EXAMINATION

6 November 2013 (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.*

3. *Save your work regularly throughout the examination on the supplied computers' 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 <u>on a new page</u>.*

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

QUESTION 1

A newly qualified actuary is conducting an analysis of surplus exercise for a book of endowment assurances which has been closed to new business for a number of years. The actuary notices that the actual per policy expenses are much higher at the current valuation date than at the previous valuation date.

Describe the investigations that the actuary would carry out in response to this finding, and the actions which might be taken following these investigations.

[8]

QUESTION 2

A large charitable trust manages a number of retirement communities across a particular country. Two types of living arrangements are provided at each of these communities:

- Independent Accommodation; and
- Frail Care: Full-time nursing and personal care in specialised accommodation at the retirement community.

It is common for retired persons to move into Independent Accommodation initially and then move to Frail Care, the much more expensive option, if and when their level of incapacity necessitates full-time care.

The charitable trust has approached several large insurers to design a long-term care product to be sold to members of the retirement communities. The two product structures being considered are as follows:

- Option A: A pre-determined monthly cash benefit payable from when the policyholder first enters Frail Care. The benefit increases by 6% per annum and is payable for the remainder of the life-time of the policyholder.
- Option B: A cost of care benefit paying the additional costs of the Frail Care arrangement (over and above the cost of the Independent Accommodation) until the death of the policyholder. The maximum monthly frail care benefit at any time is capped at 2.5 times the initial additional monthly cost of Frail Care at claims inception.

i. Suggest claims definitions for this product and outline briefly the key considerations when determining such claims definitions.

[3]

ii. Outline the relative advantages and disadvantages for the policyholder of each benefit option.

[3]

iii. Describe the general business environment factors that should be considered by a life company writing this business.

[8]

[Total 14]

PLEASE TURN OVER

QUESTION 3

A life insurance company writes only conventional protection business. You have recently been made responsible for reinsurance arrangements at the company. Your predecessor was very risk averse and set up a risk premium reinsurance arrangement on a 95% quota share basis for all products. The insurance portfolio has grown substantially since the quota share arrangement was put in place. The managing director has asked you to undertake a review of the company's reinsurance arrangements.

i. Suggest reasons why, when it was originally negotiated, it may have been beneficial to the insurer to set up the current reinsurance arrangement.

[2]

ii. Highlight key disadvantages of the current reinsurance arrangement.

[1]

The company has decided to move away from quota share reinsurance and establish a new reinsurance programme.

iii. Describe possible types of reinsurance that could be used in the new reinsurance programme and outline the key factors that will influence the reinsurance programme negotiated.

[6]

[Total 9]

QUESTION 4

A small life insurance company in an emerging market country sells a regular premium unit-linked pure endowment investment product through independent brokers and bank agents. The product currently only offers two investment portfolios:

- A portfolio that tracks the all share equity index of the country; and
- A low-risk bond and cash portfolio.

The company has a small capital base and a recent increase in sales of the product has placed strain on the capital position of the business.

i. The valuations actuary has suggested using actuarial funding to improve the capital position of the business. State the conditions required for actuarial funding and explain how actuarial funding can assist the company.

[3]

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The product development actuary has noted that a few asset managers are offering clients the opportunity to invest in properties such as hotels and shopping centres. He has thus created an additional portfolio offering for the unit-linked recurring investment product that allows individuals to invest in such property via the insurance company, with the underlying policyholder funds being invested directly in properties.

ii. Outline the main considerations regarding financing requirements, risks and profitability when adding the new property portfolio to the investment offering for the unit-linked product.

[6]

iii. Describe how the value of the units would be determined for the property portfolio.

[4]

[Total 13]

QUESTION 5

You are the pricing actuary for a large, well-established South African life insurance company. For many years the insurer has focused on whole life assurances, immediate annuities and unit-linked investment products for the middle and higher income markets.

