

# EXAMINATION

6 November 2017 (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. Candidates should 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.

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| <p>In addition to this paper you should have available the 2002 edition of the <i>Formulae and Tables</i> and your own electronic calculator from the approved list.</p> |
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## QUESTION 1

You are the actuary to a small mutual life insurer which writes mainly unitised with-profits business. You are considering the current bonus declaration.

- i. Discuss briefly the factors that you will consider when setting your bonus rates.

[6]

During the year since the last bonus declaration, it was established that an error was made that understated the asset shares at the time of the previous declaration by 1%.

- ii. Describe the potential consequences of the error.

[2]

[Total 8]

## QUESTION 2

Future Life is a well-established insurer specialising in both fully-underwritten whole life and lump sum permanent disability products for middle- and high-income customers. No surrender benefits are offered on these products.

The insurer has recently expanded its product range to provide lower sum assured whole life products to the low-income market, but without a disability option. This product is not underwritten and instead has a waiting period that is shorter than the standard practice in the market.

The insurer uses a deterministic cashflow model to calculate the policyholder liabilities for supervisory purposes using the gross premium valuation method. Policyholder liabilities are required to be determined on a market consistent basis by the supervisor.

- i. List the checks that would be used to verify the policyholder data used to calculate the policyholder liabilities.

[2]

- ii. Describe how the insurer would use a deterministic cashflow model to determine the policyholder liabilities for supervisory purposes. You may assume that the insurer does not use the cost of capital approach to determine risk margins.

[8]

After four years the insurer performs detailed investigations to assess the appropriateness of the best-estimate assumption for mortality for calculating the policyholder liability provisions for the old and new products.

- iii. Describe the process that would be used by the insurer to perform the mortality investigation.

[4]

The results of this investigation show that the mortality experience from both products is higher than that assumed for the best-estimate basis.

- iv. Discuss the actions that the insurer may take in response to the results of the mortality investigation.

[4]

[Total 18]

**PLEASE TURN OVER**

### QUESTION 3

A life insurer sells a unit-linked endowment assurance in a country with a sophisticated financial services industry. The product has the following key features:

- There is a single balanced portfolio.
  - A management fee of 1.5% per annum is charged on the value of the unit fund.
  - The product pays commission upfront equal to 5% of the premiums payable over 10 years.
- i. State the errors that may affect the unit pricing for the balanced portfolio offered by the life insurer. [2]
- ii. Outline briefly the risks of the product to the life insurer. [5]

The company is experiencing increased competition from retail collective investment schemes. The product development team suggests enhancing the unit-linked product offered by the life insurer by:

- Adding three new portfolios: a high-risk portfolio, a medium-risk portfolio and a low-risk portfolio
  - Offering a 'return of capital guarantee' on the portfolios
  - Reducing the management fee on the product
  - Reducing the upfront strain by paying commission 'as and when' premiums are paid
- iii. Outline the potential advantages and disadvantages of each of the suggested changes in the product design. [7]

[Total 14]

### QUESTION 4

- i. Explain the differences between coinsurance on original terms and coinsurance using the level risk premium approach. [3]
- ii. Discuss briefly how underwriting is used to manage the risk of insurers and reinsurers. [5]

A reinsurer has received a request from a cedant to reduce the amount of underwriting that the reinsurer currently requires it to carry out.

- iii. Outline the factors the reinsurer's chief actuary should consider in making its decision regarding this request. [9]

[Total 17]

**PLEASE TURN OVER**

## QUESTION 5

You are a senior actuary working for a large life insurer. For many years your company has sold individual life income protection (IP) products, aimed largely at self-employed individuals. At a recent strategy session, senior management decided that the company would launch a group IP product within the next six months. You have been tasked with developing and pricing this new product.

- i. Outline briefly the key product design similarities and differences between the two products that you will need to consider when designing the group product. Your answer should provide an explanation of why the differences are necessary.

[7]

- ii. Outline how you would set the pricing assumptions for the group product.

[5]

[Total 12]

## QUESTION 6

- i. State eight principles that a life office should consider when deciding on how to calculate surrender values.

[4]

Ten years ago, Joe, now aged 40, took out a whole-life without-profits assurance policy from LifeCo at standard rates. Joe has just found out that he is suffering from an aggressive cancer and is informed by medical specialists that he is unlikely to survive another five years.

XYZ Brokers is a company specialising in buying life insurance policies from terminally ill policyholders. After assessing his case with the help of its underwriters, it is willing to offer Joe a significant percentage of the current sum assured to take ownership of the policy. In return it will continue to make the premium payments of the policy, in exchange for receiving the full sum assured upon his death. (You may assume that this type of transaction is permitted in the local market.)

LifeCo has a standard calculation of surrender values based on a prospective valuation of policies.

- ii. Describe how each of the key assumptions made by LifeCo when calculating a surrender value for this policy may match or contrast with those made by XYZ Brokers when calculating its proposed purchase price, commenting on the effect of any differences.

[12]

[Total 16]

**PLEASE TURN OVER**

## QUESTION 7

A small insurer has, for a number of years, been selling unit-linked policies targeting individuals wishing to accumulate savings for long-term care. The marketing literature states that “the fund invests in assets that are expected to generate returns that should keep up with long-term care costs”. The unit fund can be encashed by the policyholder whenever funds are needed for long-term care (or any other needs).

- i. Outline the nature of long-term care costs and hence discuss how the company should select investments for the unit fund to meet the expectations of policyholders created by the marketing literature.

[8]

The marketing director has indicated that sales of the product have not been good, and suggests that adding a guaranteed annuity option will make the product more competitive – policyholders reaching the age of eighty would have the option to convert the value of their unit fund to a life annuity at a minimum guaranteed annuity rate.

- ii. Outline briefly the two main methods for pricing such a guarantee.

[4]

The insurer proceeds to add this option for new unit-linked policyholders.

- iii. Outline how the insurer might invest the additional premium for the option to match any additional liability.

[3]

[Total 15]

**END OF PAPER**