INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE **MAY 2007 EXAMINATIONS**

QUESTION 1 **(15 Marks)**

You are the valuation actuary of Super Life (SL), which has a leading position in the Australian superannuation market. SL is about to launch a new product providing a complete package of superannuation services to corporate clients with at least 100 employees. The new product will provide trustee, administration, investment, group risk insurance (death, TPD, and salary continuance cover) and professional services (accounting, actuarial, audit, legal etc).

Charges are negotiated with each client being based on numbers of members (administration), funds under management (investment and trustee services), a component of the premium rates (group risk insurance), and activity-based charges (professional services). There are no upfront charges for any client.

The product development actuary has told you that on best estimate assumptions:

- initial sales, set-up, and other acquisition costs for a new client are expected to be about 25% of the first year charges for the client, and
- excluding the initial sales and set-up costs, the expected profit to SL is about 15% of the total charges each year.

You are now asked to consider the method of setting the policy liabilities and recognising profits for the group risk insurance component of this product (you are not required to consider the other components of the product).

a) Firstly, consider a projection method for calculating the margin on services policy liabilities. Outline your approach to the liability calculation for the initial valuation of the group risk insurance component of this business, including identifying any special assumptions you might need for this component, and your choice of profit carrier, with reasons. (6 marks)

b) Secondly, consider an accumulation method. Outline your approach to the liability calculation for the initial valuation of the group risk insurance component of this business. (3 marks)

c) What are the relative advantages and disadvantages of the projection and accumulation methods for the group risk insurance component of this business ? What is your preferred method, with reasons ? (2 marks)

d) SL also calculates its profit every year based on the increase in the embedded value of the company from the start of the year to the end of the year. What are the main differences in profit recognition between the margin on services method and the embedded value method for the group risk insurance component of the product ? What are the implications of these differences for this component of the product ? (4 marks)

QUESTION 2 **(16 Marks)**

You are the appointed actuary for ALC, an Australian life insurance company. Your company launched a new product in 2001 which has proven to be very successful.

The product is a unit-linked, single premium, ordinary investment fund that allows investors access to a balanced portfolio. The product provides a minimum benefit payment under the contract of the initial amount paid into the fund less the initial and ongoing fees payable. This guarantee applies after the fifth policy anniversary. The ongoing fee is 2.5% p.a. of the account balance, which includes a fee of 1% p.a. of the account balance to cover the cost of the guarantee ("option fees").

"Account balance" for a policy means the current value of units held after deduction of fees payable.

The fund has an investment mandate as follows:

Asset type	Benchmark	Minimum	Maximum
Australian equities	65%	50%	75%
Australian fixed interest	35%	25%	50%

Assume that investment returns were not exceptional between 2001 and 2005, but investment returns from the equity market in 2006 were negative. (This is an assumption for this question only.)

Some of the policies issued in 2001 were surrendered in 2006 for an amount higher than the account balance.

The results to date of the business have been as follows:

	Business written in 2001 ($'000)	Subsequent business ($'000)
Option fees received	5,298	12,430
Surrender payments paid in excess of account balances	1,066	0
Account balances at 31 December 2006 for remaining in-force policies	83,658	219,094
Surrender values at 31 December 2006 for remaining in-force policies	92,441	219,094

a) Estimate the accumulated loss to ALC of offering this option as at 31 December 2006 for the 2001 business, and for the subsequent business.
(3 Marks)

b) What principles would you apply in valuing this option in accordance with the standard on Valuation of Policy Liabilities (AS 1.04) for the 2001 business, and for the subsequent business ? (5 Marks)

c) Given this experience, how would you investigate whether the assumptions used in determining the option fee are still appropriate ? (3 Marks)

d) Market sentiment is gloomy at the end of 2006 and you are concerned about the impact of a further fall in share prices during 2007. What actions would you suggest in the short term to protect the company against further option losses ?
(5 Marks)

QUESTION 3 **(19 Marks)**

You are an actuary working at a large Australian life insurance company. The company specialises in retail lump sum risk insurance products such as term life, total and permanent disablement, and trauma insurances. These products are sold through financial planners who are paid first year commissions of 100% of premiums and renewal commissions of 10% of premiums.

