Institute of Actuaries of Australia

2006 PART III EXAMINATIONS

Subject Title: **Course 2B Life Insurance**

Date: **Tuesday 31 October 2006**

Time**: 1:45pm to :5:00pm**

Time allowed: Three (3) hours plus fifteen (15) minutes of reading time

Instructions: Each new question (but not each section of a question) must be commenced in a new answer book.

Number of Questions: Six (6)

Question	Marks
1	18
2	16
3	21
4	15
5	15
6	15
Total	**100**

Candidates are required to answer ALL questions.

This paper has 8 pages (excluding this page and the blank back page).

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE
NOVEMBER 2006 EXAMINATIONS

Answer all 6 questions.

QUESTION 1 **(18 Marks)**

You are an actuary working for Omnipresent Life Office (OLO), a medium sized Australian life insurance company selling a range of risk and investment products in the Australian market.

OLO has had a series of losses over the last few years of its operation. Following the last annual valuation the company made 20% of its workforce redundant. In addition, each department was required to reduce its wages cost by 20%.

In the current year new business has been lower than anticipated.

The company values liabilities on a policy-by-policy basis. The most recent valuation of the Yearly Renewable Term (YRT) business for the company has just been run. The valuation results are considerably different from those of the previous valuation, even though the valuation basis remains unchanged. Despite the large experience losses the YRT product is not in loss recognition.

Spot checks have been performed on 10 policies and the calculations have been found to be correct. A preliminary analysis of profit has been performed and the results are as follows:

Item	Profit in $'000
Planned Profit	5,000
Mortality	1,675
Lapses	-3,864
Expenses	-13,934
Unexplained	-706
Total profit	-11,829

The loss from the previous year was $9,815,000.

(a) What would you do to check the valuation result? **(7 marks)**

(b) The CFO is concerned that the current year's loss has increased despite the large reduction in the workforce and has asked you to explain what might be causing this result. Highlight the main points of your response. **(6 marks)**

(c) Given the lapse, mortality, new business and expense situation outlined above, what would you advise the company to do in the short term? **(5 marks)**

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QUESTION 2 **(16 Marks)**

You are an actuary for JFC, an Australian life insurance company. Your company is in the process of developing a new product for release into the Australian market.

This 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 fund has an investment mandate as follows:

Asset type	Benchmark	Minimum	Maximum
Australian equities	60%	50%	75%
Australian Government bonds	40%	25%	50%

The Australian Government bonds held will have maturities equal to the expected term of the guarantee.

Assume that there is no default risk on the Australian Government bonds.

(a) Identify any embedded options present in this contract and describe them in terms of an option on the portfolio. **(2 marks)**

(b) Explain how these must be treated under AS1.03. **(2 marks)**

(c) Specify a formula for calculating the maximum possible loss to the company that could arise from this option and justify any assumptions made in deriving the formula. **(3 marks)**

(d) An actuarial student working in your department has suggested that a suitable method of placing a value on the guarantee included in this contract is to review the experience of a closed block of capital guaranteed investment account business also managed by your company. He has suggested that the value should be set by the following formula:

Percentage = S5 / Account Balance

Where:

- **The percentage is applied to the current value of units issued in the new product at the valuation date;**
- **S5 = Sum over 5 years of the total amount that has been required to fund the guarantee on the closed block of business;**
- **Account balance = the account balance at the valuation date of the closed block of business.**

The closed block of business has a discretionary crediting rate policy and a substantial smoothing reserve that has been built up over many years.

Explain any issues that arise from this suggestion. **(5 marks)**

(e) Comment on how the investment risk of the portfolio could be managed.
(4 marks)

QUESTION 3 **(21 Marks)**

You are an actuary working at a large Australian proprietary life insurance company. The company has previously sold a range of risk and investment contracts.

In June 2005 the company issued a new lifetime annuity product. The company has not written annuity products before and therefore the contract is competitively priced (with regard to the interest rate used) to attract new business. A new Statutory Fund has been set up to accommodate this product.

The expected capital required to support the business at the end of the first year, using the pricing and expected new business assumptions, is set out below. This is the amount actually reserved for this business before the first official year end valuation.

Item	Solvency requirement $'000 (SR)	Capital Adequacy requirement $'000 (CAR)	Target Surplus held above CAR $'000 (TS)
Liability reserve	80,738	93,701	
Expense reserve	2,953	-	
New business reserve	-	18,148	
Resilience reserve	11,400	14,875	
Total	95,091	126,724	14,591

It is now June 2006 and you have been reviewing the experience investigations for this product so that the annual valuation can be performed. In the intervening year there have been a number of new medical advancements designed to assist the elderly. This has resulted in a lower level of expected deaths at higher ages.

The MoS profit margin on the pricing basis was 8% of benefits payable. The initial valuation results indicate that the profit margin on the valuation basis is 1.5% of benefits payable.

The new business written for the year is 30% higher than expected based on a comparison of total benefit payment amount. Budgets have been updated to reflect this sales success.

