

# EXAMINATION

*3 November 2016 (am)*

## **Subject F102 — *Life Insurance* Fellowship Principles**

*Time allowed: Three hours*

### **INSTRUCTIONS TO THE CANDIDATE**

1. *Use the instructions and password provided at the examination center to log in.*
2. *Submit your answers in Word format only using the template provided. You MAY NOT use any other computer program (e.g. Excel) during the examination.*
3. *Save your work regularly throughout the examination on the supplied computer's hard drive.*
4. *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.*
5. *You must not start typing your answers until instructed to do so by the supervisor.*
6. *Mark allocations are shown in brackets on exam papers.*
7. *Attempt all eight (8) questions, beginning your answer to each question on a new page.*
8. *Candidates should show calculations where this is appropriate.*

**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.**

### **AT THE END OF THE EXAMINATION**

*Save your answers on the hard drive AND hand in 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

ABC Life sells various life insurance products. A reinsurer has recently tendered to reinsure the mortality risk on the term assurance business of ABC Life that is sold through independent intermediaries. As a part of the tender, ABC Life has asked the reinsurer to reinsure 100% (i.e. take all of the mortality risk) of the term assurance portfolio quoted on.

- i. State reasons why ABC Life may have made such a request. [2]
  - ii. Explain why the reinsurer might or might not agree to ABC Life's request. [4]
  - iii. Explain briefly the new risks ABC Life would be exposed to when placing this reinsurance with the reinsurer. [3]
- [Total 9]

## QUESTION 2

A life insurance company has a portfolio of conventional without-profit endowment assurances. The company is busy reviewing its alteration bases.

- i. Outline the key principles which should be followed by the company in setting the terms for policy alterations. [4]
- ii. Explain briefly why policyholders might find the option to make their policy paid-up attractive. [2]
- iii. State reasons, other than meeting policyholders' needs, why an insurer would offer paid-up values. [4]
- iv. Explain a method and basis that the insurer could use when calculating the paid-up value so as to ensure that:
  - a reasonable amount of profit will be extracted from policies at the time of making the policy paid-up;
  - the policy will contribute to profit going forward.

[3]  
[Total 13]

**PLEASE TURN OVER**

### QUESTION 3

A small life insurance company operating in a developing country, currently offers a range of conventional life insurance products. The company's major product is a conventional annuity which is sold through independent intermediaries. The company is considering introducing a special unit-linked annuity, which will be the first product of this kind in this market. The details of the proposed special unit-linked annuity are as follows:

- Policyholders can withdraw up to 15% of their unit fund in a particular year;
- 98% of the single premium will be allocated to the purchase of units;
- A maximum commission of 3% is payable up-front;
- A management fee of 1.5% per annum will be charged on the unit fund;
- A single investment portfolio comprising, fixed interest securities, local equities and money market instruments ;
- Returns on each portfolio are guaranteed not to fall below 0% in any particular year;
- The death benefit is equal to the unit fund at the time of death.

- i. Compare and contrast the risks that the life insurance company is exposed to on a conventional annuity versus the special unit-linked annuity proposed here.

[12]

The financial director is concerned that the special unit-linked annuity will result in capital strain on the balance sheet.

- ii. List ways the product could be restructured to reduce the capital strain.

[2]

[Total 14]

**PLEASE TURN OVER**

## QUESTION 4

You are the valuation actuary of a large life insurance company that has been selling a significant number of conventional income protection policies. The product provides a benefit in the form of a level income, defined at outset, while disabled. The product design uses an occupational disability event definition and benefits are payable until the first of recovery, death or age 65. There is a 12 month deferred period. Premiums are guaranteed.

You use the “inception and disability annuity” approach to calculate the liability reserves that will be included in the company’s published financial statements.

- i. List the assumptions, other than inception and withdrawal rates, that will be required to calculate the liability reserves.

[3]

Historically you have used standard tables to perform the liability reserve calculations, but would now like to use the internal experience to set the assumptions.

- ii. Describe briefly how the claim inception assumption would be determined using internal experience.

[7]

Recently there has been an increase in withdrawals on this book. The marketing actuary suggested that it is largely due to the deferred period on this product being significantly longer than the standard in the market. He has suggested reducing the deferred period to three months on new and all existing policies.

- iii. Describe briefly the potential impact of this change on the valuation assumptions (other than the withdrawal assumptions). Provide reasons for your answer.

[3]

[Total 13]

## QUESTION 5

A life insurer is considering introducing an accelerator critical illness benefit on its conventional without-profits whole of life product. Premiums will be level and guaranteed for life. The product will cover the standard core conditions in the market (cancer, coronary artery by-pass surgery, heart attack, stroke and major organ transplant).

- i. Describe the impact of the following factors on the design of this critical illness product:
  - a. profitability;
  - b. risk characteristics; and
  - c. marketability and competitiveness.

[10]

- ii. Describe how a deterministic model could be used to price this product and outline briefly the steps in this pricing exercise.

[5]

[Total 15]

**PLEASE TURN OVER**

## QUESTION 6

- i. List the features of the Gross Premium Valuation method.

[3]

The insurance supervisory regime in a certain country requires insurers to determine their reserves using the Gross Premium Valuation method. The basis is set using best-estimate assumptions together with relatively prudent prescribed margins. For insurers operating in this country:

- ii. Explain why an insurance supervisor would require a minimum solvency margin and describe the relationship between the calculation of supervisory reserves and the required minimum solvency margin.
- iii. Outline the steps that are required to set the best-estimate assumption for expenses for a conventional whole of life product.

[3]

[4]

[Total 10]

## QUESTION 7

- i. A small, proprietary life insurance company recently decided to start offering with-profits products. Explain the extent to which the deferral of surplus distribution is possible under the “contribution method” as compared to the “additions to benefits” bonus declaration methods.
- ii. The company has decided to use the ‘additions to benefits’ methods to distribute profits to policyholders.
- a. Explain why the company might have decided to do this.
- b. Discuss the factors that the company should consider when deciding on its bonus distribution approach under this method.

[2]

[9]

[Total 11]

**PLEASE TURN OVER**

## QUESTION 8

The sales director of an insurer that has been selling “additions to benefits” with-profits endowment assurances through tied agents has proposed that in order to increase sales the company should:

- Enhance its with-profits endowment offering by including a guaranteed annuity option whereby the maturity value can be converted into an annuity on guaranteed terms; and
  - Expand its distribution channels to include independent brokers as well as direct marketing for this product.
- i. State how the distribution channel may impact on the mortality, persistency and expense experience of the product. [3]
  - ii. Explain how the company could value the guaranteed annuity option using option-pricing techniques, and state the main difficulties of this approach. [4]
  - iii. Describe how the sales director’s proposals may change the company’s investment strategy. [8]

[Total 15]

**END OF PAPER**