	141,000
2	Active	42	421,000	22,000	608,000
3	Active	54	487,000	29,000	643,000
4	Deferred	50	76,000	0	148,000
5	Deferred	60	310,000	0	465,000
6	Retired	75	470,000	0	581,000

Asset Information

Market value of assets:	$2,700,000
Fixed income allocation:	50%

For an actuarial valuation for funding purposes as at **January 1, 2023,** you are given:

Participant data as at January 1, 2023

ID	Status	Age	Accrued Monthly Benefit	Credited Service	Salary Current Year (CY)	Salary CY-1	Salary CY-2	Salary CY-3	Salary CY-4
1	Active	40	n/a	11.00	89,000	88,000	85,000	83,000	81,000
2	Active	43	n/a	20.00	150,000	137,000	133,000	129,000	125,000
3	Retired	55	n/a	18.00	n/a	122,000	118,000	115,000	112,000
4	Deferred	51	1,000	n/a	n/a	n/a	n/a	n/a	n/a
5	Retired	61	2,500	n/a	n/a	n/a	n/a	n/a	n/a
6	Retired	76	4,000	n/a	n/a	n/a	n/a	n/a	n/a

Assume that all membership movements occurred on December 31, 2022 and that the retired members elected a life only pension.

Actuarial Assumptions and Methods

Going concern discount rate	3.5%	(per year)
Provision for adverse deviation (PfAD)	7.0%	
Solvency discount rate	2.3%	(per year)

All other assumptions and methods are unchanged from the prior valuation.

Asset Information

Market value of assets	$2,600,000
Fixed income allocation	80%

The minimum required contributions were made to the plan in 2022.

Annuity Factors:

[Provided in the Excel worksheet]

(a) (NO LONGER RELEVANT) (*2 points*) Calculate the minimum required and maximum permissible employer contributions for 2022.

The response for this part is to be provided in the Excel spreadsheet.

(b) (WOULD BE DIFFERENT ON RET 201 TO EXCLUDE CANADA-SPECIFIC MATERIAL) (*9 points*) Calculate the total normal cost, going concern liability, and the unfunded actuarial liability as at January 1, 2023.

The response for this part is to be provided in the Excel spreadsheet.

(c) (WOULD BE DIFFERENT ON RET 201 TO EXCLUDE CANADA-SPECIFIC MATERIAL) (*10 points*) Calculate the gains and losses on a going concern basis by source for 2022, excluding PfAD.

The response for this part is to be provided in the Excel spreadsheet.

(d) (*6 points*) Calculate the solvency funded position as at January 1, 2023.

The response for this part is to be provided in the Excel spreadsheet.

You have determined the projected solvency liabilities as at January 1, 2024, to be $2,900,000.

(e) (NO LONGER RELEVANT) (*2 points*) Calculate the 1-year solvency incremental cost for 2023.

The response for this part is to be provided in the Excel spreadsheet.

(f) (NO LONGER RELEVANT) (*3 points*) Calculate the minimum required and maximum permissible employer contributions for 2023.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Spring 2023, Q5

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

You are given:

Plan Provisions

Retirement benefit	1.5% of final year's earnings times years of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	Age 65
Early retirement age	Age 55
Early retirement reduction	3% per year from age 60 to age 65 6% per year from age 55 to age 60
Termination benefit	Deferred pension payable at Normal retirement age

Actuarial Assumptions and Methods

Discount rate	5.0% per year	
Salary increase rate	3.5% per year	
Retirement rates	Age 60 65	Rate 50% 100%
Termination rates	Service 0-3 4-7 8-9 10+	Rate 20% 10% 5% 0%
Other pre-retirement decrements	None	
Actuarial cost method	Aggregate	
Asset method	Market value of assets	

Annuity factors

$\ddot{a}_{65}^{(12)} = 12.5$ $\ddot{a}_{60}^{(12)} = 13.9$

Participant Data as at December 31, 2022

	Member A	Member B
Age	29	50
Service	9	20
2022 salary	$80,000	$120,000

Financial Information

Market value of assets as at December 31, 2022: $400,000

(a) (*4 points*) Calculate the normal cost of the plan as at December 31, 2022.

The response for this part is to be provided in the Excel spreadsheet.

You are given the following for 2023:

- Member B terminates employment on January 1, 2023, and remains eligible to receive a deferred pension at age 65 from the plan.
- Member A receives a salary increase of 10% on January 1, 2023.
- A contribution of $50,000 is made to the plan on January 1, 2023.
- The plan's fund earns a rate of return of 15% during 2023.

(b) (*4 points*) Calculate the accrued liability and normal cost for the plan as at December 31, 2023.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Fall 2023, Q4

(*7 points*) In order to mitigate the impact of market volatility on their contribution requirements, Company ABC is considering the following asset smoothing techniques:

Method 1:

- Linear recognition of all realized gains (losses) net of investment expenses over a period of 2 years.
- The smoothed value of assets is constrained by a corridor such that it is no less than 95% of the market value of assets, and no greater than 105%.

Method 2:

- Average of the market value of assets at the valuation date and the adjusted market values of assets at the end of the four preceding years projected to the valuation date.
- The adjusted market values are determined using the market values at December 31 of each of the four preceding years projected to the valuation date with the net cash flow (contributions less benefit payments less non-investment expenses) and assumed investment return equal to the going concern discount rate applicable for each year.
- The net cash flow is assumed to occur mid-year.

You are given the following asset reconciliation:

(000's)	**2018**	**2019**	**2020**	**2021**	**2022**
Beginning market value of assets	85,000	87,153	102,193	106,990	118,869
Additions:					
Contributions	5,896	5,931	2,968	3,054	3,150
Realized gain/(loss)	576	3,690	3,394	7,969	17,243
Deductions:					
Benefit payments	4,754	4,962	7,941	5,186	5,250
Administrative expenses	1,218	1,285	1,421	1,559	1,671
Investment expenses	758	762	846	894	1,018
Unrealized gain/(loss)	2,411	12,428	8,643	8,495	(946)
Ending market value of assets	87,153	102,193	106,990	118,869	130,377
Beginning of year going concern discount rate	5.75%	5.75%	5.25%	5.25%	5.25%

(a) (*4 points*) Calculate the smoothed value of assets as at January 1, 2023 using the two asset smoothing methods under consideration.

The response for this part is to be provided in the Excel spreadsheet.

(b) (*3 points*) Compare and contrast the two asset smoothing methods taking into consideration the Canadian Institute of Actuaries' guidance on asset valuation methods.

ANSWER:

RETFRC, Spring 2024, Q5

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

You are given:

Plan Provisions:

Retirement benefit:	2% of final year's earnings times years of service
Normal form of payment:	Life only, payable monthly in advance
Normal retirement age:	Age 65
Early retirement age:	Age 55
Early retirement reduction:	Retirement prior to 10 years of service: actuarial reduction With 10 or more years of service: 3% per year from age 65
Employee contributions:	8% of earnings
Termination benefit:	Accrued pension deferred to normal retirement age. The pension shall be increased at the date of termination, if applicable, so that the value of the pension is not less than 2 times the accumulated employee contributions with interest, based on the actuarial assumptions below.

Actuarial assumptions and methods:

Discount rate:	5% per year	
Salary increase rate:	4% per year	
Return on employee contributions:	4% per year	
Decrements:	Beginning of year	
Retirement rates:	50% at later of 10 years of service or age 55; remainder at age 65	
Termination rates:	**Service**	**Rate**
	Less than 5 years	10% per year
	At least 5 years, less than 10 years	5% per year
	10 or more years	0% per year
Other pre-retirement decrements	None	
Actuarial cost method:	Aggregate	
Asset method:	Market value of assets	

Annuity factors:

$\ddot{a}_{65}^{(12)} = 12.5$ $\ddot{a}_{55}^{(12)} = 15.5$

Participant Data at December 31, 2023:

Employee	Member A	Member B
Age (years):	30	50
Service (years):	5	15
2023 earnings:	$75,000	$100,000
Total contributions with interest:	$32,000	$190,000

Additional Information:

Market value of assets as at December 31, 2023: $500,000

(c) (*4 points*) Calculate the normal cost of the plan as at December 31, 2023.

The response for this part is to be provided in the Excel spreadsheet.

You are given the following for 2024:

- Member B terminates employment on January 1, 2024 and remains eligible to receive a deferred pension payable at normal retirement age from the plan
- Member A receives a salary increase of 10% on January 1, 2024
- The Plan sponsor makes a contribution of $30,000 to the plan on January 1, 2024
- The plan's fund earns a rate of return of 15% during 2024
- Interest on employee contributions is 4% during 2024

(d) (*4 points*) Calculate the accrued liability and normal cost for the plan as at December 31, 2024.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Fall 2024, Q4

(*9 points*) Your client established a new non-contributory defined benefit pension plan as at January 1, 2024, which will recognize service prior to plan implementation.

You are given:

Plan Provisions:

Retirement benefit	1.25% of final year's earnings per year of service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age	65
Early retirement age	55
Early retirement reduction	3% per year prior to normal retirement age
Termination benefit	Accrued pension deferred to normal retirement age

Actuarial assumptions and methods:

Discount rate	4.5% per year
Salary increase rate	3.25% per year
Decrements	Beginning of year
Retirement rates	40% at age 55; remainder at age 65
Termination rates	5% per year prior to age 40, 0% thereafter
Other pre-retirement decrements	None

Annuity factors:

$\ddot{a}_{65}^{(12)} = 14.5;\ \ddot{a}_{55}^{(12)} = 17.0$

Participant data at January 1, 2024:

	Member A	**Member B**
Age	39	50
Years of service	10	15
Earnings (2023)	$75,000	$220,000

(a) (*4 points*) Calculate the accrued liability and normal cost as at January 1, 2024 using the projected unit credit, prorated on service actuarial cost method

The response for this part is to be provided in the Excel spreadsheet.

(b) (*3 points*) Calculate the accrued liability and normal cost as at January 1, 2024, using the Individual Level Premium cost method.

The response for this part is to be provided in the Excel spreadsheet.

(c) (*2 points*) Explain, in words, why the results from (a) and (b) above are different.

The response for this part is to be provided in the Excel spreadsheet.

