

# INSTITUTE AND FACULTY OF ACTUARIES

## EXAMINATION

22 September 2021 (am)

**Subject SP2 - Life Insurance**

**Specialist Principles**

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the  
Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on  
T. 0044 (0) 1865 268 873.

- 1** A new employee of a life insurance company has suggested an approach to allocating direct expenses in the company's expense analysis. They have suggested that all direct expenses are split by product type, and then allocated equally across all policies within that product type.

Assess the approach that has been suggested. [6]

- 2** A lapse investigation has recently been completed for a particular life insurance product. The results of the investigation are shown in the table below.

	<i>Term from inception (in years)</i>										
	1	2	3	4	5	6	7	8	9	10	11+
Lapse rate	15%	10%	5%	9%	5%	4%	5%	5%	3%	8%	3%

Suggest possible reasons why this pattern of lapse rates might have occurred. [6]

- 3** The government of a country with a developing life insurance market is concerned about the level of investment risk being taken by life insurance companies, and the level of investment risk associated with insurance contracts being written in the country. It is considering introducing regulations to reduce these risks, basing its approach on common types of regulation used in other countries.

(i) Suggest possible types of regulation the government could introduce to reduce the investment risk being taken by life insurance companies. [5]

(ii) Suggest possible types of regulation the government could introduce to reduce the investment risk being taken by policyholders through insurance contracts.

[3]

[Total 8]

- 4** A life insurance company currently sells without-profits products over the internet using price comparison websites. It is now considering direct marketing using social media platforms as an additional alternative distribution channel.

Discuss the factors the company would need to consider in introducing this additional distribution channel. [10]

**5** A life insurance company sells unit-linked individual pensions and term assurance products. The company has identified that the new business profit from the business it sold in the last year was different from the new business profit expected in its business plan.

- (i) Suggest possible reasons why the actual new business profit was different to that expected in the business plan. [4]

The analysis has also indicated that the term assurance product no longer meets the profitability requirements of the company.

- (ii) Suggest possible actions the company could now take. [6]  
[Total 10]

**6** The regulator in a country has historically prescribed a passive approach for determining the statutory reserves of life insurance companies in that country.

- (i) Describe the main features of a passive valuation approach for determining the reserves of an insurance company. [4]

The regulator is now proposing that insurance companies change to an active valuation approach in the near future.

- (ii) Discuss the implications of this proposal for the life insurance companies within this country. [9]  
[Total 13]

- 7 A company uses the contribution method to allocate bonuses (also referred to as dividends).

The dividend given to a particular contract is calculated using the following formula:

$$\text{dividend} = (VO + P)(i'' - i) + (q - q'')(S - VI) + [E(1 + i) - E''(1 + i'')]$$

where:

$VO$  = value of contract at beginning of year on valuation basis.

$VI$  = value of contract at end of year on valuation basis.

$P$  = gross premium.

$i''$  = actual rate of interest earned.

$i$  = valuation basis rate of interest.

$q''$  = actual rate of mortality experienced.

$q$  = valuation basis rate of mortality.

$S$  = sum assured.

$E''$  = actual expenses experienced under the contract.

$E$  = valuation basis expenses.

$VO$  is the present value, using the valuation rate of interest, of:

- expected payments on death and maturity, assuming these occur at the end of the year, plus
- expected expenses assumed to be incurred at the beginning of the year, less
- premiums payable at the beginning of the year.

(i) Prove that the dividend payments are algebraically expected to exactly equal the premiums paid plus investment returns, minus expenses, minus the change in the value of the contract over the year. [6]

(ii) Suggest possible reasons why the dividend may not exactly reflect the profits made by the company. [7]

[Total 13]

- 8** A life insurance company is undertaking the daily unit pricing process for one of its internal linked funds. The following information is available:

Market value of assets on an offer basis	\$2,025,000
Market value of assets on a bid basis	\$2,000,000
Expenses that would be incurred on a purchase	\$22,500
Expenses that would be incurred on a sale	\$17,500
Current assets	\$15,000
Current liabilities	\$20,000
Accrued income	\$7,500
Accrued tax	\$5,000
Number of units	145,000

- (i) Calculate, showing all workings, the appropriation and expropriation prices for this fund. [4]

The fund has been expanding over the past few years. The company applies an initial charge of 2.5% within its offer and bid prices and rounds prices up to three decimal places.

- (ii) Calculate, showing all workings, the bid and offer prices for the fund. [2]

The company is reviewing the initial charge and rounding policy for all its funds. It is proposing to increase the initial charge to 3%, and to amend the rounding policy to always be in favour of the customer.

- (iii) Discuss the possible considerations the company is likely to consider before implementing these proposals. [11]

[Total 17]

- 9 A life insurance company is launching a new impaired life annuity product. A policyholder pays a lump sum upfront upon becoming a resident of a care home for the elderly, and the policy pays the annual fees to the care home. It can be assumed that upon moving to the care home, policyholders stay there for the rest of their lives.

This is a new market for the company and it sells no other impaired life annuities.

- (i) Explain how using a reinsurer may help the company. [4]

The life insurance company has entered into a reinsurance arrangement whereby the reinsurer pays the life insurance company 80% of the annual care home fees until the policyholder dies. The life insurance company pays a fixed premium per annum to the reinsurer for a duration that is equal to the reinsurer's view of the policyholder's life expectancy.

- (ii) State what type of reinsurance this is. [1]

- (iii) Discuss the risks that:

- (a) the life insurance company is exposed to from the reinsurance arrangement. [5]

- (b) the reinsurer is exposed to from the reinsurance arrangement. [3]

A new medical treatment has been developed that increases the life expectancy for the elderly, particularly those who are in care homes.

- (iv) Discuss the impact of the change in life expectancy for both the life insurance company and the reinsurer. [4]

[Total 17]

**END OF PAPER**