INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

8 October 2015 (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 four questions, beginning your answer to each question on a new page.*

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.

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.

1 (i) Describe how a life insurance company would perform an expense experience investigation. [13]

Each year, the life insurance company analyses its pension business renewal expenses, excluding commission. This is done in order to set a supervisory valuation renewal expense assumption for that business. The renewal expenses are allowed for in the supervisory valuation on a per policy basis only.

The following statistics have been observed:

Year of investigation	*Total actual renewal expenses for pension business ($ millions)*	*Valuation renewal expense assumption ($ per policy per annum)*
2013	3.8	65.8
2014	3.6	66.0

The actual expenses quoted above are the expenses that correspond to the year of investigation. The valuation expense assumptions quoted above are the assumptions used in the first projection year of the supervisory valuation performed at the end of the year of investigation.

(ii) Discuss the potential reasons why the valuation expense assumption used in 2014 has increased from the assumption used in 2013. [7]

[Total 20]

2 A small but expanding life insurance company sells only protection business.

It has recently sold 10,000 20-year term assurance policies, each of which is written on the life of a male aged 50 exact and has a sum assured of 100,000.

The following best estimate assumptions are used to price the product:

Mortality	100% of an internally developed mortality table
Initial expenses	100 per policy
Other expenses	None
Lapses	None
Investment returns	3% per annum
Profit loading	10% of premium

The following annuity and assurance factors have been provided by the actuarial team, using mortality of 100% of the internal mortality table for a male aged 50 exact at outset, an interest rate of 3% per annum and a term of 20 years.

Present value of:

- payments on survival of 1 per annum, payable annually in advance = 14.6
- payment on death of 1, payable halfway through the year of death = 0.11

The annual premium (payable in advance) for each policy is calculated as follows:

Annual premium = $\{100{,}000 \times 0.11 + 100\} / \{14.6 \times 0.9\} = 844.75$

The impact of reserving on profit can be ignored for the purposes of the calculations in this question. Taxation can also be ignored.

(i) Calculate the present value of the total expected profit from the 10,000 term assurance policies, using the best estimate assumptions and discounting at the expected rate of investment return. [2]

Immediately after writing the business, an error was found in the mortality investigation. It is now expected that the mortality experience will be 50% of the level originally expected, but that the rest of the experience will be as expected in the pricing basis.

The following revised annuity and assurance factors have been provided, both of which are again for an interest rate of 3% per annum, term of 20 years and male aged 50 exact.

Present value of:

- payments on survival of 1 per annum, payable annually in advance = 14.95
- payment on death of 1, payable halfway through the year of death = 0.057

(ii) Calculate the revised present value of the total expected profit, assuming that mortality is 50% of the level originally expected. [2]

The company is considering putting in place one (or more) of the following reinsurance treaties:

Treaty A: Original terms reinsurance written on a 50% quota share basis, including reinsurance commission equal to 50% of the initial expenses.

Treaty B: Risk premium reinsurance on 50% of the sum assured, written on an annually renewable basis, with risk premium rates based on the insurance company's original pricing assumptions plus a 10% loading.

Treaty C: Catastrophe reinsurance which pays out the full sum assured if 30 people die from the same event, with an expected cost of 200,000 per annum payable annually in advance.

On the best estimate basis, there will be no such catastrophes over the 20-year term.

(iii) Determine the impact of each of these treaties on the expected profit that you calculated in part (ii), assuming that the treaty is in place for this portfolio of business from outset. [5]

(iv) Comment on which reinsurance arrangement(s) the company may choose to put in place. [6]

The marketing director of the insurance company has heard about the proposal to reinsure this business. He has suggested that if reinsurance is taken out, there would no longer be any need to perform any underwriting.

(v) Discuss this suggestion. [9]

[Total 24]

3 A life insurance company has sold a regular premium unit-linked ten year savings product for a number of years. Premiums are paid monthly.

A surrender value, expressed as a percentage of the unit fund value at the time of claim, is payable over the full term of the policy. The percentage is 90% at outset, increasing linearly each month to reach 100% over ten years.

(i) Explain the extent to which this approach satisfies the general principles that should be applied when setting surrender values. [12]

The product is now being re-launched and a new surrender value scale is being introduced. The surrender value would continue to be defined as a percentage of the unit fund value with the percentage being 90% at outset. However, this now increases linearly each month to reach 100% over five rather than over ten years.

It has been suggested that this new scale should also be applied to current policyholders under the existing savings product.

(ii) Describe the factors that would need to be considered before implementing this suggestion. [15]

[Total 27]

4 (i) List the items which can be included in the calculation of an asset share for a with profits policy sold by a proprietary life insurance company. [6]

(ii) Describe the risks to the policyholder of purchasing a conventional with profits endowment assurance policy. [7]

Nineteen years ago, two friends each purchased a 20-year term conventional with profits endowment assurance policy. Mr A purchased his policy with Company A and Mr B purchased his policy with Company B.

The sum assured is the same for both policies, and the two friends have paid the same monthly premium throughout the policy term, with neither missing a payment. The regular reversionary bonuses paid throughout the period have been the same in amount and pattern, and the guaranteed benefit that would be payable on death has therefore also been the same. The regular reversionary bonus and guaranteed death benefit will continue to be the same for the two policies in the remaining period before maturity.

As the policies are due to mature next year, the friends have recently received their expected maturity payout statements. These show that Mr A is predicted to receive a significantly higher final payment than Mr B. They are surprised at this and would like to understand the reasons for the difference.

(iii) Suggest possible reasons why the maturity payout for the Company A policy is significantly higher than for the Company B policy. [16]

[Total 29]

END OF PAPER