RETFRC, Fall 2024, Q6

(*10 points*) Your client sponsors a non-contributory defined benefit pension plan with two members. The plan completes annual going concern valuations. You are given:

Pension Plan Provisions

Normal retirement benefit	1.50% of final year's earnings multiplied by service
Normal form of payment	Life only, payable monthly in advance
Normal retirement age (NRA)	65
Early retirement provisions	Members can retire as early as age 55 with a 1/4% per month reduction from NRA. Members who retire on or after age 62 with 25 years of service are eligible for an unreduced bridging benefit of 0.75% of final year's earnings multiplied by service, payable monthly in advance up until age 65.
Termination benefit	Deferred pension payable at age 65. Retirement from age 55 possible on an actuarially equivalent basis
Optional forms	Actuarially equivalent to the normal form of payment

Actuarial Assumptions

Discount rate	5.00% per year	
Salary increase rate	3.00% per year	
Retirement rates	**Age**	**Rate**
	62	50%
	63	50%
	64	50%
	65	100%
Termination rates	**Age**	**Rate**
	45	2.00%
	50	1.00%
Other pre-retirement decrements	None	
Timing of decrements	Beginning of year	
Asset valuation method	Investment gains and losses are amortized over three years	
Actuarial cost method	Projected Unit Credit	

Participant Data at December 31, 2023

	Member A	Member B
Age	62	45
Service (years)	25	5
2023 salary	$85,000	$60,000
2024 salary	$90,000	N/A

Annuity Factors

$\ddot{a}_{62}^{(12)}$= 14.3	$\ddot{a}_{62}^{(12)}$: 3]= 2.8
$\ddot{a}_{63}^{(12)}$= 14.0	$\ddot{a}_{63}^{(12)}$: 2]= 1.9
$\ddot{a}_{64}^{(12)}$= 13.8	$\ddot{a}_{64}^{(12)}$: 1]= 0.9
$\ddot{a}_{65}^{(12)}$= 13.5	

You are given:

	Member A	Member B
Actuarial liability as at December 31, 2023	$443,826	$41,448
2024 normal cost	$17,753	$8,198
Actuarial liability as at December 31, 2024	$484,102	N/A

Member B terminated and received a lump sum of $26,702 on December 31, 2024.

Additional Information

2022 investment gain/(loss)	$9,000
2023 investment gain/(loss)	($33,000)
Market value of assets at December 31, 2023	$410,000
Contribution made on June 30, 2024	$30,000
Fund rate of return during 2024	15.0%
Salary increase rate assumption effective December 31, 2024	4.00%
All other assumptions for the December 31, 2024 valuation	No change

An actuarial valuation was performed as at December 31, 2024.

Calculate the gains and losses by source for 2024.

The response for this part is to be provided in the Excel spreadsheet.

RET 201 Learning Objective 2 Curated Past Exam Questions

RETRPIRM, Fall 2020, Q3

(*8 points*)

(a) (*1 point*) Describe how to measure the following items from a financial economics perspective.

(i) Market Value of Assets; and

(ii) Liabilities

ANSWER:

You are a shareholder of Company XYZ. You are given the following:

	Description			
	Assets ($)	Pension Portfolio Allocation of Company XYZ's Pension Plan (%)	Tax Rates	Expected Return
Total Portfolio	$10M			
Company XYZ			35%	
Desired Equities	$5M	60%	15%	7%
Desired Bonds	$5M	40%	40%	3%
Gross Pension Assets	$0.5M			

Notes:

- *Total portfolio assets represent your portfolio and include gross pension assets.*
- *Gross pension assets represent your indirect holdings through the corporate pension plan*
- *Desired equities and bonds represent your target asset mix*

Company XYZ shifts the asset allocation of the pension plan to a 100% bond portfolio. You change your direct holdings to return to your desired allocation to equities and bonds.

(b) (*6 points*) Calculate the impact of the new portfolio on your after-tax returns by filing out the tables in Excel.

The response for this part is to be provided in the Excel spreadsheet.

Table 1: Your Portfolio Return (Pension Plan: 60/40 Portfolio)

Pension Plan: 60% Equity / 40% Bonds	**Your Holdings**	**Pre-tax Income**	**Personal Tax**	**After-tax Income**
Indirect holdings through corporate pension plan				
Equity				
Bond				
Total indirect holdings				
Your **direct holdings**				
Equity				
Bond				
Total direct holdings				
Total portfolio				

Table 2: Your Portfolio Return (Pension Plan: 100% Bond Portfolio)

Pension Plan: 100% Bonds	**Your Holdings**	**Pre-tax Income**	**Personal Tax**	**After-tax Income**
Indirect holdings through corporate pension plan				
Equity	**0**	**0**		
Bond				
Total indirect holdings				
Your **direct holdings**				
Equity				
Bond				
Total direct holdings				
Total portfolio				

(c) (*1 point*) Explain why shifting the pension plan's asset allocation to bonds represents an arbitrage opportunity.

ANSWER:

RETFRC, Fall 2020, Q9

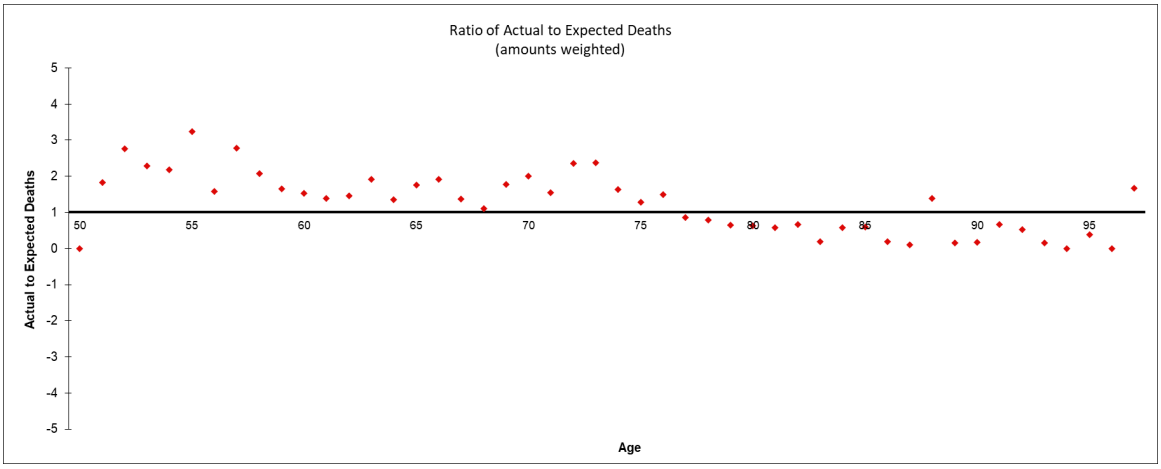
(*6 points*) You have been provided mortality experience study results for a final average pay defined benefit pension plan. A summary of the experience study results, with expected deaths based on CPM2014Priv is provided below:

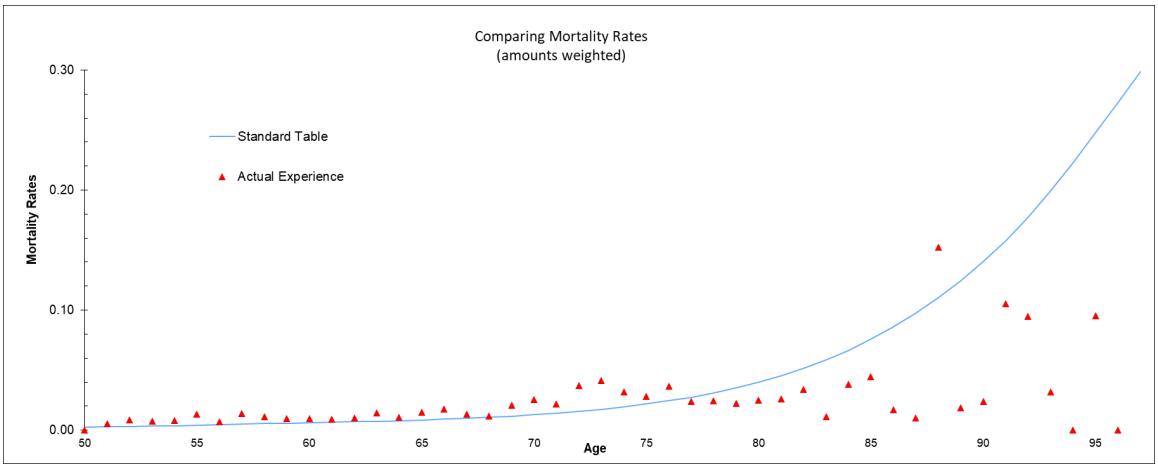
Age groups	**Number of lives**	**Benefit Amount ($)**	**Actual Deaths (lives)**	**Actual Deaths ($ benefit amount)**	**Expected Deaths (lives)**	**Expected Deaths ($ benefit amount)**
<50	26	829,878	0	0	0	2,052
50-59	3,295	110,407,713	43	1,076,040	15	491,213
60-69	4,253	108,919,379	84	1,362,101	35	879,925
70-79	1,909	30,829,784	92	913,535	38	585,224
79+	489	4,964,710	49	156,172	34	319,430
Total	**9,972**	**255,951,463**	**268**	**3,507,847**	**122**	**2,277,844**

(a) (*3 points*) Assess the appropriateness of using amounts- versus counts-weighted results.

ANSWER:

You are provided the following charts based on the experience study:





(b) (*3 points*) Recommend adjustments to the standard mortality table based on the experience study.

ANSWER:

RETDAC, Spring 2021, Q6

(*10 points*) Company ABC sponsors a defined benefit pension plan. The assets of the pension plan are invested according to the following investment strategy:

Asset Class	Portfolio Allocation	Arithmetic Return	Geometric Return	Standard Deviation
Bond	40%	3.2%	3.0%	5.5%
Equity	60%	7.7%	6.6%	18.0%

The correlation between bonds and equities is 25%.

(a) (*2 points*) Calculate the following for the pension plan portfolio:

(i) Arithmetic return

(ii) Geometric return

Show all work.

The response to this part is to be provided in the Excel spreadsheet

Company ABC used the following assumptions to determine financial disclosure information under U.S. Accounting Standard ASC 715.

Expected Return on Plan Assets	6.00%
Discount Rate	6.00%
Salary Scale	1.00%
Inflation	2.00%
Retirement Age	60
Termination Assumption	none
Mortality Table	90% of the 2014 Private Canadian Pensioner Mortality Table (CPM2014 Pri)
Mortality Improvement Scale	none

The pension plan provides an unreduced benefit at age 60.

(b) (*4 points*) Critique each of the assumptions used to calculate the financial disclosure information.

ANSWER:

(c) (NO LONGER RELEVANT) (*2 points*) Describe the economic assumption disclosures that an actuary must communicate in an actuarial report under Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations.

ANSWER:

Company ABC has decided to adopt a new investment strategy and will phase it in over three years.

