INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

20 September 2019 (am)

Subject SP2 – Life Insurance
Specialist Principles

Time allowed: Three hours and fifteen minutes

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

3. *Mark allocations are shown in brackets.*

4. *Attempt all questions, begin your answer to each question on a new page.*

5. *Candidates should show calculations where this is appropriate.*

Graph paper is NOT required for this paper.

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 Describe the three key risks to a life insurance company arising from a portfolio of immediate annuity contracts. [3]

2 A life insurance company has a portfolio of conventional with profits endowment assurance policies. The company has the following information relating to the portfolio as at 1 January 2018:

Number of policies	10,000
Average individual asset share	\$5,000
Average per policy sum assured plus attaching reversionary bonus	\$6,000
Average per policy terminal bonus payable on death	\$1,000
Average premium per policy	\$500

During 2018 the following transactions relating to the portfolio have taken place:

Number of deaths	180
Investment Income (net of investment expenses)	\$1,900,000
Renewal Expenses	\$500,000
Commission payments	2% of premiums

All premiums were received, and all expenses were incurred, on 1 January 2018, and all deaths occurred on 31 December 2018 before any declaration of any reversionary bonuses. There were no surrenders, maturities, withdrawals, or new business during the year and the company pays no tax.

The company pays shareholder transfers at the end of the year of one-ninth of any terminal bonus paid during the year, plus one-ninth of the cost of the declared reversionary bonuses added to policies in-force at the end of the year (after any deaths that occur).

The company declared a regular reversionary bonus on 31 December 2018 at a rate such that the cost of the declared reversionary bonuses was 4% of the existing sum assured plus attaching reversionary bonus at 1 January 2018.

Calculate the total aggregate asset shares at 31 December 2018 for the portfolio, showing all your workings. [5]

3 A life insurance company currently sells a unit-linked product. This product has a clause within its terms and conditions that states:

"*The company will make an annual deduction from units as a policy charge on each policy anniversary to cover administration expenses. The policy charge will increase at a rate of 5% per annum.*"

Comment on the risks that may arise for the insurer as a result of this clause. [8]

4 A life insurance company is considering adding a guarantee option to its new without profits conventional endowment assurance policies. The option would allow policyholders to choose to purchase a fixed addition to their sum assured on either the 5^{th} or 10^{th} policy anniversary.

The addition to the sum assured requires no additional underwriting and will use the premium rates that apply at the date on which the option is exercised.

Describe how the company would determine the cost of the guarantee to be charged to policyholders. [9]

5 Regulations in Country A require a life insurance company to determine statutory reserves using a prudent basis with large margins set by the regulator of Country A. Equivalent regulations in Country B require statutory reserves to be set using a best estimate basis.

(i) Describe how the solvency capital requirements are likely to differ between a life insurance company operating in Country A and a similar life insurance company operating in Country B. [3]

Country B requires solvency risk capital requirements using a value at risk approach with a confidence level of 99.5% over a one-year period. The regulator in Country B specifies the risk factors that must be considered in determining solvency risk capital.

(ii) Describe how a life insurance company operating in Country B might determine its solvency risk capital. [3]
[Total 6]

6 A life insurance company writes significant volumes of conventional without profits whole life assurance business and has done so for many years. Individuals are medically underwritten prior to taking out a policy.

The company is planning to reprice this product.

(i) Describe how the company may set its mortality assumptions for pricing this product. [7]

The company is also considering launching a similar product in a different territory.

(ii) Describe the additional considerations that the company would take into account when setting its mortality assumption for pricing the new product. [4]
[Total 11]

7 (i) State the requirements for grouping data for use in an experience investigation. [2]

A life insurance company has written unit-linked endowment assurance contracts for a number of years, which are sold via independent financial advisors. The product has a surrender penalty for the first four years to recover any initial fees. Sales of the product have reduced over recent years.

The product is designed to provide a fund at retirement, which is converted into an annuity using terms available at the time of retirement.

The current lapse assumptions for the savings products vary by the term from inception, and have been unchanged for a number of years. These assumptions are shown in the following table:

Term from inception (in years)	*1*	*2*	*3*	*4*	*5*	*6+*
Lapse assumption	2%	2%	2%	2%	10%	2%

The company has conducted a lapse experience analysis on two approaches. The first approach uses the term from inception in line with the assumptions used. The second approach uses term to retirement.

The results of the two experience investigations are shown below.

Term from inception (in years)	*1*	*2*	*3*	*4*	*5*	*6+*	*Total*
Policy count	30	35	31	40	35	1,875	2,046
Number of lapses	1	15	1	10	9	150	186
Raw lapse rate	3%	43%	3%	25%	26%	8%	9%

Term to retirement (in years)	*1*	*2*	*3*	*4*	*5*	*6+*	*Total*
Policy count	350	250	280	175	210	781	2,046
Number of lapses	50	30	28	16	15	47	186
Raw lapse rate	14%	12%	10%	9%	7%	6%	9%

(ii) Discuss which approach is most suitable. [8]

(iii) Discuss the other factors into which the lapse experience could be sub-divided. [6]

[Total 16]

8 A life insurance company (Company A) is considering buying another life insurance company (Company B). Company B has some reinsurance arrangements in place.

(i) Explain why Company A would want to understand the quality of Company B's data. [7]

(ii) Describe with reasons the information that Company A would want to know about Company B's reinsurance arrangements. [10]
[Total 17]

9 A life insurance company intends to market a new without profits endowment product. The product will be targeted at parents who have just had a child and will be marketed through magazines for new parents. The main features of the product will be:

- The term of the product will be 18 years, the current age at which children leave school.
- All policies will have the same sum assured, which remains level throughout the policy term. The sum assured has been set to be the approximate cost of attending university.
- The policy may be written on a single life basis or on a joint life policy on the lives of the two parents.
- The sum assured will be payable at maturity at the end of the term of the product, or it will be payable on the death of the first parent if death occurs prior to the maturity.
- All policies will have the same monthly premium, payable throughout the policy, and the premium will be set based on the expected mix of policyholders.
- There will be no underwriting.
- The company will waive the first year's premium on the product on receiving proof of the child's birth.
- A non-guaranteed surrender value will be offered if the policy is surrendered after the policy has been in-force for five years or more.

(i) Describe the advantages and disadvantages of this product for the target market. [8]

(ii) Assess the following features from the company's viewpoint:

(a) The use of the same premium for all policies. [10]
(b) The waiver of the first year's premium. [7]
[Total 25]

END OF PAPER