INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE
MAY 2005 EXAMINATIONS
Answer all 6 questions.

QUESTION 1 **(12 Marks)**

You are the valuation actuary at AAA Life. Your company has recently issued a new term insurance product. This new product allows policyholders to take TPD riders. None of your products have had TPD benefits before.

(a) Outline the high level steps you would undertake to enable you to calculate the TPD IBNR reserve for the first time. Include in your answer the sources of data you would consider. (7 marks)

(b) It is now 5 years since commencement of this product and the company has been very successful and built up a considerable portfolio of TPD business. There have been no changes to the TPD IBNR calculation approach since the benefit was first issued. What changes would you make to your approach in part (a) in order to calculate the TPD IBNR reserve? (2 marks)

(c) Having updated your approach, you have calculated your IBNR reserve using the two methods (part (a) and part (b)) and found that the IBNR under (b) is significantly higher than under (a). Why may this have occurred? (3 marks)

QUESTION 2 **(17 Marks)**

You are a consulting actuary who is reviewing an embedded value calculation for an investment bank. The investment bank has been asked to negotiate the sale of a life insurance company.

Company A is a small Australian life insurance company owned by an overseas parent (OS Co). OS is trying to sell Company A.

DOM Co is a large listed Australian life insurance company. DOM is interested in buying Company A.

The investment bank has provided you with the following information on the valuations performed on Company A by the seller (OS) and the buyer (DOM).

Assumptions used in calculating the embedded value of Company A		
Company Undertaking the Valuation	OS[1]	DOM
Assumption differences		
Risk discount rate	12.5%	11.5%
Mortality (% of IA 90-92)	85%	80%
Renewal Expenses (% of premium)	16.3%	12.5%
Franking Credit Value Factor[2]	0%	70%
Embedded Value ($m)	133	180

Note: 1 OS have calculated the embedded value of Company A on a stand-alone (business as usual) basis.
2 This is the proportion applied to the face value of franking credits when calculating embedded values.

(a) Why might the assumptions used by DOM for the calculation of the embedded value differ from those used by OS? (5 marks)

(b) The investment bank has calculated a value of Company A based on an approach using a P/E (Price to Earnings) ratio. What are the advantages and disadvantages of calculating the embedded value using a discounted cash flow approach when compared with the P/E approach used by the investment bank? (8 marks)

(c) The investment bank has asked you about target surplus.

(i) Explain the concept of target surplus to the investment bank. (1 mark)
(ii) Should you revise your valuation to allow for target surplus? (3 marks)

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QUESTION 3 **(9 Marks)**

You are the valuation actuary at BHB Life Insurance calculating the policy liabilities for a block of 10 year yearly renewable term business at 31 December 2004. You have been provided the following projection results for the in-force business as at 31 December 2004. This is shown separately for business sold in 2004 and business sold prior to 2004. Both sets of projections have used the 2004 best estimate assumptions (i.e. Basis 2 assumptions). These were identical to the best estimate assumptions for the previous year (2003). The results (all figures are in $'000) are as follows:

Business Sold Prior to 2004 (i.e. excludes new business written in 2004):

Year	Premium	Claims	Initial Expenses	Renewal expenses	Planned Profit[1]
2005	7,260	2,541	-	2,855	1,271
2006	6,454	2,323	-	2,690	1,162
2007	5,219	1,931	-	2,306	966
2008	4,148	1,576	-	1,943	788
2009	3,203	1,249	-	1,590	625
2010	2,423	969	-	1,275	485
2011	1,744	715	-	973	358
2012	1,237	520	-	732	260
2013	878	378	-	550	189
2014					
PV @ earning rate	26,278	9,282	0	10,659	4,641

Note 1: This has been calculated using the final 2003 profit margin.

Business sold in 2004 (projected from 31 December 2004):

Year	Premium	Claims	Initial Expenses	Renewal expenses	Planned Profit[2]
2005	4,001	1,282	-	1,485	545
2006	2,893	1,049	-	1,138	446
2007	2,085	782	-	869	333
2008	1,498	581	-	662	247
2009	1,073	430	-	502	183
2010	765	316	-	380	134
2011	544	232	-	286	99
2012	384	169	-	214	72
2013	270	122	-	160	52
2014	0	51	-	120	22
PV @ earning rate	11,318	3,913	0	4,282	1,664

Note 2: The profit margin used for this projection is the profit margin for the current year's new business

You know that the earning rate for the assets of this business is 10% per annum, premium and initial expense cash flows occur at the beginning of the year, renewal expenses occur at the end of the year and claims are paid throughout the year. The profit carrier is claims.