(d) (*2 points*) Explain three approaches to determine the expected return on plan assets.

ANSWER:

RETDAC/U, Spring 2021, Q9

(*9 points*)

(a) (NO LONGER RELEVANT) (*1 point*) List the factors actuaries should take into account in the selection of mortality and mortality improvements, according to Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

ANSWER:

You are provided the following information:

	Design	Covered Population	Gender mix of employees	Number of Employees	Number of Retirees
Plan A	Unit benefit defined benefit plan	Hourly union	85% male	20,000	27,500
Plan B	Final average pay defined benefit plan	Salaried non-union	50% male	18,000	25,000
Plan C	Career average pay plan with a lump sum option	Physicians	50% male	2,000	30

(b) (*6 points*) Describe the considerations for setting the mortality assumption for the following:

(i) Plan A

(ii) Plan B

(iii) Plan C

ANSWER:

You are provided the following data from Plan A's 2017-2020 annuitant experience study.

	Male	Female
Actual deaths during period	1,650	201
Expected deaths during period, based on standard mortality table	1,500	233
Number of deaths on a counts-weighted basis for full credibility	1,537	1,537

(c) (*2 points*) Calculate the multipliers to be applied to the standard mortality table base rates based on the plan experience and credibility theory for the following:

(i) Males

(ii) Females

Show all work.

The response to this part is to be provided in the Excel spreadsheet

RETDAU, Spring 2021, Q6

(*10 points*) Company ABC sponsors a defined benefit pension plan. The assets of the pension plan are invested according to the following investment strategy:

Asset Class	Portfolio Allocation	Arithmetic Return	Geometric Return	Standard Deviation
Bond	40%	3.2%	3.0%	5.5%
Equity	60%	7.7%	6.6%	18.0%

The correlation between bonds and equities is 25%.

(e) (*2 points*) Calculate the following for the pension plan portfolio:

(i) Arithmetic return

(ii) Geometric return

Show all work.

The response to this part is to be provided in the Excel spreadsheet

Company ABC used the following assumptions to determine financial disclosure information under U.S. Accounting Standard ASC 715.

Expected Return on Plan Assets	6.00%
Discount Rate	6.00%
Salary Scale	1.00%
Inflation	2.00%
Retirement Age	60
Termination Assumption	none
Mortality Table	90% of the Pri-2012 Private Retirement Plans Mortality Table
Mortality Improvement Scale	none

The pension plan provides an unreduced benefit at age 60.

(f) (*4 points*) Critique each of the assumptions used to calculate the financial disclosure information.

ANSWER:

(g) (NO LONGER RELEVANT) (*2 points*) Describe the economic assumption disclosures that an actuary must communicate in an actuarial report under Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations.

ANSWER:

Company ABC has decided to adopt a new investment strategy and will phase it in over three years.

(h) (*2 points*) Explain three approaches to determine the expected return on plan assets.

ANSWER:

RETRPIRM, Spring 2021, Q1

(*6 points*) You are the actuary for ABC Company's defined benefit pension plan that is not fully funded. ABC Company is considering an investment strategy for its pension plan of a 100% government bond portfolio, the cash flows from which closely match the liability cash flows.

(2 points) Critique the following statement made by the CFO of ABC Company: "The only true representation of the liability of a pension plan is calculated by discounting its cash flows using the risk-free interest rate."

ANSWER:

(4 points) Describe the advantages and disadvantages of this investment strategy.

ANSWER:

RETFRC, Spring 2021, Q4

(*6 points*) Company XYZ sponsors a large defined benefit pension plan. The following is a summary of the key plan provisions:

Plan Provisions:

Normal retirement benefit:	2% of final year's earnings times years of service
Normal retirement age:	Age 65
Early retirement benefit:	Unreduced at age 62 with 20 years of credited service; Otherwise 0.25% reduction per month for retirements before age 65
Termination benefit:	Deferred pension payable at age 65 or lump sum commuted value transfer from the plan Retirement from age 55 possible on an actuarially equivalent basis

You have performed a demographic experience study for the plan's going concern funding valuation. The results for the retirement and termination decrements are as follows:

Retirement Assumption

Age	Current Assumption	Experience
55-57	0.10	0.05
58-60	0.10	0.09
60-62	0.10	0.11
62-64	0.10	0.30
65 and over	1.00	1.00

Termination Assumption

Age	Current Assumption	Experience
Under 25	0.15	0.10
25-34	0.10	0.03
35-44	0.05	0.02
45-54	0.02	0.05
55 and over	0.00	0.00

Assume the following:

- Experience is **credible** for the retirement decrement; and
- Experience is **not credible** for the termination decrement.

(a) (*4 points*) Assess the appropriateness of the current retirement and termination assumptions.

ANSWER:

The early retirement benefit was changed as follows:

- Unreduced with 30 years of credited service; or
- Unreduced at age 62 with 20 years of credited service;
- Otherwise 0.25% reduction per month for retirements before age 65

(b) (*2 points*) Recommend changes to the current retirement assumption. Justify your recommendation.

ANSWER:

RETFRC, Spring 2021, Q7

(*7 points*) You have recently been hired by ABC Company to provide actuarial services for its single-employer defined benefit pension plan. While reviewing the last filed Actuarial Valuation Report ("AVR") for funding purposes at January 1, 2020, you notice that the termination assumption was set by the prior actuary based on an experience study using plan data from 2015 to 2019, the results of which had significantly increased the assumed termination rates compared to that of the previously filed AVR.
After a discussion with your contact at ABC Company, you are told that the company had experienced a significant downsizing from 2017 to 2019 as part of a restructuring effort, which is now completed. No further downsizing is planned or expected.

(a) (*2 points*) Assess the appropriateness of the termination assumption used in the January 1, 2020 AVR.

ANSWER:

(b) (*2 points*) Describe how the termination assumption should have been developed based on the Standards of Practice.

ANSWER:

(c) (*3 points*) Describe the steps that should be taken and considerations for developing the credibility procedure for using the experience data.

ANSWER:

RETRPIRM, Fall 2021, Q4

(*6 points*) Assess the features of the accounting standards applicable to the following types of defined benefit pension plans according to the principles of financial economics:

(*3 points*) Private sector plans.

ANSWER:

(*3 points*) (NO LONGER RELEVANT) Public sector plans.

ANSWER:

RETDAC/U, Spring 2023, Q4

(*7 points*) You are the actuary for Company ABC, which sponsors a frozen defined benefit pension plan. Company ABC is interested in conducting a mortality credibility study for the plan and has asked you to calculate an experience adjustment to the plan's current mortality assumption, a standard base mortality table.

(a) (*2 points*) Propose the data items to collect for the mortality study.

Justify your response.

ANSWER:

The table below represents the observed experience.

	2018	2019	2020	2021	2022	Total
Actual deaths	10	20	30	90	90	240
Expected deaths based on current mortality assumption	25	25	25	25	25	125
Number of deaths on a counts-weighted basis for full credibility	N/A	N/A	N/A	N/A	N/A	1,022
Number of deaths on a benefits-weighted basis for full credibility	N/A	N/A	N/A	N/A	N/A	1,245

Company ABC has inquired about limiting the experience period to 2021-2022.

(b) (*3 points*) Recommend a response to Company ABC's inquiry.

Justify your response.

ANSWER:

Company ABC has decided to use all five years of mortality experience.

(c) (*2 points*) Derive the multiplier to be applied to the standard table base rates based on credibility theory.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETFRC, Spring 2023, Q2

(*8 points*) A small professional services firm sponsors a final average pay defined benefit pension (DB) plan for all employees.

The DB plan has been a differentiator for the firm in retaining employees in an industry where turnover is common, but they have seen a sharp increase in turnover in recent months.

Plan provisions

Normal retirement age	Age 65
Early retirement age	Age 55
Normal retirement benefit	2% final average earnings per year of service
Early retirement benefit	Accrued benefit reduced by 0.25% per month that early retirement precedes age 62 for actives, and actuarially reduced for members who terminate prior to retirement
Termination benefit	Actuarially equivalent lump sum of the accrued pension payable at age 65, or deferred pension payable at normal retirement age

Assumptions

Retirement assumption: 100% at age 62
Termination assumption: None prior to retirement

Historical plan experience

	1/1/2018	1/1/2019	1/1/2020	1/1/2021	1/1/2022
Retirement (gains)/losses	($2,200)	$1,400	($10,200)	($6,700)	($7,100)
Termination (gains)/losses	($5,300)	($3,800)	($4,700)	($8,200)	($10,500)
Unfunded going concern liability	$66,000	$74,000	$68,000	$61,000	$53,000

(a) (*3 points*) Assess the appropriateness of the current retirement and termination assumptions.

ANSWER:

(b) (*5 points*) Describe the considerations for changing the retirement and termination assumptions for the January 1, 2023 valuation.

ANSWER:

RETFRC, Spring 2023, Q7

(*8 points*) You are the actuary for a company that sponsors a defined benefit pension plan registered in Ontario.

You are given:

Government of Canada Bonds at December 31, 2022

	CANSIM Series	Yield
Marketable bonds with maturities over 10 years	V39062	2.86%
Real-return long-term bonds	V39057	0.86%

Inflation Expectations at December 31, 2022

Period	Bank of Canada Target for Inflation (per year)	Economist Consensus Inflation Expectations (per year)
Short-term (< 1 year)	1% - 3%	6% - 8%
Long Term	1% - 3%	2%

Statistics Canada released the following historical Canadian consumer price index (CPI) increase data:

Year	CPI increase
2019	2.4%
2020	1.0%
2021	5.7%
2022	6.2%

Describe the considerations for determining the following actuarial assumptions for a going concern valuation as at December 31, 2022.

(i) Inflation;

(ii) (NO LONGER RELEVANT) YMPE and Income Tax Act Maximum Defined Benefit Pension increases; and

(iii) Salary Scale.

ANSWER:

RETDAC/U, Fall 2023, Q7

(*7 points*)

(a) (5 *points*) Describe considerations for setting the following long-term assumptions for a defined benefit pension plan:

(i) Termination

(ii) Retirement

(iii) Disability

(iv) Election of optional forms of benefits

(v) Salary merit scale

ANSWER:

(b) (NO LONGER RELEVANT) (*2 points*) Identify the disclosures required to document demographic assumptions based on Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

ANSWER:

RETRPIRM, Fall 2023, Q2

(*6 points*)

(c) (*4 points*) Critique the following statements related to the financial economics viewpoint:

a. Pension plans should invest 100% in bonds

b. Liabilities must be discounted at the risk-free rate

ANSWER:

(d) (*2 points*) Explain why an investment strategy of investing in 100% cash flow matching bonds may not be optimal for a pension plan.

