EXAMINATION

23 May 2018 (am)

Subject F102 — *Life Insurance*
Fellowship Principles

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of EACH OF your answer booklets.*

2. *You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made.*
   You then have three hours to complete the paper.

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven (7) questions, beginning your answer to each question IN A SEPARATE BOOKLET.*

6. *Show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in your answer booklets, with any additional sheets firmly attached to the correct booklet, AND this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

QUESTION 1

A large life insurance company has a significant portfolio of endowment assurance and whole life policies. Poor economic conditions are leading to an increase in the number of surrenders.

i. State reasons why the company would prefer policyholders to make policies paid-up rather than surrendering them.

[1]

ii. State the considerations for the company when setting an alteration basis.

[4]

iii. Discuss alternatives, other than making a policy paid-up, that the company can offer policyholders who want to retain their death cover, albeit at a lower level.

[3]

iv. Outline other elements of the business that may be affected by the poor economic conditions.

[4]

[Total 12]

QUESTION 2

A large life insurance company currently reinsures its portfolio of term assurance business and is considering changing the retention limit on this portfolio.

i. Define what is meant by a "retention limit" and list the general factors that should be taken into account when setting the retention limit.

[5]

ii. Outline, making use of formulas where appropriate, how the life insurance company can use a stochastic simulation model to select a retention limit based on specified ruin criteria.

[4]

iii. Outline, making use of formulas where appropriate, how the life insurance company can then use a stochastic simulation model to determine the optimal balance between a mortality fluctuation reserve and such reinsurance.

[6]

[Total 15]

PLEASE TURN OVER

QUESTION 3

A small insurance company in a developing market writes without-profits immediate annuities.

i. Explain how a market-consistent value of the liabilities might be calculated in practice for this book.

[6]

The assets backing the liabilities are infrastructure bonds. A junior actuary in the company has suggested that the discount rate be increased to reflect an illiquidity premium.

ii. Discuss the advantages and disadvantages of this proposal for the company, and outline any difficulties that would be involved in the process.

[3]

iii. Describe the requirements and restrictions that may be imposed by a regulator on insurance companies that allow for illiquidity premiums in their reserving.

[5]

[Total 14]

QUESTION 4

We're Here for You is a large insurance company in a developed market that has been selling a comprehensive critical illness product for many years. The product covers 30 diseases and conditions. The marketing actuary, who is a member of the senior management team, has proposed that your company launch a "cancer only" critical illness product, sold through a call centre. You are a senior pricing actuary.

i. Outline briefly the advantages and disadvantages of the marketing actuary's suggestion.

[5]

ii. Outline how you would set the key assumptions required to price this product, including some of the challenges you will face in deriving accurate assumptions.

[5]

iii. Outline briefly risk mitigation strategies that you could implement to reduce the risk of adverse experience on the new product for the insurer.

[4]

[Total 14]

PLEASE TURN OVER

QUESTION 5

A life insurer offers a 15-year unit-linked regular premium endowment assurance contract. The contract design includes the following features:

- Maturity benefit: 100% of the bid value of units
- Death benefit: 100% of the bid value of units
- Surrender value: 100% of the bid value of units less a surrender penalty, expressed as a percentage of the unit fund, applied for the first five years of the policy
- Partial surrender option: up to 5% of the value of units, without penalty, available on each policy anniversary
- Deductions and charges:
  - Bid-offer spread
  - Annual management charge
  - Charges on the product are reviewable
- Commission: a percentage of each premium
- Investment funds: a range of internal investment funds is offered

The insurer has introduced a new policy administration system and processes for providing information on the fund value of the policy to policyholders on a regular basis. After the system change the insurer undertakes a detailed expense investigation into the per policy expenses of the product to investigate the adequacy of the charging structure on the product. The insurer considers the actual direct costs of the business as well as an allowance for indirect costs and overheads in determining the per policy expenses.

i. Describe how the insurer would determine the per policy expenses for this product.

[6]

ii. Describe how the insurer would use a cashflow model to determine the adequacy of the charging structure for the unit-linked product.

[8]

The insurer has found that the expenses relating to the product have increased since the product was initially priced and that the charges are inadequate. The insurer is considering increasing the charges for the product for both new and existing policies.

iii. State the considerations that the insurer should take into account before increasing the charges.

[3]

[Total 17]

PLEASE TURN OVER

QUESTION 6

i. Give 8 examples of regulations that a regulator can impose on the investments of a life insurer.

[4]

An insurer in a developing country sells without-profit immediate annuities that increase in line with the consumer price index (CPI) of the country.

ii. Outline the characteristics of the liabilities and hence discuss the types of investments the company might use to back its annuities.

[6]

iii. Discuss how your answer to (ii) would differ if the insurer sold without-profit immediate annuities that change in line with an equity market index.

[4]

[Total 14]

QUESTION 7

i. List the assumptions that need to be made when valuing a mortality option using a cashflow projection model.

[2]

A life insurance company sells a 10-year unit-linked regular premium endowment assurance with the following characteristics:

- Policyholders undergo full medical underwriting at inception.
- Unit funds are invested in a variety of different asset classes.
- There is a guaranteed maturity value, expressed in Rand terms.
- There is a guaranteed minimum death benefit that remains level throughout the policy term, expressed in Rand terms.
- In addition to the above-mentioned minimum death benefit, policyholders have the option to double their death benefit at the policy's five year anniversary, without undergoing further medical underwriting. The mortality charges for the additional benefit are guaranteed to be the same as for lives that are fully underwritten at that point in time.

For this product the company has implemented the following risk mitigating measures:

- The guaranteed maturity value is matched with derivative instruments.
- The administration of this business is outsourced to a third party administration company that has guaranteed the costs of administering the business, including a guarantee regarding the rate at which the administration costs may increase in future.

ii. Describe the company's exposure to mortality risk under this product.

[3]

iii. Outline the non-mortality risks that the company is exposed to under this product.

[9]

[Total 14]

END OF PAPER