You have been asked to calculate the Solvency Requirement for this business which is treated as a single Related Product Group and written in a separate Statutory Fund. You have been provided with the following information:

Item	($'000)
Margin on Services Policy Liability	-23,440
Solvency Liability	-23,440
Minimum Termination Value	18,148
Expense Reserve	5,506
Current Termination Value	18,148
Other Liabilities	4,119
Inadmissible Assets Reserve	2,628
Resilience Reserve	2,684
Transitional adjustment	0

a) Calculate the Solvency Requirement from this information showing clearly the steps required as set out in the Solvency Standard (AS2.04).
(3 Marks)

b) The newly appointed Chief Financial Officer (CFO) reviews your calculations and is puzzled by some of the results. He asks you to explain :
   (i) Why the Policy Liabilities for these products are negative.
   (ii) Why the Solvency Liability is the same as the Policy Liability even though the assumptions used to calculate the Solvency Liability are more conservative than those used to calculate the Policy Liability.
   (iii) Why there is a Resilience Reserve requirement even though the assets of this Statutory Fund are entirely invested in cash.
   (iv) Why there is an Inadmissible Assets Reserve even though there are no significant counterparty risks and no investments in related companies in this Statutory Fund.

   Draft a memo to the CFO giving your answers to each of these questions.
(8 Marks)

c) The CFO has reviewed your calculation of the Capital Adequacy Requirement for this Fund and has sent you an email expressing surprise that the Capital Adequacy Requirement is the same as the Solvency Requirement. Draft a reply email to the CFO explaining how this might have occurred. (4 Marks)

d) The CFO has also reviewed your analysis of the claims experience of this business and observed that on your best estimate assumptions the actual / expected claims ratio for the business reinsured is lower than the ratio for the business retained. The CFO suggests that the surplus reinsurance program may not be effective and that the company's retention level should be increased for this business. Outline the main points you would make to the CFO on this suggestion. (4 Marks)

QUESTION 4 **(20 Marks)**

You are an actuary working in the valuation department of Australian Life Company ("ALC") which is a subsidiary of Australian Bank Company ("ABC"). ALC has a portfolio of lifetime annuities. About half of the annuities provide payments which are increased annually in line with inflation.

The profitability of this business has been unsatisfactory. Three years ago as a result of poor investment, expense and mortality experience, the product was reviewed and the following actions taken:

- the product was closed to new business
- the investments supporting the liabilities were changed to long duration fixed interest securities issued by government enterprises, including inflation-linked bonds, which overall provide a reasonable match to the duration of the annuity liabilities
- the best estimate assumptions for the portfolio were revised, the product moved into loss recognition and a significant loss was recognised that year.

You have been asked to make a preliminary review of the experience of the portfolio for the current year starting with an analysis of experience for this year. You are provided with the following information:

	Expected Results ($'000)	Actual Results ($'000)
Total assets boy	608,131	608,131
Policy liabilities boy	539,885	539,885
Annuity payments	47,355	47,272
Management expenses	3,137	2,748
Investment income on total assets	34,995	35,593
Total assets eoy	592,634	593,704
Policy liabilities eoy	520,293	519,844
Profit	4,095	5,614

Where "boy" is beginning of the year and "eoy" is end of the year.

The policy liabilities at the end of the year are calculated using the same assumptions used for the policy liabilities at the beginning of the year.

a) Analyse the profit between investment income on the excess assets, the planned profit, and the experience profit and further analyse the experience profit between investment earnings, management expenses and mortality. For this purpose assume annuity payments and management expenses were paid mid-way through the year and that inflation adjustments to annuity payments were exactly as expected.