ANSWER:

RETDAC/U, Spring 2024, Q1

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
RETDAC Case Study Spring 2024

(*5 points*)

(a) (*3 points*) Describe the factors that should be considered when setting an expected return on assets assumption under U.S. Accounting Standard ASC 715.

ANSWER:

You are the actuary for NOC's pension plan. NOC's Chief Financial Officer has asked you to use an expected return on assets assumption of 9.50% for the 2025 Net Periodic Pension Cost.

(b) (*2 points*) Propose a course of action as an actuary in response to the request.

ANSWER:

RETDAC/U, Fall 2024, Q10

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Fall 2024 Design and Accounting (RETDAC) Exam – Canada – Case Study

(*10 points*)

(a) (NO LONGER RELEVANT) (*4 points*) Compare and contrast assumption setting for the following types of pension plans:

(i) Defined benefit plan

(ii) Variable Annuity Plan

ANSWER:

Question 10b pertains to the Case Study.

(b) (*6 points*) Propose a process for assessing and potentially updating the following assumptions for the National Oil Pension Plan:

(i) Retirement

(ii) Mortality

(iii) Turnover

(iv) Salary scale

ANSWER:

RETFRC, Fall 2024, Q8

(*9 points*)

(a) (*3 points*) Describe the considerations in setting the base mortality assumption for a going concern valuation of a defined benefit pension plan

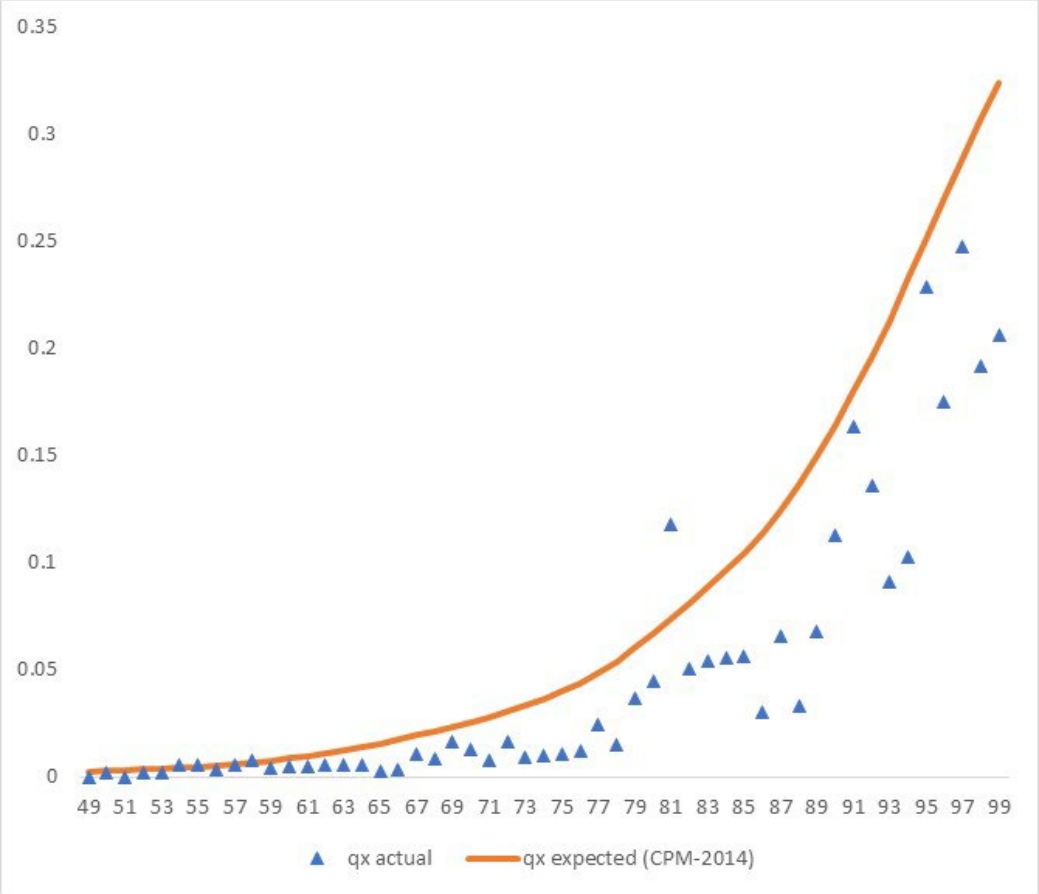
ANSWER:

(b) (*3 points*) Describe the assumptions needed to establish a mortality improvement scale for a going concern funding valuation of a defined benefit pension plan.

ANSWER:

You are performing the January 1, 2024 going concern valuation for a defined benefit pension plan for high earning professionals. The mortality assumption used for the prior valuation was 100% of the CPM2024Priv table. You have been provided with mortality experience study results for the plan. A summary of the experience study results, as well as the expected deaths based on the CPM2014Priv table, is provided below:

Age groups	Number of lives	Benefit amount ($)	Actual deaths (lives)	Actual deaths ($ benefit amount)	Expected Deaths (lives)	Expected Deaths ($ benefit amount)
<50	525	69,483,834	-	0	1	173,779
50-59	5,374	583,586,749	20	2,231,949	26	2,840,836
60-69	3,278	372,712,744	20	2,187,214	47	5,171,926
70-79	990	165,064,022	14	2,308,197	37	5,924,877
79+	567	90,072,179	54	8,701,415	86	13,849,314
Total	10,734	1,280,919,528	108	15,428,775	197	27,960,732



(c) (*3 points*) Describe the considerations for adjusting the base mortality assumption for the January 1, 2024 going concern valuation.

ANSWER:

RET 101 Learning Objective 3 Curated Past Exam Questions

RETDAC/U, Fall 2020, Q5

(7 *points*) Company ABC is considering de-risking its Pension Plan through an annuity purchase.

(a) (*4 points*) Explain why the annuity purchase price would likely be different than the liability currently reflected on the balance sheet.

ANSWER:

You are provided the following additional information about ABC Pension Plan:

Benefit Obligation at an interest rate of 3.8%	$1,900,000
Duration of Benefit Obligation	14.6
Plan Assets	$1,700,000
Plan Asset Allocation Mix	50% Fixed Income 50% Equity
Duration of Plan's Fixed Income Assets	5.1

(b) (*3 points*) Calculate ABC Pension Plan's accounting funded status assuming a 0.65% decrease in interest rates and a 10% increase in the market value of equities.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETDAC, Fall 2020, Q9

(*9 points*)

(a) (*2 points*) Compare and contrast components of Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 and Defined Benefit Cost under International Accounting Standard IAS 19, Revised 2011.

ANSWER:

Company XYZ reports under U.S. Accounting Standard ASC 715. Company XYZ has received regulatory approval and has decided to freeze pay and service accruals in its defined benefit pension plan effective December 31, 2020. The following information has been provided prior to the plan freeze as of December 31, 2020:

Accumulated Benefit Obligation	970,000,000
Projected Benefit Obligation	1,070,000,000
Market Value of Assets	625,000,000
Unrecognized (Gain)/Loss in Accumulated Other Comprehensive Income (AOCI)	125,000,000
Unrecognized Prior Service Cost in AOCI	20,000,000

(b) (*7 points*) Calculate the impact on the following values due to the plan freeze under U.S. Accounting Standard ASC 715:

(i) 2020 Net Periodic Pension Cost

(ii) Funded Status as of December 31, 2020

(iii) Amounts recognized in AOCI as of December 31, 2020

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETDAU, Fall 2020, Q9

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Fall 2020 Retirement Benefits—Design and Accounting, U.S. Exam Case Study

(*10 points*) NOC has decided to freeze pay and service accruals in the National Oil Full-Time Pension Plan effective June 30, 2020. No assumption changes were made since December 31, 2019.

The following information has been provided:

Accumulated Benefit Obligation Service Cost as of 1/1/20	60,000,000
Actual Benefit Payments from 1/1/20 – 6/30/20	18,000,000
Actual Contributions from 1/1/20 – 6/30/20	17,500,000
Market Value of Assets at 6/30/20	645,000,000
Expected Benefit Payments from 7/1/20 – 12/31/20	18,000,000
Expected Contributions from 7/1/20 – 12/31/20	17,500,000
Assumed Benefit Payment and Contribution date	10/1/20
Average Future Working Lifetime as of 7/1/20	10.5

(a) (*7 points*) Calculate the impact of the plan freeze on the 2020 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

(b) (*3 points*) Explain how the following de-risking strategies would affect the 2021 financial results under U.S. Accounting Standard ASC 715:

(i) Option to all retirees to receive an October 1, 2021 lump sum payment in lieu of future lifetime annuities

(ii) Full plan termination where all benefits are paid out in 2021

No calculations required.

ANSWER:

RETDAC/U, Spring 2021, Q1

(*7 points*)

(a) (NO LONGER RELEVANT) (*1 point*) Describe the risks an actuary should disclose in a valuation report based on Actuarial Standard of Practice No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (ASOP 51).

ANSWER:

(b) (NO LONGER RELEVANT) (*1 point*) Identify the methods for assessing the risks described in part (a) based on ASOP 51.

ANSWER:

Company XYZ has experienced significant cost fluctuation in their defined benefit pension plan and wishes to mitigate this volatility.

(c) (*2 points*) Recommend two pension risk transfer strategies available to Company XYZ.

Justify your response. No calculations required.

ANSWER:

(d) (*3 points*) Compare and contrast the accounting treatment of each strategy identified in part (c) under:

(i) U.S. Accounting Standard ASC 715

(ii) International Accounting Standard IAS 19, Rev. 2011

No calculations required.

ANSWER:

RETDAC, Spring 2021, Q5

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Spring 2021 Retirement Benefits—Design and Accounting, Canada Exam Case Study

(*14 points*) NOC sponsors an unfunded Supplemental Retirement Plan (SRP) for its CEO. The SRP restores the annuity benefit not payable from the National Oil Pension Plan.

CEO Employee Data:

Date of Birth	1/1/1971	
Date of Hire	1/1/2011	
Earnings History	2016	$800,000
	2017	$850,000
	2018	$900,000
	2019	$950,000
	2020	$1,000,000

SRP assumptions under International Accounting Standard IAS 19, Rev. 2011 (IAS 19) as of December 31, 2020:

Retirement age	62.0
Pre-retirement decrements	None
Future Salary Scale	3.00%
Discount Rate	3.75%
Age 62 Annuity Factor at 3.75%	15.2

(a) (*5 points*) Calculate the 2021 Defined Benefit Cost for the SRP under IAS 19.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

NOC has decided to freeze benefit accruals in both the National Oil Pension Plan and the SRP effective March 31, 2021.

