EXAMINATION

21 November 2022 (am)

Subject F102 — *Life Insurance*
Fellowship Principles

Time allowed: *Three hours and twenty minutes (which includes five minutes for downloading and uploading your answer document)*

Total marks: *100*

INSTRUCTIONS TO THE CANDIDATE

1. *Ensure that you are logged in and authenticated through Examity before you attempt the examination.*
2. *The question paper is only available in the ASSA Exam Platform as a PDF download and may not be printed. Copy/paste of questions or parts thereof is allowed from the question paper to your Word answer document only.*
3. *Download the Word answer document template from the ASSA Exam Platform. Save this Word answer document on your desktop using your Candidate Number as filename. You are required to submit your answers in Word format ONLY using this document. No answers in any other format (e.g. handwritten) will be accepted. Save work regularly.*
4. *Ensure that your Candidate Number appears in the "header" of your Word answer document. [Double-click on the header at the top of the Word document, input your Candidate Number only in the header, then press "Esc" to close the header.]* ***Do not use your name or member number anywhere in your Word answer document.***
5. *You may not access any file from your computer, use any other computer program (e.g. Email or Excel), or open any other browser during the examination.*
6. *You may not use any other material (e.g. a Formulae and Tables book) during the examination. Any such information that may be required will be provided to you within the examination.*
7. *You are strongly encouraged to use the first 15 minutes as reading time only, however, you may start answering the paper whenever you are ready.*
8. *Mark allocations are shown in brackets.*
9. *Attempt all eight (8) questions, starting each on a new page (as provided for in the Word answer document).*
10. *Show calculations where appropriate. You may use blank paper to carry out rough work calculations. You may use a calculator from the approved list only.*
11. *Upload your Word answer document only into the ASSA Exam Platform. Once you have uploaded your document, you must click on* ***Finish Attempt*** *to save your document. You will still be allowed to go back and make changes (****Review Attempt****) if you have time.*
12. *Once you are satisfied with your uploaded document, click* ***Finish Attempt*** *and* ***Finish all and Submit****. Once you have submitted you will not be able to make any changes.*
13. ***You must submit your Word answer document BEFORE the end of the allotted examination time.*** *You should stop writing and start uploading during the last five minutes (when the ASSA Exam Platform countdown clock turns red). Take this into account when planning your review and submission. There will be no time announcements.*

Note: The Actuarial Society of South Africa will not be held responsible for loss of data where candidates have not followed instructions as set out above.

END OF INSTRUCTIONS

QUESTION 1

A large life insurance company has, to date, sold conventional annuities only. The insurance supervisor in the country requires that supervisory reserves are set on a prudent basis.

i. Describe how the company would set each of the assumptions required to determine the supervisory reserves for its without-profits immediate annuity business, which have inflation-linked benefits and no spouse's benefit.

[6]

The insurer is launching a conventional without-profits whole life assurance product. Policyholders may opt to pay level premiums or age-rated premiums which increase throughout the policy.

ii. Describe how the company would set the mortality, withdrawal and expense assumptions required to determine the supervisory reserves for this product.

[5]

[Total 11]

QUESTION 2

i. Outline briefly 6 types of regulatory restrictions which may be imposed on life insurance companies.

[3]

Life & Invest is a large life insurance company in a developing country with a well-recognised local brand. It sells unit-linked savings contracts, without-profits whole life assurance and funeral insurance and with-profits endowment assurance contracts.

ii. Suggest, with reasons, suitable investments for the funeral insurance business.

[4]

Inflation rates globally and locally have recently risen sharply, resulting in rapidly rising interest rates and falling asset prices.

iii. Discuss the expected impact of the change in economic conditions on the sales volumes and product profitability of Life & Invest, assuming no changes to its product design or pricing.

[4]

To increase the sales volumes of its products, Life & Invest is considering a partnership with an internet-based distribution platform in a large, developed country to distribute the company's products in that country.

iv. Outline the risks, other than regulatory restrictions, that this new partnership may pose for the company.

[4]

[Total 15]

PLEASE TURN OVER

QUESTION 3

You are a consulting actuary assisting a newly established life insurance company in setting up a new range of whole life assurance products. The sums assured on the policies will change automatically based on the age of a policyholder. The following benefit structure is proposed:

Age Range	Sum Assured
18 – 35	R1 million
36 – 50	R3 million
51 +	R2 million

You are building a model which can be used to profit test different premium levels for this product.

i. Outline the factors to consider when choosing a set of model points.

[3]

ii. Outline the advantages of using a deterministic model for this purpose.

[2]

iii. Describe a model that you could use for this purpose.

[5]

iv. Discuss the challenges faced in determining a suitable premium pattern over the term of the policies.

