INSTITUTE OF ACTUARIES OF AUSTRALIA

LIFE INSURANCE PART B **NOVEMBER 2005 EXAMINATIONS**

QUESTION 1 **(11 Marks)**

You are the valuation actuary for a medium sized UK life insurance company owned by a large Australian funds management company. You report to your parent under Australian legislation, guidelines and standards. Your team has recently completed the Margin on Services (MoS) valuation results for the financial year ended 30 June 2005.

The Chief Financial Officer (CFO) has asked you to provide him with some preliminary information regarding the earnings performance and the corresponding valuation interest rate used on your large block of annuity business. The assets backing the annuity business have always been fixed interest securities. This product has been closed to new business for 2 years.

The investigations provided to you by your staff are:

Year ending 30 June	1999	2000	2001	2002	2003	2004	2005
Actual earned rate	6.70%	6.80%	6.90%	9.20%	7.10%	7.20%	7.50%
Benchmark earned rate	6.60%	6.60%	6.75%	7.00%	6.80%	6.80%	7.00%
Risk free rate	5.10%	5.20%	5.30%	5.50%	5.30%	5.40%	5.60%

The valuation investment earnings rate assumption for this product, whilst reviewed annually, has remained the same at 6.90% since 30 June 1999.

General economic commentary indicates that interest rates are expected to remain stable for the medium term due to the low level of economic growth being experienced globally.

While the duration of liabilities is greater than the duration of assets, the investment team has actively managed the portfolio to improve the matched position (increasing exposure to longer term fixed interest securities). It has also been improving the yield and credit risk profiles of the securities held, at low cost to the fund.

For your reply to the CFO, discuss the following points:

(a) What are the benefits of improving your matched position? (3 marks)

(b) Discuss your views on increasing the valuation investment earnings rate assumption for the valuation at 30 June 2005 and recommend an appropriate rate. (4 marks)

(c) Having concluded that you will increase your valuation investment earnings rate assumption at 30 June 2005, discuss the effect this change would have on the:

(i) Best Estimate Liability; (1 mark)

(ii) Policy Liability; and (2 marks)

(iii) Profit Margin. (1 mark)

QUESTION 2 **(19 Marks)**

You are an actuary working for DEF Funds Management of Australia. Your company is the wholly owned subsidiary of an overseas parent.

Your parent wishes to expand its Australian operation and is negotiating the purchase of UVW, an Australian life insurance company. UVW has a large block of participating traditional business and is about to launch a single premium investment-linked savings product. The traditional product is closed to new business.

You have been asked to assist with the calculation of UVW's appraisal value (from the perspective of DEF's parent).

(a) The Appointed Actuary (of DEF) has decided that the method to be used to determine the value of new business is the present value of net of tax shareholder cash flows. The following assumptions are to be used:

Policy term:	5 years
Capital:	12% of account balance
Annual management fee:	4% of account balance
Expenses:	1.5% of account balance
Investment earnings rate:	8% p.a. (earned in advance)
Tax:	30% of profit
Discount rate:	13.5% p.a.
New business growth rate:	10% p.a.

All cash flows occur at the start of the year. The total account balance for the business sold in the first year ($m) is expected to be as follows:

Year (soy)	1	2	3	4	5
Balance ($m)	10.000	8.250	6.806	5.615	4.633

Note: soy means start of year.

Calculate the value of future new business (i.e. all future years). (11 marks)

(b) For the following assumptions, discuss whether you think the values given are appropriate for this product. Suggest any changes you would make and the impact they would have on the value of new business.

(i) Capital (2 marks)

(ii) New Business Growth Rate (3 marks)

(c) This acquisition is still being discussed over the financial year end of UVW. The year end figures provided by the company have been relied on for the calculation of the appraisal value (AV).

Subsequent to the year end, a 10% fall has occurred on the Australian share market, where 65% of the company's assets backing its liabilities are held. For the traditional portfolio this has resulted in a 6.5% ($2.47m) reduction in the value of assets backing liabilities.