The solvency liability has been calculated at the valuation date to be 119,758 (on best estimate assumptions plus the appropriate margins). The asset/liability matching policy has not changed and has been implemented as expected.

(a) Determine a rough estimate of the Solvency requirement and Capital Adequacy Requirement at the end of the year using valuation assumptions. Provide your rationale for each step in the process.

(5 marks)

(b) What are the consequences for the company of these results?

(6 marks)

(c) How would your answer to b) change if the product were being written in a Statutory Fund containing other products with $28m of excess policyholder retained earnings (above the Capital Adequacy Requirement for the fund) and $7m of excess shareholder retained earnings?

(3 marks)

(d) You have been asked to draft a memorandum to the Board providing your advice, based on your estimate following the valuation. What advice would you give to the Board?

(7 marks)

QUESTION 4 (15 Marks)

You are an actuary working in the valuation department of a medium sized Australian life insurance company. The company has a large book of disability income insurance business. The annual valuation has just been completed and you have been asked to perform an analysis of profit for this business.

You have been provided with the following information (all figures are $ million):

Reserves

	Policy Liability (Active Lives)	Policy Liability (Disabled Lives)
Opening (30/06/2005)	-87.35	39.84
Expected (30/06/2006)	-93.54	42.10
Actual (30/06/2006)	-91.37	54.28

Cash flows

	Premiums	Expenses	Commission	Claims	Interest
	(BOY)	(BOY)	(BOY)	(EOY)	
Expected	318.17	17.68	25.45	204.47	11.38
Actual	318.17	22.10	25.45	206.54	17.85

Where BOY is beginning of the year and EOY is end of the year.

The lapse experience and new business is exactly as expected, the profit margin is 42% of claims and the valuation basis has not changed from the 2005 year-end valuation. In addition, you estimate that approximately 90% of the movement in the policy liability was caused by claims experience.

(a) Calculate the pre-tax actual and experience profit for the year-ended 30/06/2006. (4 marks)

(b) Identify the components of the pre-tax experience profit for the year-ended 30/6/2006 in the following order so that the table below can be populated. (7 marks)

Experience profit:	
Interest	
Premium	
Expenses	
Commission	
Claims	
Lapses	
Unexplained	
Total	

(c) Comment on the likely cause of the poor claims experience. (4 marks)

QUESTION 5 (15 Marks)

You are an actuary working for Excessive Business Growth Ltd. (EBG); a large life insurance company listed on the Australian Stock Exchange (ASX). EBG writes both risk and investment business.

The company's management team is concerned about the value placed upon it by equity analysts in the investment markets and has asked for two alternative valuations to be prepared.

Valuation 1

Valuation 1 will be performed by the actuarial department on best estimate assumptions. The following values are to be produced at 31st October 2006:

Value of in force (VIF)
Value of all future years' new business (VNB)
Adjusted net worth (ANW)

Valuation 2

Valuation 2 will be performed by an equity analyst within the company's funds management operation, based on publicly available information, using the following method:

- **A discounted cashflow approach will be employed using last year's operating profit after tax less a capital charge.**
- **The capital charge is set by applying a cost of capital factor (equal to the difference between the discount rate and the risk-free rate) to the excess of the Solvency Requirement over the policy liability.**
- **The discount rate used will be derived as last year's operating profit after tax, divided by total beginning of year shareholder equity balances for all listed companies in the financial services sector.**
- **The growth rate applied to operating profits will reflect a consensus view of the expected industry growth rate.**
- **Excess assets above the solvency liability are taken at face value.**

(a) Explain how the three components of Valuation 1 are derived to the equity analyst. (3 marks)

(b) What aspects of the two valuation methods would be similar? (4 marks)

(c) Why would the two valuation results differ in practice? (8 marks)

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QUESTION 6 **(15 Marks)**

You are the valuation actuary of Investment Linked Funds (ILF); a medium sized Australian life insurance company.

The valuation data provided for the non-participating investment linked business for the financial year ended 30th June 2006 is set out below. All values are in $'000.

	Ordinary	Superannuation
Gross premiums	108,968	928,218
Income component of premiums	912	9,148
Investment income	20,729	146,342
Claims	77,991	731,314
Expense component of claims	4,176	56,742
Expenses	2,705	55,267
Tax	9,497	(7,817)
Gross policy liabilities at start of year	145,786	3,500,972
Shareholder retained profits at start of year	209,575	31,104
Gross policy liabilities at end of year	182,782	3,765,550
Amount transferred to shareholder fund from shareholder retained profits	32,568	35,400

(a) Prepare the profit and loss statement for the financial year ended 30th June 2006 in accordance with AASB1038. **(3 marks)**

(b) The Federal Government has decided to introduce a tax of 5% on the deposit component of life insurance premiums. The tax will be borne by the life company and is not deductible for income tax purposes. The tax will apply to any premium received after 1 July 2005. Assume that the product will not go into loss recognition.

Identify the changes that would flow through to each component of the profit and loss statement if this tax were introduced, providing figures where possible. **(8 marks)**

(c) Give your opinion on any significant market or corporate issues arising as a result of this new tax. **(4 marks)**

END OF PAPER