[2]

[Total 12]

QUESTION 4

A life insurance company has written significant amounts of unit-linked business in the last decade while its conventional with-profits book has seen a sustained period of lower new business sales. It has decided to close the conventional with-profits book, which currently has a healthy surplus, to new business, and to launch a unitised with-profits product range instead.

i. Outline the likely benefits to the company and to current and future policyholders, of the company's decision.

[5]

A few years after the launch, the actuary performing an analysis of surplus notices that the per policy renewal expenses are much higher than expected in the pricing basis for the unitised with-profits contracts.

ii. Describe the investigations that could be conducted in response to this finding, and the actions which might be taken related to the pricing and valuation bases following the investigations.

[5]

[Total 10]

PLEASE TURN OVER

QUESTION 5

i. Define briefly what is meant by "actuarial funding".

[2]

ii. State the principles, other than fairness, that should be considered when designing the surrender value terms for conventional life insurance products.

[6]

An insurance company is designing a single premium unit-linked endowment assurance contract, with a policy term of 15 years. The pricing actuary has determined that a fund management charge of 0.2% p.a. over the 15-year policy term should be sufficient to recoup the initial expenses incurred on this product (assuming policyholders do not surrender).

She is considering two surrender penalty designs, where the penalty on surrender at time *t*, measured in years from policy inception, is:

- A: 0.2% × (unit fund value at time t) × (15 – *t*).
- B: 0.4% × (unit fund value at time t) × (10 – *t*) for $t < 10$, and zero for $t \geq 10$.

iii. Discuss these two designs with respect to each of the following:

a. Impact on the insurer's ability to actuarially fund units; and
b. Fairness.

[5]

[Total 13]

QUESTION 6

An insurance company in a particular country plans to launch an income protection product in the next twelve months to be sold to individuals.

i. Outline, with reasons, the factors that will influence the amount of reinsurance the company might put in place.

[6]

ii. Suggest, with reasons, appropriate types of reinsurance for the company.

[3]

iii. List the information that the applicant could provide on a standard application form that an underwriter could use to assess the risk.

[3]

[Total 12]

PLEASE TURN OVER

QUESTION 7

The insurance regulator of a country permits insurance companies writing unit-linked business to hold negative non-unit reserves, provided that certain conditions are met.

i. Outline briefly the conditions that may be specified by the regulator for the holding of negative non-unit reserves.

[2]

An established life insurance company has been selling regular-premium unit-linked endowment assurances for a number of years. Benefits include:

- A death benefit equal to the higher of the unit fund or the guaranteed sum assured.
- A maturity value equal to the higher of the unit fund or a return of premiums paid.
- Surrender and paid-up values based on the unit fund less a fund-based surrender penalty.

The company's actuary has just extracted policy data from the company's database to perform the annual valuation and prepare the company's financial statements including the balance sheet and income statement for the year. Accounting information and information from the fund manager have also been received for the preparation of the financial statements.

ii. List 4 items of accounting information and 4 items of fund management information that you expect to have been received by the actuary.

[2]

iii. Outline briefly 8 data checks that could be done by the actuary to specifically check for consistency between the policy data extracted, accounting information, and fund management information.

[4]

The actuary completes the valuation and notices that the non-unit reserves have changed from being negative at the last valuation to being positive at the current valuation. There have been no changes to the valuation method or assumptions, and you can assume that no errors have been made.

iv. Explain possible reasons for the change in the non-unit reserves.

[6]

[Total 14]

PLEASE TURN OVER

QUESTION 8

A life insurance company offers a wide range of unit-linked life insurance products. The company is planning to expand its operations to a neighbouring country which is experiencing strong recent growth in demand for life insurance. All life insurance sold to date in the neighbouring country has been conventional without-profit business.

The company plans to launch a regular premium unit-linked whole life assurance policy in the new market with the following characteristics:

- Policy benefits:
  - On the first of death or total and permanent disability (based on an occupational definition): The larger of a guaranteed minimum sum assured (selected by the policyholder at outset) and the value of units.
  - On surrender: The value of units less a surrender penalty.
- The unit fund to be offered will be based on equities in the company's current home country.
- The only charges to be levied on the policy will be:
  - Annual management charges; and
  - Monthly benefit charges (in respect of any excess of the guaranteed sum assured over the value of units in the unit fund).

  Both charges will be variable at the discretion of the life office.
- Premiums are guaranteed for 10 years only at which point they may be reviewed.

i. Outline the risks faced by the company related to this product in respect of:

   a. mortality and morbidity; and
   b. expenses.

[10]

ii. Describe a method the company could use to recoup its initial expenses under the product design outlined above, explaining how it could be used to reduce new business strain.

[3]

[Total 13]

END OF PAPER