You can ignore tax for all calculations in this question.

(a) Calculate the 31 December 2004 policy liability for the combined block of business. (2 marks)

(b) Determine the final 2004 profit margin percentage for the combined block of business. (1 mark)

(c) You have not yet finalised your valuation when you learn that the marketing department has devised a new campaign to attract new sales in 2005. It involves reducing the premium rates for this product by 20% for all policies (both 2004 in-force policies and 2005 new business) for the next year only. You are not considering any other changes to your valuation assumptions.

(i) Determine the revised final 2004 profit margin percentage for this business taking this change into account. (2 marks)

(ii) What are the implications if the targeted company profit margin (as a % of claims) for this type of business is 40%? (2 marks)

(iii) What would the implications be for both the current profits and expected future profits if it were decided that this 20% reduction was to apply to all future premiums? (2 marks)

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QUESTION 4 **(25 Marks)**

You are an actuary in the valuation department of MENO, an Australian Life insurance company. You have been asked to determine the Solvency Requirement for their Statutory Fund No.1 (SF 1) which has only two related product groups, Yearly Renewable Term (YRT) insurance and non-participating Whole of Life (WOL) assurance.

You have been provided with the following end of year information for MENO's Statutory Fund No.1. All numbers are in $m.

		SF 1	
	YRT	WOL	Total
POLICY LIABILITIES			
BEL	(3,299)	4,121	822
PVFP	2,711	498	3,209
PL	(588)	4,619	4,031
OTHER LIABILITY INFORMATION			
Solvency Liability	(2,756)	4,221	1,465
Solvency Liability (after adjusting for resilience reserve yield changes)	(2,632)	4,010	1,378
Minimum Termination Value	152	3,320	3,472
Current Termination Value	152	3,897	4,049
BALANCE SHEET			
Assets			
Cash			885
Accounts Receivable			90
Future Income Tax Benefit			20
Australian Government Bonds			2,759
Listed Equities[1]			1,558
Subtotal Assets			5,312
Liabilities			
Policy Liabilities	(588)	4,619	4,031
Accounts Payable			250
Provisions			200
Subtotal Liabilities			4,481
Equity			
Share Capital			100
Retained Profits			731
Subtotal Equity			831

PROFIT AND LOSS STATEMENT

Premiums	2,225
Investment Income	487
Claims	(1,001)
Expenses	
- acquisition commission	(362)
- other acquisition expenses	(374)
- maintenance commission	(390)
- other maintenance expenses	(969)
Change in Policy Liabilities	607
Profit (pre Tax)	223

Notes:

1. The listed equities include a holding of $280m in AXP Ltd. The remainder of the listed equity investments are across a wide range of companies.
2. There are no related party assets or assets dependent on the conduct of business.

(a) Section 6, paragraph 6.1 of AS2.03 outlines 9 steps in the calculation of the Solvency Requirement. For MENO's Statutory Fund No.1:

(i) Complete the steps a) through to f) of the Solvency Requirement calculation. (5 marks)

(ii) Calculate the Inadmissible Assets Reserve. (2 marks)

(iii) Calculate the Resilience Reserve. You may assume that A' equals 0.93 * A for your calculations and that other (non-policy) liabilities are unchanged under the resilience scenario. (2 marks)

(iv) Calculate the total Solvency Requirement. (1 mark)

(b) MENO needs to increase the amount of excess assets above its Solvency Requirement for Statutory Fund 1. Suggest possible actions that MENO might consider to achieve this. Explain how each of your suggested actions will increase the excess assets and outline any other business impacts that would arise. (15 marks)

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QUESTION 5 **(22 Marks)**

You work in the actuarial department of Retirement Inc, a life insurance company specialising in annuities. You have been valuing a block of annuity business written since the start of 2001. The following table shows the actual results calculated for 2003 and the expected results for 2004 (on the 2003 basis).

All numbers are in $'000.

Year	Premium boy	Annuity payments eoy	Commut-ations eoy	Initial Expenses boy	Renewal Expenses eoy	Planned Profits eoy	Policy liability eoy	Total Assets eoy	Investment income (total) eoy
2003							1,176,052	1,216,262	
2004	0	100,527	157	0	3,519	20,508	1,127,783	1,167,382	79,057

Note: boy is an abbreviation for beginning of year, eoy for end of year.

The profit carrier is annuity payments.

Assume all actual cash flows occur with the same timing as expected cash flows.

For the prior three years (i.e. 2001 to 2003) experience was exactly as expected.