How would this change be reflected in the AV of the traditional portfolio?

(3 marks)

QUESTION 3 **(17 Marks)**

You are an actuary working for a large multi-national insurer based in Apica. Your company owns a number of life insurance subsidiaries. Your responsibilities cover Australia and a number of other countries. Each subsidiary is currently subject to the regulatory and reporting requirements of its country of residence. Several of the life insurance subsidiaries you are responsible for operate in highly competitive environments with little prudential supervision.

The life insurance regulator in Apica has announced the following proposed changes to the policy liability valuation and capital requirements.

	Proposed Approach
Policy Liability Valuation	A requirement to use best estimate assumptions with a prudential margin.
Capital Requirement	Minimum capital requirement of $5m. A risk-based capital requirement, which is consistent with the company's risk profile and provides a buffer above the liability valuation.

The proposed changes will apply for the parent company and all subsidiaries in the consolidated entity.

The Executive Committee has determined that this revised basis should also be used for all internal management reporting, with internal profit and capital benchmarks throughout the group based on this revised basis.

You have been asked to provide your advice, in the form of a memorandum to the Executive Committee, on each of the following aspects of the proposed approach:

(a) Compare the proposed approach to the existing approach applicable to the Australian subsidiary for the:

(i) policy liability valuation; (4 marks)

(ii) capital requirement. (4 marks)

(b) For the non-Australian subsidiaries you are responsible for, discuss the likely impacts of applying the proposed approach for the following:

(i) policy liability valuation; (4 marks)

(ii) capital requirement. (5 marks)

QUESTION 4 (16 Marks)

You are the valuation actuary for Protect It Life Insurance Company of Australia. Your company writes a range of business including a Disability Income product offering two alternative benefit types:

- Policy A provides income for up to 2 years. At the end of the benefit period or when the insured resumes work, the policy remains in force and the insured can claim for any disability NOT related to previous claims.

- Policy B provides income to the insured up to the policy anniversary following their 65th birthday. If the insured resumes work, the policy remains in force and he/she can claim for any disability, i.e. the claim can relate to previous claims.

One of your assistants has recently developed a computer model to calculate the reserves for this business. To check the reasonableness of the results of this model you have requested that calculations be performed for a policyholder aged 40 for Policy A and Policy B separately.

The model assumes that:

- calculations are at policy inception;
- the profit carrier is claims;
- the profit margin is the same for both policies, with premiums set accordingly;
- premiums are paid annually in advance; and
- all other assumptions, except for second and subsequent claims, are the same for both policies.

The model output for the best estimate liability (BEL) for each of these is below:

Benefit Term	BEL
2 Years	-8,526
To age 65	-14,289

(a) Explain why the BEL results differ and what the profit consequences are. (4 marks)

(b) Satisfied that the model is accurate, you decide to review the assumptions used for the MoS valuation for these policies. For each of the following, comment on how and why your assumptions would differ between Policy A and Policy B:

(i) Termination rates (i.e. claim recovery rates); (3 marks)

(ii) Renewal expenses. (3 marks)

(c) Now consider the Solvency Requirement 6 months after policy inception. Discuss the differences in magnitude that you would expect Policy A and Policy B (for same age, sex, waiting period, occupation class) to contribute to each of the following:

(i) Minimum Termination Value; (3 marks)

(ii) Expense Reserve (ignore Offset Statutory Capital); (1 mark)

(iii) Resilience Reserve. (2 marks)

QUESTION 5 **(17 Marks)**

You are a valuation actuary at Great Asia Life Insurance, a large life insurance company selling life insurance policies in Asia.

Great Asia has been very successful in selling participating Whole of Life business and has a very large block of open business.