(6 marks)

b) These results are forwarded to the company's chief accountant (CA). The CA asks you whether the best estimate assumptions can now be improved and some of the past loss recognition reversed in the current year. Comment on the likely causes of this year's experience and the considerations involved in changing the best estimate of each assumption. (6 marks)

c) You conclude that it is not appropriate to change the best estimate assumptions this year. The CA is not convinced and points to a table in last year's embedded value report which attributes substantial value of in-force business to the annuity portfolio. Briefly explain to the CA the reasons for this. (2 marks)

d) The CA considers this for some time and then asks you whether the best estimate assumptions might be changed in the following circumstances:
   (i) the annuity payment process is outsourced to a department of ABC which specialises in regular transfers of funds, with the prospect of substantial expense savings
   (ii) the investments are changed to good quality corporate bonds with higher credit risk margins than the current investments.

Comment on whether each of these suggestions would be effective in reversing the loss recognition, and what general considerations would apply in each case. (6 marks)

QUESTION 5 **(15 Marks)**

You are the valuation actuary for Nice Tidy Finance (NTF), a life insurance company based in an Asian country selling traditional business. NTF has been in operation for many years and has been successful in attracting new business in a highly competitive market.

NTF has declared a reversionary bonus rate of 4% annually on its whole of life product. Currently there is no terminal bonus paid on this product. Shareholders receive a profit payment of 25% of the declared bonus. The valuation has recently been completed and the bonus rate to be declared for the current year is being discussed.

Information extracted from the most recent valuation is as follows:

	($'000)
Value of supporting assets (VSA)	128,463
Present value of sum insured and previously declared bonus (PVB)	80,932
Present value of expenses (PVE)	16,111
Present value of premiums (PVP)	100,000

Bonus rate declared	Present value current year bonus ($'000)	Present value future years bonuses ($'000)
4%	2,790	61,720
6.5%	4,571	100,565
9%	6,430	124,990

An analysis of the sources of profit and retained earnings has revealed that the profit has arisen from the following sources:

Source	Percentage share (%)
Mortality	68
Investment market movements	23
Expenses	-12
Surrenders	21
Total	100

a) Determine the supportable bonus rate for this product. (4 marks)

b) Identify the issues you would consider when setting the current year's bonus rate for this product. (6 marks)

c) NTF has just announced it is having discussions with a larger competitor which wishes to purchase the business of NTF. The Board of Directors of NTF are concerned to protect the entitlements of the NTF participating policyholders and have informally raised this issue with you. Outline three ways in which the interests of the participating policyholders could be compromised after the proposed purchase and suggest two alternative methods of providing protection for these policyholders in the purchase agreement. (5 marks)

QUESTION 6 **(15 Marks)**

You have recently been engaged as a consulting actuary to Sleepy Life Limited ("SLL"). The owners of SLL have decided in principle to sell the company because they have not been able to achieve satisfactory returns from their investment.

SLL sells a range of non-participating products through its single statutory fund. The appointed actuary of SLL calculated the MoS profits for the year ending 31 December 2006 and your first assignment was to calculate an appraisal value of SLL at that date.

You adopted a risk discount rate (net of tax) of 12% p.a. and otherwise used the MoS best estimate assumptions which included a net investment earnings rate of 5% p.a. To value the new business you calculated the PV at 31 December 2006 of projected earnings from SLL's budgeted new business (volume and product mix) for the 2007 calendar year. This resulted in a value of one year's new business of -$8 million. After some thought you decided to value the future new business by multiplying the value of one year's new business by a multiplier of 2. The results are shown in the following table:

	31 December 2006 ($ millions)
MoS Liabilities	362
Other Liabilities	0
Shareholder Capital and Retained Profit	85
Total Liabilities and Equity	447
Assets (100% cash)	447
Total Capital Adequacy Requirement	432
Value of Net Worth	15
Value of In-force	189
Value of New Business	-16
Total Appraisal Value	188

In this question you can assume that all cash flows are at year-end.

a) The owners realise that it will be some time before the sale will take place and ask you to make an estimate of the embedded value of the company at 31 December 2007 using only the above information. Show your calculation explaining each step and stating clearly the assumptions you have made. (5 marks)

b) The owners are concerned about the negative value of future new business. Explain how the negative value arises and its implications for a prospective buyer of SLL. (3 marks)

c) The owners ask for your advice as to how to fix the negative value of new business in the short term. Set out the steps you would take to assist the owners in addressing this issue. (7 marks)

END OF PAPER

