

# Exam CFEFD

**Date:** Friday, April 25, 2025

## INSTRUCTIONS TO CANDIDATES

### General Instructions

1. This examination has 7 questions numbered 1 through 7 with a total of 70 points.

The points for each question are indicated at the beginning of the question. Questions 1 through 5 and question 7 pertain to the Case Study.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

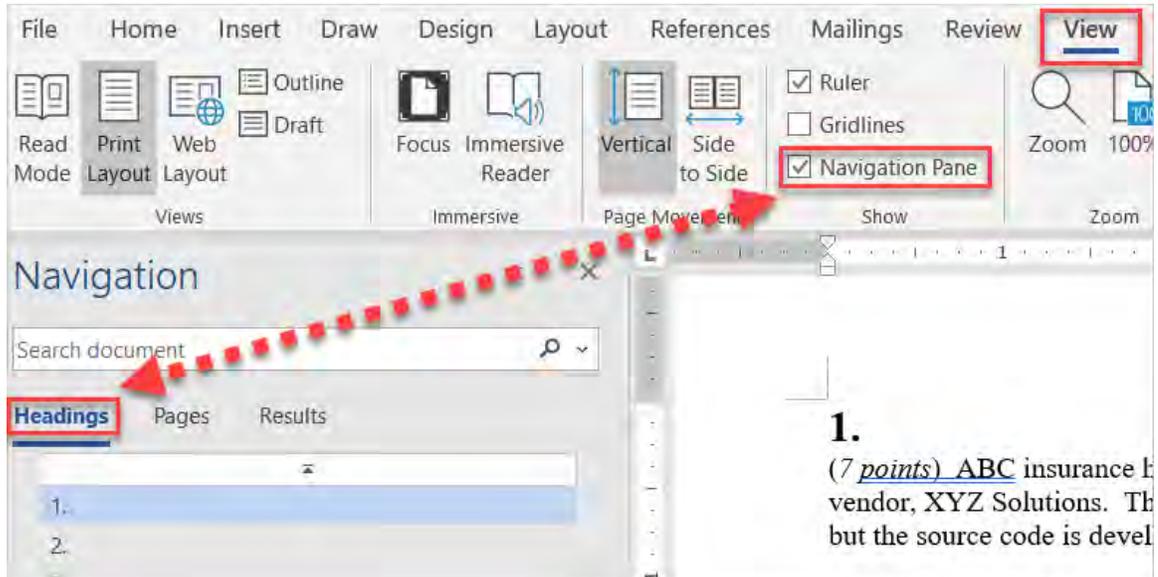
### Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
  - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example,  $\beta_1$  can be typed as beta\_1 (and ^ used to indicate a superscript).
  - b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
  - c) For each question part requiring an answer in Excel, (1) clearly identify the inputs to the calculations, (2) show the necessary interim calculations, adding rows and / or columns, if necessary, and (3) enter the final answer in some or all of the cells highlighted in yellow, as applicable in each circumstance. These cells should contain formulas with links to other calculations in the worksheet. Minimize the use of hard-coded figures and maximize the number of interim steps in the calculations that would demonstrate your line of thinking.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename. To maintain anonymity, please refrain from using your name and instead use your candidate number.
4. The Word and Excel files that contain your answers must be uploaded before time expires.

## Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



## **CASE STUDY INSTRUCTIONS**

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

**Questions 1 through 5 and question 7 pertain to the Case Study.  
Each question should be answered independently.**

**1.**

(9 points) You are an actuary at Darwin Life Insurance Company (Darwin) (Case study section 6) collaborating with external consultants from Consultants R Us (CRS) on capital measurement and management strategies (Case Study section 6.7.4).

You have been asked to evaluate the work of CRS consultants on the development of an economic capital model.

(a) (3 points) Assess each of the following based on a risk-based performance management framework:

- I. Darwin's goal is to improve its ability to better manage capital and return. CRS advises that three underlying themes are important to support this goal: capital productivity, capital protection, capital adequacy.
- II. CRS argues that risk-adjusted return on capital (RAROC) addresses the trade-off between capital productivity and capital adequacy.
- III. CRS indicates economic capital is typically calculated with a top-down approach.

ANSWER:

The CRO, Aaliyah Jackson, has requested profitability benchmarks for new products. The pricing team recommends using the Variable Annuity (VA) RAROC as a benchmark for the proposed Indexed Universal Life (IUL) product (Case Study section 6.7.1.). Darwin's CEO, Gabriela Martinez, has been pleased with the VA product but expects its RAROC will be very high and, therefore, unfair to use as a benchmark for the new product.

(b) (3 points)

- (i) Describe why the VA RAROC may not meet Gabriela's expectation.

ANSWER:

- (ii) Explain potential implications if Darwin uses the VA RAROC to evaluate the IUL product.