Your analysis of profit results and other valuation information for this block of business are detailed below:

	$m
Analysis of profit	
Planned profit	20,510
Experience profit	15,821
Interest on retained earnings	5,614
MoS profit	41,945
Experience Profit	
Investment earnings	10,758
Surrenders	5,063
Valuation information	
Reversionary bonus rate on sum insured and bonuses	4.00%
Policyholder retained earnings (soy)	14,069
Shareholder retained earnings (soy)	6,530
Proposed policyholder distribution (at 4%)	16,472
Proposed shareholder distribution	4,036

Note: "soy" is beginning of year; "eoy" is end of year.

The regulatory and tax environment in which you operate is identical to Australia.

(a) Calculate the policyholders' and shareholders' retained earnings after the proposed distributions at the end of the year. (5 marks)

(b) Your marketing department has heard about these results and has suggested that a reversionary bonus rate of 8% be declared for both sum insured and existing bonuses.

(i) Identify and explain three main considerations for bonus distribution that apply in this situation. (6 marks)

(ii) Give your opinion, with reasons, as to whether the bonus rate should be increased as suggested. If the bonus rate is not increased, suggest alternative approaches. (6 marks)

QUESTION 6 (20 Marks)

You are the valuation actuary for an Australian life insurance company writing both risk and investment business. Your area of responsibility covers only the investment-linked business of the company.

The only investment-linked product sold by the company is a single premium superannuation product. There are no entry or exit fees but there is a 2% p.a. management fee.

The following information has been extracted from the general ledger and valuation systems for the investment-linked statutory fund (all figures are in $m):

Year ending 31 December	2005	2006
Single Premium	500.0	1,000.0
Initial Commission	20.0	40.0
Other Acquisition Expenses	7.0	15.0
Renewal Commission	9.0	12.5
Other Renewal Expense	50.0	60.0
Investment Management Expense	9.0	12.5
Surrenders	300.0	450.0
Policyholder Investment Income	(200.0)	1,342.5
Shareholders' Retained Profits Investment Income	(65.0)	50.0
Policyholder Tax Expense/(Credit)	(20.0)	134.3
Shareholders' Retained Profits Tax Expense/(Credit)	12.6	3.0
Management Fee Income	72.0	100.0
Transfer to Shareholder Fund	0.0	75.0
Policyholder Account Balance	4,200.0	5,858.3
Other Liabilities:		
Creditors	125.0	125.0
Tax provisions	270.0	407.3
Investment Assets	4,750.0	6,352.0
Debtor Assets	250.0	375.5
DAC	500.0	625.0

The company calculates the investment-linked policy liability using the accumulation method.

(a) Using this information calculate the profit for the investment-linked statutory fund for the year ending 31 December 2006. (3 marks)

(b) Calculate the Solvency Requirement and "Excess Assets" at 31 December 2005 and at 31 December 2006 for the investment-linked statutory fund. (Excess Assets is defined as the difference between the total Assets and the Solvency Requirement i.e. essentially the buffer before solvency is breached.)

To assist in performing this calculation you have been given the following additional information:

- the Minimum Termination Value exceeds the Solvency Liability;
- Statutory Offset Capital has been utilised in another statutory fund (and cannot be used for this statutory fund);
- to simplify the resilience calculations the company assumes L' equals L for this statutory fund;
- at 31 December 2005 the inadmissible assets were $100m and the resilience factor 'f' (i.e. A'/A) was 80%;
- at 31 December 2006 the inadmissible assets were $110m and the resilience factor 'f' (i.e. (A'/A) was 75%.

(7 marks)

(c) A new CFO has recently joined the company. He has read through the valuation report for this business and is concerned with some of the results presented. He has written to you seeking clarification. Prepare your response to the following:

"I am concerned with the decline in the Excess Assets above the Solvency Requirement at 31 December 2006. As I find the analysis of profit approach used by actuaries to be quite useful in explaining the profit, would you please use a similar approach to explain the decline in the Excess Assets."

(10 marks)

END OF PAPER