SRP assumptions as of March 31, 2021 under IAS 19:

Discount Rate	3.25%
Age 62 Annuity Factor at 3.25%	16.1
Earnings through March 31, 2021	$257,500

All other assumptions remain the same. No other gains, losses, or assumption changes occurred during 2021.

(b) (*5 points*) Calculate the revised 2021 Defined Benefit Cost, including the change to Other Comprehensive Income, for the SRP under IAS 19 reflecting the plan freeze.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

(c) (*4 points*) Compare and contrast the accounting treatment of the plan freeze under IAS 19 and U.S. Accounting Standard ASC 715.

No calculations required.

ANSWER:

RETDAU, Spring 2021, Q5

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Spring 2021 Retirement Benefits—Design and Accounting, U.S. Exam Case Study

(*15 points*) NOC sponsors an unfunded Supplemental Retirement Plan (SRP) for its CEO. The SRP restores the annuity benefit not payable from the National Oil Pension Plan.

CEO Employee Data:

Date of Birth	1/1/1971	
Date of Hire	1/1/2011	
Earnings History	2016	$800,000
	2017	$850,000
	2018	$900,000
	2019	$950,000
	2020	$1,000,000

SRP assumptions as of December 31, 2020 under U.S. Accounting Standard ASC 715 (ASC 715):

Retirement age	62.0
Pre-retirement decrements	None
Future Salary Scale	3.00%
Discount Rate	3.75%
Age 62 Annuity Factor at 3.75%	15.2

Excerpt of SRP results under ASC 715 as of December 31, 2020:

Unamortized Transition Obligation	$0
Unamortized Prior Service Credit	$60,000
Unamortized (Gain)/Loss	$700,000
Annual Prior Service Credit Amortization	$7,000

(a) (*7 points*) Calculate the 2021 Net Periodic Pension Cost for the SRP under ASC 715.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

NOC has decided to freeze benefit accruals in both the National Oil Pension Plan and the SRP effective March 31, 2021.

SRP assumptions as of March 31, 2021 under ASC 715:

Discount Rate	3.25%
Age 62 Annuity Factor at 3.25%	16.1
Earnings through March 31, 2021	$257,500

All other assumptions remain the same.

(b) (*8 points*) Calculate the revised 2021 Net Periodic Pension Cost for the SRP under ASC 715 reflecting the plan freeze.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETDAC, Fall 2021, Q8

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Fall 2021 Retirement Benefits—Design and Accounting, Canada Exam Case Study

(*10 points*) NOC is restructuring and has offered a voluntary retirement incentive program with enhanced early retirement subsidies to its employees.

400 employees accepted the offer to retire at July 1, 2021.

You are given the following (dollars in thousands):

Actual Benefit Payments, 1/1/2021 – 6/30/2021	$19,000
Expected Benefit Payments, 7/1/2021 – 12/31/2021	$21,000
Actual Benefit Payments, 7/1/2021 – 12/31/2021	$21,500
Actual Contributions in 2021	$35,849
Other actuarial gains or losses during 2021	None
Asset gain/loss at the end of the year	$0
Information as of 7/1/2021:	
Discount Rate	4.00%
Market Value of Assets	$700,000
Total Plan Defined Benefit Obligation (DBO) reflecting immediate decrement of the 400 employees who accepted offer	$1,200,000
Total Plan DBO reflecting enhanced benefit of the 400 employees who accepted offer	$1,210,000
Full year Service Cost for the remaining employees	$51,580

Assume this is a 2021 event and all contributions and benefit payments are uniformly distributed.

(a) (*7 points*) Calculate the revised 2021 Defined Benefit Cost, including the change to Other Comprehensive Income, under International Accounting Standard IAS 19, rev. 2011 (IAS 19).

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

(b) (*3 points*) Compare and contrast the accounting treatment of the retirement incentive program under IAS 19 and U.S. Accounting Standard ASC 715.

No calculations required.

ANSWER:

RETDAU, Fall 2021, Q8

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Fall 2021 Retirement Benefits—Design and Accounting, U.S. Exam Case Study

(12 points) NOC is restructuring and has offered a voluntary retirement incentive program with enhanced early retirement subsidies its employees.

400 employees accepted the offer to retire at July 1, 2021.

You are given the following (dollars in thousands):

Actual Benefit Payments, 1/1/2021 – 6/30/2021	$19,000
Expected Benefit Payments, 7/1/2021 – 12/31/2021	$21,000
Actual Benefit Payments, 7/1/2021 – 12/31/2021	$21,500
Actual Contributions in 2021	$35,849
Other actuarial gains or losses during 2021	None
Asset gain/loss at the end of the year	$0
Information as of 7/1/2021:	
Discount Rate	4.00%
Market Value of Assets	$700,000
Total Plan Projected Benefit Obligation (PBO) reflecting immediate decrement of the 400 employees who accepted offer	$1,200,000
Total Plan PBO reflecting enhanced benefit of the 400 employees who accepted offer	$1,210,000
Full year Service Cost for the remaining employees	$51,580
Average Future Working Lifetime of remaining active employees	12.0 years

Assume this is a 2021 event and all contributions and benefit payments are uniformly distributed.

Calculate the following under U.S. Accounting Standard ASC 715:

(i) Revised 2021 Net Periodic Pension Cost

(ii) Accumulated Other Comprehensive Income as of December 31, 2021

(iii) Funded status as of December 31, 2021

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETDAC/U, Fall 2021, Q9

(*8 points*) Company XYZ sponsors a defined benefit pension plan. Company XYZ is winding up the plan with the following actions:

- Amend the plan in 2020 to wind up the plan effective December 31, 2021
- Fully fund the plan at the asset distribution date
- Distribute all plan assets on June 30, 2023

(a) (*3 points*) Describe the effect on the 2021 Net Periodic Pension Cost (NPPC) under U.S. Accounting Standard ASC 715 (ASC 715) if Company XYZ's pension plan prior to the termination was structured as:

(i) Open and ongoing

(ii) Closed to new entrants

(iii) Frozen for all participants

ANSWER:

(b) (*4 points*) Compare and contrast the calculation of the following:

(i) 2022 NPPC under ASC 715

(ii) 2022 Defined Benefit Cost under International Accounting Standard IAS 19 (IAS 19)

ANSWER:

(c) (*1 point*) Explain how the 2023 NPPC under ASC 715 would be calculated.

ANSWER:

RETDAC/U, Spring 2022, Q3

(*9 points*) Company ABC is estimating the 2023 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715) for budget purposes.

Information for the pension plan is provided below for year-end 2021.

	December 31, 2021
Projected Benefit Obligation (PBO)	$1,164,740
Market Value of Assets	$1,264,714
Unrecognized (Gain)/Loss in Accumulated Other Comprehensive Income (AOCI)	$373,966
Discount Rate	3.75%
Expected Return on Assets	6.25%

	2022	**2023**
Service Cost (Beginning of Year)	$59,347	$61,127
Interest Cost	$45,155	
Expected Return on Assets	$(78,918)	
Amortization of Gain Loss	$20,798	
Net Periodic Pension Cost	$46,382	
Expected Contribution	$35,849	$36,207
Expected Benefit Payments	$39,900	$42,294
Average Future Working Lifetime	11.8	12.3

PBO Duration	15.0
Service Cost Duration	20.0

Expenses	Assume all expenses paid by company
Asset valuation method	Market value
Gain/loss amortization method	10% corridor; amortized over average future working lifetime

(a) (*3 points*) Calculate the 2023 Net Periodic Pension Cost under ASC 715 assuming no experience gains or losses.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

You are given the following:

Discount rate increase at December 31, 2022	0.50%
Market Value of Assets at December 31, 2022	$1,364,000

(b) (*3 points*) Calculate 2023 Net Periodic Pension Cost under ASC 715 based on these new assumptions.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

Company ABC is considering the following de-risking strategies:

- Strategy 1: Moving a portion of their target asset allocation from equities to fixed income over a period of 3 years
- Strategy 2: Providing a one-time option to all terminated vested employees to receive a lump sum payment in lieu of future benefit

(c) (*3 points*) Describe the impact of these strategies on Company ABC's financial results under ASC 715 in the short and long term.

No calculations required.

ANSWER:

RETDAU, Spring 2022, Q5

(*7 points*)

(NO LONGER RELEVANT) (*1 point*) Describe the considerations when selecting an asset valuation method under Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

ANSWER:

Company ABC is reviewing its asset valuation method for accounting purposes for its defined benefit pension plan. You are given the following:

Year	**2018**	**2019**	**2020**	**2021**
Actual benefit payments paid mid-year	$900,000	$1,000,000	$1,000,000	$1,000,000
Contributions paid mid-year	$300,000	$800,000	$700,000	$400,000
Expenses paid mid-year	$190,000	$200,000	$200,000	$250,000
Expected Return on Assets	7.0%	7.0%	7.0%	7.0%
Fair Value of Assets at 1/1	$14,100,000	$14,000,000	$13,000,000	$14,000,000
Market-related Value of Assets at 1/1	$15,200,000	$14,900,000	$14,700,000	$15,100,000

	2022
Service Cost	$0
Projected Benefit Obligation	$20,000,000
Unrecognized Net Transition Obligation	$0
Unrecognized Prior Service Cost	$500,000
Unrecognized Net Actuarial (Gain)/Loss	$4,000,000
Expected benefit payments paid mid-year	$950,000
Expected contributions paid mid-year	$400,000
Average expected future service	8.0
Remaining period for prior service cost amortization	5.0
Discount rate	4.0%
Expected Return on Assets	7.0%
Fair Value of Assets at 1/1	$13,500,000

(b) (*5 points*) Calculate the 2022 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 using the following asset valuation methods:

(i) Fair Value of Assets

(ii) Market-related Value of Assets with unrecognized gains and losses smoothed over five years.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

Company ABC is considering making a large contribution next year to improve their funding deficit while also changing their asset allocation to be more liability hedged. Company ABC currently uses the Market-related Value of Assets with unrecognized gains and losses smoothed over five years.

(c) (*1 point*) Recommend whether Company ABC should move to using the Fair Value of Assets valuation method.
Justify your response. No calculations required.

ANSWER:

RETDAC/U, Spring 2022, Q11

(*9 points*) Company XYZ sponsors a final average pay defined benefit pension plan.