ANSWER:

**1. Continued**

- (c) (3 points) Outline a response, using the RAROC metric, to three of Gabriela's questions regarding the IUL product in her email to Aaliyah. (Case Study section 6.7.1.)

ANSWER:

**Questions 1 through 5 and question 7 pertain to the Case Study.  
Each question should be answered independently.**

## 2.

(10 points) Darwin Life Insurance Company (Darwin) (Case study section 6) is concerned about its high expenses and is reviewing its cost structure.

- (a) (1.5 points) Explain why a traditional cost structure to allocate overhead is not adequate for Darwin.

ANSWER:

Darwin's senior management is considering adopting an Activity-Based Costing (ABC) system. You prepare research to understand ABC and its potential benefits to Darwin.

- (b) (4 points)
- (i) Explain two considerations for Darwin in determining the granularity of its cost management system.

ANSWER:

- (ii) Describe two activities which will be difficult for Darwin to allocate, given its business profile. Explain your reasoning.

ANSWER:

- (iii) Explain two benefits to Darwin of implementing an ABC system.

ANSWER:

- (c) (4.5 points)

Darwin's management decides to move its costing system to an ABC system. Using the information provided in Excel tabs 2\_c-i, 2\_c-ii, and 2\_c-iii:

- (i) Construct the new business product costing using the traditional method with overhead allocated by labor hours. Show your work.

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

## 2. Continued

- (ii) Construct the new business product costing using the ABC method. Show your work.

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

- (iii) Evaluate how the use of these two costing methods in (i) and (ii) impacts management's view of the profitability of each of the following products:

- I. Term
- II. Trad Life + Other
- III. Variable Annuity
- IV. Universal Life

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

*Questions 1 through 5 and question 7 pertain to the Case Study.  
Each question should be answered independently.*

**3.**

(12 points) Darwin Life (Case Study section 6) uses stress testing to capture adverse but not extreme tail risks.

To measure gaps in Profit and Loss projection, the following stress test scenarios were used:

- 3Q 2023: interest rates up and equity down.
- 4Q 2023: interest rates down and equity up.

Mean Absolute Error (MAE) in 000s	3Q 2023	4Q 2023
Prediction - stress test	158.365	421.239
Prediction - known macro	78.358	180.531

Mean Error in Direction (MED) in %	3Q 2023	4Q 2023
Prediction - stress test	38.2%	45.4%
Prediction - known macro	19.7%	20.1%

In 000's

MAE on liability model	9	12.5
MAE on interest rate hedging performance	15.672	126.372
MAE on equity market risk hedging performance	70.522	63.186

- (a) (2 points) Explain the backtesting process Darwin Life would have taken to produce the table above.

ANSWER:

- (b) (4 points) Interpret the MAE and MED results shown above.

ANSWER:

- (c) (2 points) Recommend two changes to the stress testing process. Justify your recommendation.

ANSWER:

### 3. Continued

Darwin's Variable Annuity product requires a stochastic reserve calculation. You were given the following information:

- The reserve is calculated using 1,000 inner-loop scenarios at annual timesteps over 40 years.
- The outer loop scenarios are run quarterly for 40 years.
- Calculating the reserve requires 16,000 hours of processing time in the inner loops for each outer loop scenario. Darwin runs many outer loop scenarios for various purposes.
- The stochastic calculation only results in a non-zero reserve if the equity market is down more than 20% from the prior year.

(d) (4 points)

- (i) Recommend three actions for Darwin to reduce the time and/or cost of performing nested stochastic calculations. Justify your recommendation.

ANSWER:

- (ii) Describe the tradeoff between runtime and accuracy from Darwin's perspective.

ANSWER:

**Questions 1 through 5 and question 7 pertain to the Case Study.  
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**4.**

(10 points) Darwin Life Insurance Company (Darwin) (Case Study section 6) wants to acquire Snappy Life Insurance Company (Snappy) (Case Study section 7) for \$250 million (M). Darwin's CFO, Alexis Marino, has asked you to perform analysis of the potential impact to financial statements and ratios.

Assume no synergies are realized.

- (a) (2 points) Contrast the benefits of using equity vs. using debt in Darwin's financing of the acquisition.

ANSWER:

- (b) (4 points) Calculate the interest coverage ratio in 2023 for each of the following. Show your work.

- (i) Darwin before the acquisition.

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

- (ii) Darwin and Snappy combined, assuming no new debt.

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

- (iii) Darwin and Snappy combined, assuming \$100M of new debt using the expected cost of debt of Darwin's parent company, RPPC.

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

- (c) (1 point) Explain why Darwin would care about the interest coverage ratio.

