

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

28 September 2012 (pm)

Subject ST2 – Life Insurance Specialist Technical

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
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 questions, beginning your answer to each question on a separate sheet.*
6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

<p><i>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.</i></p>
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1 Discuss the role of solvency projections in a life insurance company. [9]

2 (i) Define the embedded value of a life insurance company. [2]

A life insurance company has only ever sold term assurance business. It has just finished analysing its mortality experience for the past year. The conclusion of the study is that mortality has worsened, requiring a change to the company's mortality assumptions.

The company uses two sets of mortality assumptions in its embedded value calculation. One set is used to project experience and is realistic; the other is used to calculate future reserves and is prudent.

(ii) Explain the impact on the company's embedded value if:

- (a) the realistic mortality assumptions were increased in isolation
- (b) the reserving mortality assumptions were increased in isolation
- (c) both sets of mortality assumptions were increased at the same time.

[9]

[Total 11]

3 A life insurance company sells a conventional with profits endowment assurance product. Profits are distributed by the additions to benefits method.

(i) Describe how the company would determine the terminal bonus rates for maturities for this product. (Description of how to calculate the asset shares is not required.) [5]

The company has recently declared its latest terminal bonus rates. Since the declaration, there has been a fall in worldwide equity market values.

(ii) Discuss the actions that the company might take with regard to terminal bonus rates. [8]

[Total 13]

- 4** A life insurance company has historically only sold single premium unit-linked bonds, with a fixed term of ten years. It is planning to launch a new unit-linked endowment assurance product. The features of both products are detailed below.

	Current product	New product
Contract	Unit-linked bond	Unit-linked endowment assurance
Premiums	Single premiums	Single or regular premiums
Term	Ten years	Various
Maturity Benefit	Value of unit fund	Value of unit fund subject to minimum of guaranteed sum assured
Surrender Benefit	Value of unit fund, less surrender penalty which is expressed as a percentage of the value of unit fund	Value of unit fund, less surrender penalty which is expressed as a percentage of the value of unit fund and is applied during the first five years only
Death Benefit	101% of value of unit fund	Value of unit fund subject to minimum of guaranteed sum assured
Charges	Allocation rate applied to the premium	Variable annual management charge taken as a percentage of the value of unit fund
	Fixed annual management charge taken as a percentage of the value of unit fund	
Commission	Percentage of premium	Percentage of each premium

The company currently uses a deterministic model to project the cashflows for its unit-linked bonds, and this model is used for both pricing and valuation purposes. It is considering how the model would need to be changed if it introduces the new endowment assurance product.

- (i) Outline the additional features that would need to be included in the model. [7]

An external company which provides a standard actuarial model for unit-linked endowment assurances has spoken to the Finance Director about using its model for this new product.

- (ii) Discuss the considerations for the life insurance company when deciding between amending the existing model and purchasing the new model. [6]
[Total 13]

- 5** (i) List the factors by which data would be subdivided when analysing withdrawal experience, assuming sufficient volume of available data. [4]

A life insurance company has just performed a high level analysis of the previous year's withdrawal experience. The experience appears to be significantly worse than expected.

- (ii) Discuss the possible next steps in response to this analysis. (You are not required to discuss ways in which the actual withdrawal experience could be managed). [12]
[Total 16]

- 6 A life insurance company sells a without profits whole life assurance product, for which premiums are payable annually and the benefit is payable at the end of the year of death. Renewal expenses are incurred annually from the start of the first policy year and do not inflate. Death claim expenses are incurred at the end of the year of death and also do not inflate.

The company is considering setting the surrender value using an adjusted “retrospective method” such that it retains profit equal to the accumulated value of 5% of each premium received plus 5% of the expected value of future premiums payable.

- (i) Give a surrender value formula which satisfies this requirement. [5]

The company has used the following basis to calculate its premium rates:

Mortality	100% AM92
Initial expenses	100
Renewal expenses	20 per annum
Interest	6% per annum
Profit loading	5% of each premium.

The actual experience to date has been as follows:

Mortality	100% AM92
Initial expenses	95
Renewal expenses	25 per annum
Interest (averaged)	4% per annum
Death claim expenses	5
Surrender expenses	10

All expense information quoted above is per policy.

The company’s best estimate future assumptions are currently the same as its actual experience.

Consider a policy purchased by a 50 year old at entry for a sum assured of 50,000. The annual premium for this policy is 800.

The company has used the surrender value formula in (i) to determine what should be paid to such a policyholder under the proposed approach, if surrender were to occur now after three years in force and also now after 35 years in force. The results of these calculations are 1,200 and –7,000 respectively.

The Finance Director has queried these results.

- (ii) Demonstrate the reasonableness of the three year figure. [5]
- (iii) Explain why the 35 year figure is negative. [4]
- (iv) Discuss the extent to which the proposed method fits with the principles for determining surrender values. [6]

[Total 20]

7 A life insurance company writes term assurance business, for which it uses medical underwriting at the application stage.

- (i) Describe the medical underwriting process that is likely to be followed by the company. [8]

It has been suggested that medical underwriting is a barrier to sales and that the underwriting criteria should be relaxed.

- (ii) Discuss this suggestion. [10]

[Total 18]

END OF PAPER