(a) (*2 points*) Compare and contrast the impact of closing the pension plan to new entrants under U.S. Accounting Standard ASC 715 (ASC 715) and International Accounting Standard IAS 19, Rev. 2011 (IAS 19) on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

ANSWER:

Company XYZ closed the pension plan to new entrants.

(b) (*4 points*) Compare and contrast the impact of freezing future service accruals under ASC 715 and IAS 19 on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

ANSWER:

Company XYZ's pension plan is closed to new entrants and has frozen future service accruals for all plan participants.

(c) (*3 points*) Compare and contrast the impact of freezing future pay accruals under ASC 715 and IAS 19 on the following:

(i) Net Periodic Pension Cost

(ii) Funded Status

(iii) Other Comprehensive Income

No calculations required.

ANSWER:

RETRPIRM, Spring 2022, Q5

(*6 points*) You are given the following information about two companies:

($thousands)	Company Balance Sheet				Pension	
	Assets	**Liabilities**	**Equity**	**Long-Term Debt**	**Assets**	**Liabilities**
Company A	47,162	34,453	12,709	20,994	11,663	12,983
Company B	70,659	52,267	18,392	24,437	3,764	2,298

(a) (*1 point*) Calculate the following ratios for each company, adjusted for the net pension obligation:

- Debt-to-equity ratio;
- Long-term debt to equity ratio; and
- Asset-to-equity ratio.

The response for this part is to be provided in the Excel spreadsheet.

(b) (*3 points*) Calculate the following ratios for each company using a holistic corporate balance sheet approach:

- Debt-to-equity ratio;
- Long-term debt to equity ratio; and
- Asset-to-equity ratio.

The response for this part is to be provided in the Excel spreadsheet.

(c) (*2 points*) Describe the advantages of using the holistic corporate balance sheet approach in (b) versus the traditional balance sheet approach used in (a).

The response for this part is to be provided in the Excel spreadsheet.

RETDAC/U, Fall 2022, Q5

(*8 points*)

(a) (*2 points*) Describe the short-term impact of an upward sloping and downward sloping yield curve on the Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715) using the following:

(i) Traditional Approach

(ii) Spot Rate Approach

No calculations required.

ANSWER:

You have been provided a set of cash flows and spot rates in the Excel spreadsheet for a pension plan with frozen benefit accruals. All cash flows are made at the end of the year.

(b) (*6 points*) Calculate the following using both the Traditional and Spot Rate Approaches:

(i) Projected Benefit Obligation under ASC 715

(ii) Interest Cost under ASC 715

(iii) Equivalent discount rates that would be disclosed in the ASC 715 report

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETDAC, Fall 2022, Q9

(*8 points*) Company ABC sponsors a defined benefit plan for its hourly union population and a defined benefit plan for its salaried non-union population. Company ABC is considering merging the two plans.

(d) (*3 points*) Describe three advantages and three disadvantages of merging the two plans from the perspective of Company ABC

ANSWER:

The Hourly Pension Plan and Salaried Pension Plan are legally merged effective December 31, 2022.

You are given the following:

	Hourly Pension Plan	**Salaried Pension Plan**
January 1, 2023 Information		
Defined Benefit Obligation	$1,100,000	$3,000,000
Fair Value of Assets	$1,400,000	$2,850,000
Service Cost	$125,000	$360,000
Expected 2023 Benefit Payments	$160,000	$275,000
Expected 2023 Contributions	$50,000	$0
Discount Rate	2.60%	
Timing of Benefit Payments	Mid-Year	Mid-Year
Timing of Contributions	Mid-Year	Mid-Year

(b) (2 *points*) Calculate the 2023 Defined Benefit Cost under International Accounting Standard IAS 19, Rev. 2011 (IAS 19) for the merged plan.

The response to this part is to be provided in the Excel spreadsheet.

Effective March 31, 2023, Company ABC purchases an annuity buy-out for the retirees in the merged plan.
You are given the following:

	March 31, 2023
Defined Benefit Obligation prior to annuity buy-out	$4,250,000
Fair Value of Assets prior to annuity buy-out	$4,300,000
Retiree Only Defined Benefit Obligation	$800,000
Retiree Annuity Purchase Premium	$875,000
Additional Information	
Service Cost (annualized)	$505,000
Expected 2023 Contributions	$0
Discount Rate	2.35%
There are no other gains or losses as of March 31, 2023.	

(c) (*3 points*) Calculate the revised 2023 Defined Benefit Cost under IAS 19 reflecting the annuity buy-out.
Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETDAU, Fall 2022, Q9

(*11 points*) Company ABC sponsors a defined benefit plan for its hourly union population and a defined benefit plan for its salaried non-union population. Company ABC is considering merging the two plans.

(a) (*3 points*) Describe three advantages and three disadvantages of merging the two plans from the perspective of Company ABC.

ANSWER:

The Hourly Pension Plan and Salaried Pension Plan are legally merged effective December 31, 2022.

You are given the following:

	Hourly Pension Plan	Salaried Pension Plan
January 1, 2022 Information		
Projected Benefit Obligation	$1,200,000	$2,900,000
Fair Value of Assets	1,300,000	$2,700,000
Service Cost	$100,000	$300,000
Unrecognized Prior Service Cost	$30,000	$100,000
Prior Service Cost Amortization	$3,500	$8,000
Unrecognized (Gain)/Loss	$(300,000)	$700,000
Average future working lifetime	10.0	10.0
January 1, 2023 Funded Status		
Projected Benefit Obligation	$1,100,000	$3,000,000
Fair Value of Assets	$1,400,000	$2,850,000
Service Cost	$125,000	$360,000
Average future working lifetime	10.0	10.0
Expected Benefit Payments		
2022	$150,000	$250,000
2023	$160,000	$275,000
Expected Contributions		
2022	$50,000	$0
2023	$0	$0
Additional Information		
Discount Rate at 1/1/2022	2.50%	3.00%
Discount Rate at 1/1/2023	2.60%	
Expected Return on Assets	6.50%	6.50%
Market-related value of assets method	Fair Value	Fair Value
Timing of Benefit Payments	Mid-Year	Mid-Year
Timing of Contributions	Mid-Year	Mid-Year

(b) (*5 points*) Calculate the 2023 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715) for the merged plan.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

Effective March 31, 2023, Company ABC purchases an annuity buy-out for the retirees in the merged plan.

You are given the following:

	March 31, 2023
Projected Benefit Obligation prior to annuity buy-out	$4,250,000
Fair Value of Assets prior to annuity buy-out	$4,300,000
Retiree Only Projected Benefit Obligation	$800,000
Retiree Annuity Purchase Premium	$820,000
Additional Information	
Discount Rate	2.60%
There are no other gains or losses as of March 31, 2023.	

(c) (*3 points*) Calculate the settlement charge/(credit) under ASC 715 due to the retiree annuity buy-out as of March 31, 2023.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

RETRPIRM, Fall 2022, Q4

(*9 points*)

(a) (*1 point*) Recommend an approach to consolidating pension positions into a balance sheet analysis that is appropriate on an economic basis.
Justify your recommendation.

The response for this part is to be provided in the Excel spreadsheet.

You have been hired by Company MNO to evaluate companies for a potential acquisition.

You are given:

- The US pension buy out index shows that the pension buy out liability is 110% of Projected Benefit Obligation (PBO).
- Company B has announced a pension buy out deal, priced in accordance with the buy-out index pricing, that will conclude before the potential acquisition.
- Company D utilizes a dynamic asset liability matching strategy to hedge its pension liability on a PBO basis with a strategy that hedges out 80% of the interest rate risk.

(*4 points*) Calculate the debt to equity ratios, long-term debt to equity ratios and asset to equity ratios for each Company by filling out the table in Excel.

($ millions)	Total Asset	Total Liability	Equity	Long-term debt	Pension asset	PBO
Company A	50.50	40.60	9.90	20.10	6.57	8.70
Company B	200.30	160.40	39.90	30.20	30.60	27.80
Company C	10.50	9.80	0.70	0.50	0.42	0.29
Company D	800.80	600.90	199.90	150.90	240.24	210.32
Company E	100.70	90.20	10.50	10.70	5.04	5.61

The response for this part is to be provided in the Excel spreadsheet.

(*1 point*) Recommend the acquisition of either Company B or Company E, taking into account the risk involved for Company MNO.

Justify your recommendation.

The response for this part is to be provided in the Excel spreadsheet.

The following is given for Company XYZ:

- Current equity allocation: 45%
- PBO: $33.0 million
- Operating assets: $52.1 million
- Pension asset: $38.3 million
- Equity beta: 2.1
- Debt: $35.0 million

(*3 points*) Calculate the change in equity capital and debt-to-equity ratio for Company XYZ if the pension plan's equity allocation were changed to 30%, 15% or 0%, by filling out the table in Excel.

The response for this part is to be provided in the Excel spreadsheet.

RETDAC/U, Spring 2023, Q3

(*7 points*)

(a) (*3 points*) Explain the concept of an economic benefit under IFRIC Interpretation 14: IAS 19 – The Limit on a Defined Benefit Asset, Minimum Funding Requirements and their Interaction.

ANSWER:

(b) (*1 point*) List the considerations used to test whether an entity has an unconditional right to a refund under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

ANSWER:

(c) (3 *points*) Describe the disclosure requirements under IAS 19 for defined benefit pension plans.

ANSWER:

RETDAC/U, Spring 2023, Q6

(*4 points*)

(a) (*3 points*) Compare and contrast the accounting implications of an annuity buy-in under International Accounting Standards IAS 19, Rev 2011 (IAS 19) versus U.S. Accounting Standard ASC 715 (ASC 715).

No calculations required.

ANSWER:

(b) (*1 point*) Describe the accounting implications of converting an annuity buy-in to an annuity buy-out under both IAS 19 and ASC 715.

No calculations required.

ANSWER:

RETDAC/U, Spring 2023, Q9

(*8 points*) Company ABC sponsors a defined benefit pension plan.
You are provided the following as of January 1, 2023:

Discount Rate	3.30%
Expected Return on Assets	5.30%
Projected Benefit Obligation (PBO):	
Non-Retiree	$73,760,000
Retiree	$90,127,000
Market Value of Assets	$157,759,000
Service Cost	$2,652,000
2023 Expected Benefit Payments	$9,288,000
2023 Expected Contributions	$2,245,000

Gains and losses are recognized immediately in the period in which they arise. Assume benefit payments and contributions are uniformly distributed.

(a) (*2 points*) Calculate the 2023 Net Periodic Pension Cost under U.S. Accounting Standard ASC 715 (ASC 715).