ANSWER:

#### 4. Continued

Darwin has concerns about taking on any additional product risk. In an ERM Committee meeting about the potential acquisition Darwin's actuary, John Clark, suggests investigating the following reinsurance options for the additional product risks it would acquire from Snappy:

- I. Create a captive
- II. Financial reinsurance

(d) (3 points)

- (i) Explain one general benefit of each reinsurance option.

ANSWER:

- (ii) Recommend if either reinsurance option is a good solution for the additional product risks Darwin would acquire from Snappy. Justify your recommendation.

ANSWER:

**Questions 1 through 5 and question 7 pertain to the Case Study.  
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**5.**

(11 points) Robert Kaplan, CRO of Frenz, wants you to review the quality of earnings of the Frenz financial results and projections for years 2022 to 2026 (Case Study section 4.5 Exh B).

(a) (4 points)

- (i) Calculate Frenz's Inventory Turnover and Net Profit Margin. Show your work.

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

- (ii) Assess the sustainability of Frenz's earnings using the metrics calculated in part (i).

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

You are told that depreciation of long-term investments will be sped up for new assets acquired from 2024 to 2026 for financial reporting purposes only. As a result, depreciation for the projected income statement between 2024 and 2026 will be as follows (with Deferred Tax Assets included on the balance sheet in Accounts Receivable):

Depreciation	2026	2025	2024
Current projection	31,770	28,061	24,601
Revised projection	34,270	30,061	26,101

- (b) (2 points) Calculate the following financial items in each year given the revised projection in the table above:

- I. Account Receivable  
II. Total Assets

Show your work.

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

## 5. Continued

(c) (3.5 points)

(i) Explain the aggregate effect of the change to the depreciation schedule on each of the following financial statements:

I. Income statement

II. Cash flow statement

Justify your answer.

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

(ii) Describe two potential issues that impact Frenz's reporting quality.

ANSWER:

Robert suggests that management comments, related to certain non-IFRS items, should be disclosed along with Frenz's statements to provide financial statement users with more context on Frenz's earnings.

(d) (1.5 points) Recommend two important disclosure practices that Frenz should adopt to comply with IFRS disclosure standards. Justify your recommendation.

ANSWER:

## 6.

(12 points) ABC Life primarily sells simple annuity products. ABC now plans to develop a complex variable annuity (VA) product with an embedded Long-Term Care (LTC) rider. It has developed a model for this product which projects future cash flows over 10,000 stochastic economic scenarios. ABC is considering using a proxy model to simplify the more complex stochastic projections.

- (a) (2 points) Describe four common uses of proxy models for insurers.

ANSWER:

The fee for the rider has been set at 1% of account value per year. ABC would like to run a model once a week to validate its pricing of the 1% rider fee.

- (b) (5 points)

- (i) Assess if a proxy model is appropriate for ABC to validate its pricing of the 1% rider fee. Justify your response.

ANSWER:

- (ii) Recommend an approach for each of the following aspects of developing a proxy model to estimate the rider fee. Justify your recommendation.

- I. Type of proxy model.
- II. Type of required accuracy.
- III. Validating the quality of fit.
- IV. Calibrating the model.

ANSWER:

## 6. Continued

To help make the product more competitive, ABC Life has decided to add equity exposure to the asset portfolio backing the LTC rider reserves. John, an ALM manager, is developing a risk prediction model for the equity exposure.

John asks you to use a binomial distribution model to predict 1-day horizon profit and loss using the data provided in Excel tab 6\_c.

(c) (5 points)

(i) Complete the summary table in Excel.

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

(ii) Conduct a one-sided hypothesis test for the model at a significance level of 5%.

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

(iii) Interpret the results of the one-sided hypothesis test in (ii).

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

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## 7.

(6 points) RPPC (Case study section 1) is considering Seaplane Expeditions and Aviation (SEA) (Case study section 8) as an acquisition target. As part of due diligence, RPPC is reviewing the strategy, balance sheet, and capital structure of SEA as of 2023.

One of SEA's strategies is to lease one plane to accommodate the growing business need. SEA is leasing the plane to expand the business over the next five years.

- (a) (1 point) Describe two benefits of leasing a plane compared to purchasing a plane.

ANSWER:

- (b) (2 points) Describe how to calculate the value of SEA's lease in Euros (EUR) using each of the following:

- (i) the spot-rate method

ANSWER:

- (ii) the forward-rate method

ANSWER:

An executive from RPPC suggests "We can hedge currency risk. However, since cash flows are uncertain, we must add a premium to cost of capital for foreign investment to mitigate the foreign currency risk of acquiring SEA."

- (c) (1.5 point) Critique the executive's statement.

ANSWER:

## 7. Continued

RPPC is converting SEA's balance sheet as of 2023 to Euros.

- (d) (1.5 points) Explain why the current method is a more appropriate approach in this case than the temporal method or the inflation-adjusted currency method.

ANSWER:
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**\*\*END OF EXAMINATION\*\***