For 2004 there was no new business and the following actual results were recorded:

Item	$'000
Annuity payments	100,803
Commutations	157
Renewal Expenses	9,526
Investment Income (total)	78,944

The actual investment earning rate was 6.5%.

The actual policy liability at the end of 2004 is 1,130,879. The difference between the expected and the actual policy liability at the end of the year is purely the result of more annuitants being alive than expected.

(a) Calculate the operating profit for 2004. (1 mark)

(b) Calculate the planned profits, total experience profit/loss and any other components of operating profit for 2004. (3 marks)

(c) Assuming all cash flows occur at the end of the year, determine the following:

(i) The experience profit/loss due to investment/economic conditions. (1 mark)

(ii) The experience profit/loss due to maintenance expenses. (1 mark)

(iii) The experience profit/loss due to mortality experience. (2 marks)

(d) You have been asked to provide a commentary on these results for inclusion in the Financial Condition Report. Please draft your comments for the appointed actuary. (4 marks)

(e) Given the experience results for this product you have been allocated one of the actuarial analysts to assist you in performing your investigation into the expense experience. The aim of this investigation is to determine the causes of the deterioration in results. Please provide the analyst with a list of things that need to be investigated together with reasons why. (4 marks)

(f) Following this investigation you have determined that there are permanent changes to the business that need to be reflected by strengthening the basis. You have decided that the renewal expense assumption needs to be increased.

The Managing Director (MD) is upset with your change as this has caused a $15m reduction in the present value of future profits. He has suggested that:

- any changes to the valuation basis cannot be justified on the results of 1 year;
- the company should be able to move gradually into taking these changes into account and thus should not have to wear the difference now;
- he is sure that the expense situation can be brought back in line with expectations within the next year or two.

He has therefore suggested that the basis should not change this year and that the experience should be monitored for another year to give him a chance to consider ways to reduce the expense levels first.

Draft your response to the MD covering the following:

- ➢ the professional issues involved in complying with the MD’s request;
- ➢ the impact your assumption change will have on current period financial statements;
- ➢ the impact of the assumption change on actual future profits that will be earned if the MD is able to reduce expenses to their previous levels. (6 marks)

QUESTION 6 **(15 Marks)**

You are an Australian consulting actuary who has been asked to provide advice to ETERNAL, a small life insurance company operating in the country of Moldovia.

ETERNAL has just one Statutory Fund from which they only sell profitable single premium investment-linked business. You have been provided with the following information about ETERNAL's only investment linked product:

Product Information:

- Entry Fee: Nil
- Exit Fees: 3% in year 1, 2% in year 2, 1% in year 3 and 0% thereafter
- Ongoing Fees: 2.5% of Account Balance

Expense Levels:

- Acquisition Expenses (including commission): 8% of Premium
- Maintenance Expenses (including commission): 1% of Account Balance

Asset Information:

- ETERNAL's Statutory Fund investments include four unlisted companies (including an IT company and a finance company that both have low net assets relative to their net market value). Each of these companies is very profitable and together they account for about 30% of the current value of total assets.
- The balance of assets is a mixture of listed shares, commonly traded debt securities and cash investments.

The Insurance Regulator of Moldovia is thinking of changing its financial reporting regime in relation to life insurance business. Its current regulatory and financial reporting regime is identical to Australia's at 1 January 2004. The financial reporting changes being considered by the Regulator are as follows:

Area of regulation:	Current situation	Proposed situation
Valuation of Assets (Life Insurance Companies)	All life insurer's assets are valued at net (of realisation costs) market value in their balance sheet.	The value of unlisted subsidiary companies owned by life insurers cannot exceed the net assets of the subsidiary. Other assets will be valued at current market value.
Expense treatment of investment linked contracts	For profitable business, acquisition costs are currently able to be fully deferred and offset against future revenues.	Only 50% of acquisition costs will be able to be deferred and offset against future revenues.
Surrender Value Floor	N/A.	The policy liability (at the related product group) for investment linked policies cannot be less than the current surrender value.

(a) You have been asked to provide a report to the Board of ETERNAL answering the following questions:

  (i) What impact will the asset valuation changes have on the value of assets, as reported in the financial reports to the Regulator? (2 marks)

  (ii) What impact will the change in expense treatment have on the pattern of operating profits and total operating profits for this business, as reported in the financial reports to the Regulator? (3 marks)

  (iii) What additional impacts will the introduction of the surrender value floor (in addition to the expense changes) have on the pattern of operating profits and total operating profits for this business? (7 marks)

(b) What product changes could the company consider to reduce the impact of the proposed financial reporting changes on operating profits? State the reasoning behind your suggested changes. (3 marks)

Draft your report.

END OF PAPER