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

Company ABC purchases buy-out annuities for all retirees.
You are given the following as of July 1, 2023:

Discount Rate	3.00%
Duration	
Non-Retiree PBO	16
Retiree PBO	11
Service Cost	22
Market Value of Assets	$159,374,000
Annuity Purchase Price	$97,290,000

No participants are expected to decrement during 2023. All other data and assumptions remain the same as January 1, 2023.

(b) (*4 points*) Calculate the following values under ASC 715 reflecting the annuity buy-out:

(i) 2023 Net Periodic Pension Cost

(ii) 2023 Other Comprehensive Income

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

(c) (*2 points*) Describe how the values in part (b) would change if the transaction was an annuity buy-in rather than an annuity buy-out.

No calculations required.

ANSWER:

RETDAC/U, Fall 2023, Q5

(*8 points*) Company ABC wishes to de-risk the retiree portion of its pension liability.

You are provided the following:

Retiree Defined Benefit Obligation (DBO)	**December 31, 2022**
DBO at 3%	$1,110,000
DBO at 4%	$1,000,000
DBO at 5%	$910,000

(a) (*2 points*) Calculate the following for the retiree DBO:

(i) Effective Duration

(ii) Convexity

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

Company ABC is considering an annuity buy-out of the retiree portion of its pension liability at December 31, 2022. You are provided the following at December 31, 2022:

Annuity Premium	$990,000
DBO Discount Rate	4.70%

(b) (*2 points*) Determine the settlement credit/(cost) of the annuity buy-out under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

(c) (*2 points*) Compare and contrast the accounting implications of an annuity buy-out under IAS 19 versus U.S. Accounting Standard ASC 715.

No calculations required.

ANSWER:

(d) (*2 points*) Critique an annuity buy-in as an alternative de-risking strategy.

No calculations required.

ANSWER:

RETDAC/U, Fall 2023, Q8

(*11 points*) Company ABC sponsors a contributory defined benefit pension plan.

You are given the following information under U.S. Accounting Standard ASC 715 (ASC 715):

	At December 31, 2022	At December 31, 2023
Discount rate	2.50%	3.00%
Expected return on assets	5.50%	6.00%
Fair value of assets	$18,500,000	$21,000,000
Projected benefit obligation	$25,000,000	$24,500,000
Total current service cost at January 1, 2023	$900,000	
Expected employer contributions for the following fiscal year	$400,000	
Expected employee contributions for the following fiscal year	$325,000	
Expected benefit payments for the following fiscal year	$500,000	
Expected average remaining service lifetime (EARSL)	11.0	
Average future lifetime of all participants	20.0	
Gain/loss amortization method	The company amortizes gains/losses outside of the 10% corridor	
Unrecognized (gain)/loss in accumulated other comprehensive income (AOCI)	$2,750,000	

Contributions and benefit payments are made uniformly throughout the year.

(a) (*5 points*) Calculate the following under ASC 715:

(i) 2023 Net Periodic Pension Cost

(ii) AOCI as of December 31, 2023

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

Company ABC subsequently informed you that they froze the plan effective July 1, 2023 for all its active members.

You are given the following additional information:

	At July 1, 2023
Projected benefit obligation after freeze	$21,500,000
Fair value of assets	$19,750,000
Discount rate	2.50%
Expected return on assets	5.50%

Assume the following:

- Employer and employee contributions are suspended effective July 1, 2023
- No change to expected benefit payments for the year

(b) (*6 points*) Calculate the 2023 Net Periodic Pension Cost under ASC 715.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETDAC/U, Fall 2023, Q10

(*5 points*) Company ABC is freezing future pay and service accruals for its defined benefit (DB) pension plan effective December 31. The change is announced on September 30.

(a) (*4 points*) Describe the accounting implications of the freeze under the following:

(i) International Accounting Standard IAS 19, Rev. 2011 (IAS 19)

(ii) U.S Accounting Standard ASC 715 (ASC 715)

ANSWER:

As a result of the DB plan freeze, Company ABC experiences high turnover. Vested plan participants have the option to cash out their DB entitlement as part of the plan rules when leaving the company.

(b) (*1 point*) Explain how to determine whether settlement accounting applies under the following:

(i) IAS 19

(ii) ASC 715

ANSWER:

RETDAC, Spring 2024, Q5

(*10 points*) Company ABC sponsors a defined benefit pension plan and reports under U.S. Accounting Standard ASC 715 (ASC 715). The plan was improved for active members effective January 1, 2024.

You are provided the following information:

	As of January 1, 2024	As of December 31, 2024
Discount Rate	5.30%	4.50%
Expected Return on Assets	6.00%	6.00%
Projected Benefit Obligation	$695,000,000	$815,000,000
Market Value of Assets	$805,000,000	$795,000,000
2024 Service Cost (before interest)	$23,000,000	
2024 Expected Benefit Payments	$25,000,000	
2024 Expected Contributions	$22,000,000	
Timing of Benefit Payments and Contributions	Mid-Year	
Unrecognized (Gain)/Loss	$125,000,000	
Prior Service Cost/(Credit)	$33,000,000	
Amortization Method	10% corridor	
Average Future Working Lifetime	12	
Average Inactive Life Expectancy	20	

The Prior Service Cost was established effective January 1, 2024.

(a) (*3 points*) Calculate the 2024 Net Periodic Pension Cost under ASC 715.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

(b) (*2 points*) Calculate the Accumulated Other Comprehensive Income as of December 31, 2024.

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

Company ABC offers a lump sum window to retirees with all payments made on December 31, 2024. You are given the following additional information:

Value of Lump Sum Payments	$233,500,000
Reduction in Projected Benefit Obligation	$200,000,000

(c) (*3 points*) Calculate the following:

(i) Revised 2024 Net Periodic Pension Cost

(ii) Funded status at December 31, 2024

(iii) Accumulated Other Comprehensive Income at December 31, 2024

Show all work.

The response to this part is to be provided in the Excel spreadsheet.

(d) (*2 points*) Calculate the revised 2024 Defined Benefit Cost under International Accounting Standard IAS 19, Rev. 2011 (IAS 19).

Show all work.

The response to this part is to be provided in the Excel spreadsheet

RETDAC/U, Spring 2024, Q7

(*9 points*)

(a) (*3 points*) Describe the advantages and disadvantages of the following pension risk transfer strategies from the perspective of an employer:

(i) Annuity buy-in

(ii) Annuity buy-out

ANSWER:

(b) (*2 points*) Explain why an annuity buy-out premium may exceed the projected benefit obligation (PBO) under U.S. Accounting Standard ASC 715.

ANSWER:

(c) (*4 points*) Describe the advantages and disadvantages of adding a permanent lump sum option at retirement to a defined benefit pension plan from the perspective of the following:

(i) Employer

(ii) Plan participants

ANSWER:

RETDAC/U, Spring 2024, Q8

(*10 points*) You are provided with the following related to the most recent valuation of the pension plan for Company ABC at January 1, 2023:

Discount rate	6.00%
Expected return on assets for ASC 715	5.50%
Salary increase assumption	3.00%
Liability Duration	12
Service Cost Duration	20
Projected/Defined Benefit Obligations	$25,650,000
Market Value of Assets	$26,200,000
2023 Service Cost (before interest)	$670,000
2023 Expected Benefit Payments	$1,180,000
2023 Expected Contributions	$1,540,000
Unrecognized (Gain)/Loss under ASC 715	$2,200,000
Average Future Working Lifetime	14

Company ABC:

- reports under both International Accounting Standard IAS 19, Rev. 2011 (IAS 19) and U.S. Accounting Standard ASC 715 (ASC 715)
- uses a projection of the most recently completed valuation results for financial reporting
- ASC 715 amortization method: 10% corridor; amortized over average future working lifetime
- Market-related Value of Assets equals Fair Market Value of Assets under ASC 715

Assume benefit payments and contributions are paid midway through the year and increase each year by the salary increase assumption.

The following are the assumptions in effect for the plan under IAS 19 and ASC 715 at January 1, 2024:

Discount rate	4.30%
Expected Return on Assets for ASC 715	5.50%
Market Value of Assets	$24,300,000
Average Future Working Lifetime	13

(a) (*7 points*) Calculate the following:

(i) 2024 Defined Benefit Cost under IAS 19

(ii) 2024 Net Periodic Pension Cost (NPPC) under ASC 715

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

Company ABC is closing one of its plants, eliminating 30% of their workforce, effective December 1, 2024. Lump sum payments related to this event are not paid in 2024.

(b) (*3 points*) Describe how the values in part (a) would change for this scenario.

No calculations required.

ANSWER:

RETDAC/U, Fall 2024, Q5

(*8 points*)

(a) (*4 points*) You are calculating the Net Periodic Pension Cost (NPPC) under U.S. Accounting Standard ASC 715 (ASC 715).

Compare and contrast the following approaches:

(i) Bond Matching

(ii) Traditional Yield Curve

(iii) Spot Rate

No calculations required.

ANSWER:

(b) (*4 points*) Compare and contrast the Traditional Yield Curve approach versus the Spot Rate approach in a downward sloping yield curve environment on the following under ASC 715:

(i) NPPC

(ii) Funded Status

ANSWER:

RETDAC/U, Fall 2024, Q7

(*10 points*) Company ABC sponsors a defined benefit pension plan. Company ABC prepares its financial disclosures under U.S. Accounting Standard ASC 715.

The following information has been provided.

	12/31/2023	**12/31/2024**
Fair Value of Plan Assets	225,780,000	245,970,000
Projected Benefit Obligation	250,650,000	270,450,000
Unrecognized Loss/(Gain)	(40,150,000)	
Retiree % of Liabilities		48.2%
Discount Rate	4.5%	4.5%
Expected Return on Plan Assets	6.0%	6.0%
Average Future Working Lifetime	12.5	13.1
Gain/Loss Amortization Method	10% corridor; amortized over average future working lifetime	

	2024	**2025**
Service Cost	19,870,000	20,480,000
Expected Benefit Payments paid mid-year	9,251,000	8,624,000
Expected Contributions paid mid-year	21,550,000	21,550,000

(a) (*3 points*) Calculate the 2024 Net Periodic Pension Cost.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

Company ABC wants to reduce its risk exposure under the defined benefit pension plan by purchasing annuities for its retirees through an annuity buy-out contract. The annuity buy-out contract is effective March 31, 2025.

The following information has been provided for the first 3 months of 2025.

Fair Value of Assets as of March 31, 2025	252,597,000
Benefit Payments (retirees)	2,156,000
Contributions	5,952,000
Annuity Buy-out Premium	142,150,000

- There were no other benefit payments paid during the first 3 months of 2025.
- The discount rate remained unchanged at March 31, 2025.
- There were no experience gains or losses on the Projected Benefit Obligation.
- The expected benefit payments are $0 for the remainder of 2025.
- No additional contributions are expected to be made as a result of the annuity purchase.