The existing whole life product has a minimum sum assured of R200 000 and no maximum sum assured limit. The average sum insured for the business sold is R800 000. Extensive underwriting is applied for this product. Each applicant is required to complete a detailed application form, which contains medical questions. Applications are flagged for additional medical tests based on the answers to the medical questions and the size of the sum assured. The underwriting information is used to determine whether lives are accepted at standard rates, loaded, declined, or specific exclusions are applied. Pricing for this product makes use of rating factors common in the market.

The company is launching a regular premium simple whole life assurance product with limited underwriting and with no surrender value. The minimum sum insured will be R50 000 and the maximum R300 000. This product will be sold via the same distribution channel as the existing product.

i. Suggest, with reasons, an appropriate approach to the underwriting of the new simple whole life product.

[3]

ii. Identify the assumptions needed to price the new product, and describe how you would set each assumption.

[11]

[Total 14]

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QUESTION 6

A proprietary life insurance company sells mainly unit-linked policies and has limited free assets. However, it has recently acquired a closed book of with-profits endowment assurance policies from another company. The assets backing this business are predominately equities but some fixed-income assets are also in the portfolio. Surplus has been distributed using the additions to benefits method through a combination of reversionary and terminal bonuses.

i. Describe how the insurer would allow for past and future bonuses in the determination of the supervisory reserves.

[4]

ii. Discuss the factors that the company should take into account when considering the split between reversionary and terminal bonuses for future bonus declarations.

[7]
[Total 11]

QUESTION 7

A life insurance company is designing a new 10-year regular premium unit-linked savings product. Policyholders can select from a number of equities-based funds. On maturity the policyholder will receive the maximum of the bid value of the units or a return of premiums. The only charge on the product will be a 2% p.a. fund management charge.

i. Explain how a stochastic model could be used to model the cost of the maturity guarantee.

[5]

An actuarial student has proposed that the following penalties (to be deducted from the unit fund) should be applied if the policy is altered by the policyholder:

Alteration	**Penalty**
Premium reduction	(10% of the chosen percentage reduction in premium) × bid value of units (For example, if premiums are reduced by 40% then the surrender penalty will be 4% of the bid value of the units)
Alteration or partial disinvestment	10% × bid value of units being disinvested

ii. Discuss the suitability of the proposed alteration penalties.

[8]
[Total 13]

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QUESTION 8

A life insurance company has been writing only without-profit business for a number of years. The following table shows the company's financial position as at 30 June 2013:

Balance Sheet **R million**	**30 June 2013**
Total assets	1 270
Total liabilities	1 040
Policyholder liabilities	850
Current liabilities	190
Shareholder equity	**230**
Minimum Solvency Margin (supervisory basis)	**120**

The Minimum Solvency Margin is determined by the regulator and the company has decided to set its Internal Solvency Margin equal to 1.5 times the Minimum Solvency Margin.

i. Outline reasons why the company might decide to target an Internal Solvency Margin that is higher than the Minimum Solvency Margin and declare a dividend lower than the maximum amount available on a supervisory basis.

[6]

ii. Calculate the maximum affordable dividend if after the dividend payment the company needs to have sufficient shareholder equity to cover the Internal Solvency Margin.

[1]

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As part of the company's risk management process it has performed the following two sensitivity tests.

- An increase of 100 basis points in interest rates
- A depreciation of 10% of the domestic currency

The following table shows the impact of these sensitivity tests on the company's balance sheet:

Balance Sheet R million	**30 June 2013 Base case**	**Interest rates increase 100 basis points**	**Domestic currency depreciates 10%**
Total assets	1 270	1 150	1 270
Total liabilities	1 040	900	1 080
Policyholder liabilities	850	710	890
Current liabilities	190	190	190
Shareholder equity	**230**	**250**	**190**
Minimum Solvency Margin	**120**	**120**	**120**

iii. Based on the sensitivity results above, discuss briefly the company's asset liability matching with respect to interest rates and foreign exchange rates, assuming that currently the company does not have any exposure to derivatives.

[2]

iv. Explain briefly why pure matching may not be possible for the life insurance company.

[3]

v. Outline the potential actions that the company can take to reduce its mismatching risk relating to foreign exchange rates.

[6]

[Total 18]

END OF PAPER