(b) (7 *points*) Calculate the 2025 Net Periodic Pension Cost.

Show all work.

The response for this part is to be provided in the Excel spreadsheet.

RETDAC/U, Fall 2024, Q9

THIS QUESTION REFERENCES THE FOLLOWING CASE STUDY:
Fall 2024 Design and Accounting (RETDAC) Exam – Canada – Case Study

(*7 points*)

(a) (*2 points*) Describe considerations when selecting an amortization method under Actuarial Standard of Practice No. 4 Measuring Pension Obligations and Determining Pension Plan Costs or Contributions (ASOP 4).

ANSWER:

NOC is considering amending the National Oil Pension Plan.

(b) (5 *points*) Explain the implications of each of the following changes on the 2025 Net Periodic Benefit Cost under U.S. Accounting Standard ASC 715:

(i) Freezing the defined benefit pension plan and implementing a new defined contribution plan for all members after January 1, 2025.

(ii) Implementing post-retirement indexation of 50% of inflation per year for all years of service.

(iii) Reducing the normal retirement benefit by 0.25% per month that early retirement precedes age 60 for service earned after January 1, 2025.

No calculations required.

ANSWER:

RETRPIRM, Fall 2024, Q3

(*8 points*) XYZ Company is a publicly traded company that sponsors a defined benefit pension plan.

You are given:

Total Corporate Assets ($ millions)	$6,000
Total Corporate Debt ($ millions)	$3,500
Shareholder Equity ($ millions)	$2,500
Long-term Corporate Debt ($ millions)	$1,000
CAPM Beta for XYZ Stock	1.50
Pension Benefit Obligation (PBO) ($ millions)	$2,000
Pension Liability Adjusted for Holistic Balance Sheet ($ millions)	$2,250
Pension Assets ($ millions)	$1,500
Asset Allocation	60% in equities; 40% in bonds
Risk-free Rate of Return	3.00%
Market Return	7.00%

Note that the Net Pension Obligation is included in the Total Corporate Debt.

(a) (*2 points*) Describe four adjustments that can be made to the PBO to account for the pension liability under a holistic balance sheet approach.

ANSWER:

(b) (*1 point*) Describe the shortcomings of including the Net Pension Obligation instead of separating the pension asset and pension liability in the corporate balance sheet.

ANSWER:

(c) (*2 points*) Calculate the Weight Adjusted Cost of Capital (WACC) using:

(i) the accounting balance sheet; and

(ii) the holistic balance sheet

The response for this part is to be provided in the Excel spreadsheet.

(d) (*2 points*) Explain how the long-term debt-to-equity ratio would be impacted if the pension liability were perfectly hedged, using the holistic balance sheet.

ANSWER:

The following year, Company XYZ's financial situation changes as noted in the following table:

Shareholder Equity ($ millions)	$2,200
CAPM beta for XYZ stock	1.50
Pension Assets ($ millions)	$1,800
Pension funded ratio	100%

(e) (*1 point*) Calculate how much equity capital is needed by XYZ Company to maintain the same equity beta if the plan no longer invests in equities.

The response for this part is to be provided in the Excel spreadsheet.

RET 101 Learning Objective 4 Curated Past Exam Questions

RETRPIRM, Fall 2020, Q5

(*5 points*) You are the actuary for XYZ Company which sponsors a frozen defined benefit pension plan.

You are given:

Assets	$100 million
Liabilities	$125 million
Asset Mix	60% Equity / 40% Bonds
Bond duration	7.7 Years
Interest Rate Hedge Ratio	16.43%

(a) (*2 points*) Calculate the impact on the funded ratio of a 20 basis point reduction in both the fixed income yields and the liability discount rate.

Show all work.

ANSWER:

The plan sponsor would like to reduce the volatility of the funded ratio without reducing the expected return of the investment strategy.

(b) (*3 points*) Describe potential changes to the investment strategy that achieve the plan sponsor's objective.

ANSWER:

RETRPIRM, Spring 2021, Q6

(*6 points*)

(*3 points*) Describe the objectives of the following stakeholders with respect to a public defined benefit pension plan:

(i) Taxpayers;

(ii) Elected officials; and

(iii) Plan participants.

ANSWER:

The pension department of a government that sponsors a defined benefit pension plan has decided to implement an asset liability management framework.

(*3 points*) Explain how an asset liability management framework would affect the stakeholders from part (a) in terms of their objectives.

ANSWER:

RETRPIRM, Fall 2022, Q2

(*6 points*)

(a) (*3 points*) Compare and contrast the following strategies for a single employer pension plan:

(i) An immunization investment strategy

(ii) Purchasing buy-in annuities

ANSWER:

(b) (*3 points*) Describe three key considerations when designing an investment glide path strategy for a single employer pension plan.

ANSWER:

RETRPIRM, Fall 2022, Q3

(*5 points*)

(a) (*3 points*) Describe how addressing the following elements in a defined benefit governance structure can create value for stakeholders:

(i) Investment beliefs

(ii) Risk management

(iii) Investment time horizon

(iv) Mission

(v) Agency issues

ANSWER:

(b) (NO LONGER RELEVANT TO RET 201) (*2 points*) Defined contribution plan governance should address the structural flaws that make these plans less efficient than defined benefit plans at delivering retirement financial security.

Describe three of these flaws.

ANSWER:

RETRPIRM, Fall 2022, Q5

(*7 points*)

(a) (*4 points*) Describe potential barriers associated with de-risking through the purchase of a group annuity buy-out.

ANSWER:

(b) (*3 points*) Describe the advantages and disadvantages of group annuity buy-outs for:

(i) Plan members; and

(ii) Plan sponsors.

ANSWER:

RETRPIRM, Spring 2023, Q4

(*9 points*) You are given the following about Company ABC's frozen defined benefit pension plan:

	Active members	Terminated vested members	Retired members	Total
Number	1,500	1,000	5,000	7,500
Plan termination liabilities	$30,000,000	$10,000,000	$150,000,000	$190,000,000
Liability duration (years)	20	18	12	

You are also given:

Fixed income assets	$80,000,000
Equity assets	$100,000,000
Hedge ratio	43%
Duration of fixed income assets	14

Company ABC's CFO is considering the following de-risking options:

(i) Adopting a glide path that will have an allocation of 100% in liability-hedging assets when the plan is 100% funded on a termination basis.

(ii) Purchasing an annuity buy-out for retired members and keeping the current asset allocation for the remaining assets.

(iii) Purchasing an annuity buy-in for retired members and adopting a glide path for the remaining assets that will have an allocation of 100% in liability-hedging assets when the plan is 100% funded on a termination basis.

Compare and contrast how the following economic event would have affected the three de-risking options:

- A 200-basis point increase in interest rates; and
- A 25% drop in equity markets.

The response for this part is to be provided in the Excel spreadsheet.

RETRPIRM, Spring 2024, Q3

(*7 points*) You are the actuary for Company ABC's defined benefit pension plan. Company ABC recently made the decision to terminate the plan within 5 years. The primary objective of Company ABC is to minimize the cost of plan termination by ensuring that the plan is fully funded before termination occurs.

You are given:

Plan type	Closed and frozen
Funded status	86%
Asset allocation	60% equity / 40% bonds
Bond duration	7.2 years
Liability duration	9.8 years

(a) (*2 points*) Describe the benefits of implementing a glide path liability-driven investment (LDI) strategy.

ANSWER:

(b) (*5 points*) Recommend one of the following LDI strategies considering Company ABC's primary objective.

Justify your recommendation.

	Option 1	**Option 2**
Initial asset allocation	No immediate change	35% Equity / 65% Bonds
Triggers	Interest rate level (long term bond index) increases by 0.50%	Funded status improves by 2%
Monitoring frequency	Quarterly	Monthly
% of equity replaced with bonds when a trigger is reached	15%	5%
Duration of bonds added to the portfolio	14.9 years	7.2 years
End state objective	Hedge ratio = 100%	Funded status = 100%

ANSWER:

RETRPIRM, Fall 2024, Q1

(*6 points*)

(a) (*2 points*) Compare and contrast the following pension risk transfer solutions

(i) Annuity buy-in

(ii) Annuity buy-out

The response for this part is to be provided in the Excel spreadsheet.

You are given the following mid-year cash flows for Company XYZ's frozen defined benefit pension plan:

[Cash flows are provided in Excel]

Company XYZ is considering completing an annuity buy-out for all the existing retirees in the plan.

You are given the following yield curve information as of the annuity purchase date:

[Yield curve is provided in Excel]

(b) (*2 points*) Calculate the plan's effective duration.

(i) before the buy-out transaction; and

(ii) after the buy-out transaction

The response for this part is to be provided in the Excel spreadsheet.

As the plan is preparing to complete the annuity buy-out, the yield curve experiences a parallel shift of 100 basis points down.

(c) (*2 points*) Using the duration measures calculated in part (b), calculate the liability.

(i) before the buy-out transaction; and

(ii) after the buy-out transaction.

The response for this part is to be provided in the Excel spreadsheet.

RETRPIRM, Fall 2024, Q4

(*6 points*)

(a) (*3 points*) Describe the risks associated with investing in fixed income securities.

ANSWER:

Company XYZ sponsors a defined benefit pension plan.

You are given:

Plan Type	Open to new entrants Final salary benefit formula
Funded Status	68%
Current Asset Mix	40% Equities 60% Fixed income

The CFO of Company XYZ anticipates a fall in interest rates and proposes an asset mix of 100% in fixed income securities. The CFO asserts that the proposed asset mix would guarantee a lower and more stable level of employer contributions compared to the current asset mix.

(b) (*3 points*) Critique the CFO's assertion.

ANSWER:

RET 101 Learning Objective 5 Curated Past Exam Questions

RETRPIRM, Fall 2021, Q6

(*4 points*)

(a) (*2 points*) Describe the advantages of pension guarantee schemes for the following:

i) Sponsors of defined benefit pension plans; and

ii) Members of defined benefit pension plans.

ANSWER:

(b) (*2 points*) Describe the challenges that pension guarantee schemes face.

ANSWER:

RETRPIRM, Spring 2022, Q3

(*7 points*)

(a) (*3 points*) Describe four advantages of counter-cyclical funding regulations for defined benefit pension plan sponsors.

ANSWER:

(b) (*4 points*) Describe four regulatory incentives that could promote the counter-cyclicality of funding rules.

ANSWER: