INSTITUTE OF ACTUARIES OF AUSTRALIA

LIFE INSURANCE **2004 EXAMINATIONS**
PAPER TWO

Answer all 5 questions.

QUESTION 1 (12 Marks)

You are a consulting actuary. Your client is the newly appointed Finance Director of an established life reinsurance company. He has asked for your assistance in a review of their financial reporting area and the various reports produced by this team. The financial reporting area is only one week away from completing the year end valuation and financial statements.

The Finance Director (from a banking background) is specifically concerned with the divergence of the financial reports he is receiving from his staff. For example, monthly management reports immediately prior to year end were indicating a 20% increase in profits for the full year 2004 over the previous full year (the budget was for a 5% increase). However, the profit calculated (using the draft Margin on Service (MoS) policy liability) for the full year 2004 shows a reduction of 10% from last year. The draft MoS policy liability has been calculated using a projection methodology.

The Finance Director has also received from his staff a final draft of the 31 December 2004 embedded value results, showing a significant drop from the previous year.

The Finance Director has also provided you with copies of:

- drafts of the financial statements, incorporating PR35 returns / AASB1038 Accounts (with Notes);
- the budget for the full year 2004; and
- actual monthly management reports produced throughout 2004.

He is hoping you can explain the divergence between the various reports before the valuation results and financial statements are finalised the following week.

(a) From the documents provided to you, what sections would you review and what would you be looking for in those sections to explain the wide divergence in profit between the monthly management reports and the financial statements. (4 marks)

(b) What other information would you request and why? (5 marks)

(c) Discuss what steps could be taken to minimise the divergence in profit between the monthly management reports and the financial statements in the future. (3 marks)

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QUESTION 2 **(20 Marks)**

You are an actuarial student studying the life insurance course of the Institute of Actuaries of Australia.

You have a friend who works for a life insurance company in Asia. This company only sells participating whole of life insurance with reversionary bonuses. The company sets the bonus rates and guarantees that policyholders will receive all investment returns (net of taxes and investment expenses) over the life of the entire product portfolio.

She would like you to explain the Margin on Services (MoS) profit reporting methodology to her and how the financial reporting results would change if her company were to use MoS.

Currently, her company uses statutory profits and the increase in embedded value for financial reporting.

She provides you with the following information.

Financial Reporting Measures:	
Statutory profits:	Premiums received + Investment Income – Expenses – Claims paid – Tax – increase in Statutory Reserve

Investment Income assumes assets are held at market value and includes unrealised capital gains. Expenses include commission payments.

Statutory Reserving Basis:	
Calculation method:	Gross premium valuation.
Mortality assumption:	Set by the regulator and is about 50% higher than the company's best estimate assumption.
Expense assumption:	Set by the regulator and is about 20% higher than the company's recent experience.
Interest Rate assumption:	Set by the regulator at 4% but the regulator does review the assumptions every few years. The current government bond yield is 8%.
Future bonus rate assumption:	The statutory liability includes future bonuses, assuming bonus continues at the current bonus rate.

Embedded Value:	
Net Worth:	Market Value of Assets – Capital Requirement
Value of In force:	The present value of future statutory profits assuming best estimate experience and a risk discount rate of 15%.

The Capital Requirement represents the minimum amount of assets required to be held and is equal to 125% of the Statutory Reserve.

Prepare an answer for your friend covering:

(a) A brief description of the similarities and differences between the statutory profit in the Asian country and MoS profit. (2 marks)

(b) A brief description of the similarities and differences between the change in embedded value and MoS profit as measures of profitability. (4 marks)

(c) The flaw that you have identified with the Embedded Value methodology as documented by your friend in Asia, and whether this would result in the embedded value being understated or overstated? (2 marks)

(d) Assume your friend decides to perform a statutory valuation, embedded value calculation and MoS valuation at the end of the current financial reporting year (i.e. at the valuation date). Provide a brief description of how the following items:

- the statutory profit in both the current year and future years;
- the embedded value at the valuation date; and
- the MoS profit in both the current year and future years

would be impacted, if

(i) over the 12 months preceding the valuation date, sales were higher. (3 marks)

(ii) at the valuation date, there was a one off increase in the bonus rate declared. (3 marks)

(iii) the best estimate expense assumption at the valuation date was higher. (3 marks)

(iv) the local regulator reduces the official mortality rates by 10% at the valuation date. (3 marks)

(In preparing your answer for part (d) you should:
- assume the financial reporting is at the end of the year;
- ignore the impact of capitalised losses on the MoS profit;
- consider each item in isolation; and
- assume your friend is only interested in the main issues and not the "finer points" of each method.)

QUESTION 3 **(16 Marks)**

You are the Appointed Actuary for APEX Life, a small Australian life insurance company. APEX has only one statutory fund, which contains single premium investment-linked products. The charging structure for these products consists of an entry fee and ongoing management fee. These products have been quite profitable for APEX, however they have received only negligible new business volumes for a number of years prior to the 2004 year.

Exceptional investment returns for the first half of 2004, combined with a reduction in the ongoing management fee, have led to a dramatic increase in new business volumes and resulted in substantial unrealised capital gains at the end of the financial year 30 September 2004. Total investment-linked account balances have almost doubled from $715m at 30 September 2003 to $1,360m at 30 September 2004. APEX expects sales volumes to continue at the current levels for a number of years.

You are about to calculate the Solvency, Capital Adequacy and Management Capital Requirements as at 30 September 2004. APEX currently has a policy of not applying any statutory capital offsets in the calculation of its Solvency and Capital Adequacy Requirements.

(a) What is the purpose of the Solvency Standard ("AS2.03") and the Capital Adequacy Standard ("AS3.03")? (2 marks)

(b) Describe the aspects of the Solvency and Capital Adequacy Requirement calculation process that will require greater attention compared to previous years. (3 marks)

(c) Explain why you expect the Solvency Requirement to be greater than the Capital Adequacy Requirement (prior to applying the minimum value of the Solvency Requirement) at 30 September 2004. (3 marks)

(d) The CEO has requested that you investigate how APEX may be able to reduce its Solvency and Capital Adequacy Requirements. Explain how Offset Statutory Capital can be utilised to reduce the Solvency and/or Capital Adequacy Requirements and discuss the impact on APEX's capital requirements overall from utilising such a strategy. (5 marks)

(e) APEX currently has a policy of holding cash assets to back all of the tax liabilities of its statutory fund. Discuss why this approach may lead to a mismatch between the assets and the liabilities. Suggest an alternative asset mix that may result in a better match. (3 marks)

QUESTION 4 **(25 Marks)**

You are the Appointed Actuary for an Australian life insurance company, INSHORE, that has two products only: immediate lifetime annuities and yearly renewable term. Both products have positive MoS profit margins, but for annuities they are very small. Only the term insurance product is open to new business.

You have just finished your 30 June 2004 year end activities, which included the calculation and documentation of net policy liabilities and the calculation of the embedded value. The embedded value, which includes the value of imputation credits at 70% of the value of future tax payable, has been calculated using the best estimate assumptions at the valuation date and a risk discount rate of 10%.

(a) State the components of an embedded value. (1 mark)

(b) The newly appointed Chief Financial Officer has just finished reading your draft embedded value and policy liabilities reports and she has a few questions for you.

Draft your response to your Chief Financial Officer, explaining your answers to her following queries.

(i) Why does the analysis of change in embedded value show a positive value of business written in the period, whereas new business profits do not seem to have been included in the analysis of MoS profits? (3 marks)

(ii) Why does the immediate annuity business have a large positive value of in force business in the embedded value, while the product has only small profit margins for policy liability purposes? Does this mean we should reopen this product to new business? (4 marks)

(iii) The federal government changed the tax consolidation legislation during the year, resulting in a lowering of tax reserves and thus a lowering of tax expense. The analysis of MoS profit after tax includes a significant positive experience profit from this tax change. The analysis of change in embedded value shows a much smaller (positive) impact of the same tax changes. Why is the impact smaller for the change in embedded value than for the MoS profit? (4 marks)

(c) While reading your draft year end reports the CFO has noticed that you have incorrectly assumed total budgeted expenses for the year ending 30 June 2005 of $15.7m when calculating your unit cost assumptions. The final budgeted expenses for this period totalled $16.9m.

You have been informed that the additional expenses of $1.2m are all ongoing maintenance expenses and are split equally between the annuity and the term products.

The following table has been extracted from the 30 June 2004 results.

Product:	**Term**	**Annuity**	**Total**
Basis 2 Best Estimate Liability	-30.3	678.4	648.1
Basis 2 Present Value of Future Profit Margins	25.1	4.2	29.3
Policy Liability	-5.2	682.6	677.4
Basis 2 Modelled Maintenance Expenses (for the year ending 30 June 2005)	5.9	4.3	10.2
PV Maintenance Expenses @ Net Earned Rate	48.00	26.56	74.56
PV Maintenance Expenses @ 10%	39.70	21.97	61.67

Note: Basis 2 uses the best estimate assumptions at the current reporting date.

(i) Estimate the impact on your draft 30 June 2004 best estimate liabilities, present value of future profit margins and policy liabilities from incorporating the additional budgeted expenses. (5 marks)

(ii) Estimate the impact on your draft 30 June 2004 MoS profit from incorporating the additional budgeted expenses. (1 mark)

(iii) Estimate the impact on your draft 30 June 2004 embedded value from incorporating the additional budgeted expenses. (4 marks)

(iv) After further investigation you find out that the additional expenses of $1.2m were budgeted policy issue acquisition expenses for the term insurance product. What would be the impacts on your draft 30 June 2004 policy liabilities, MoS profit and embedded value from incorporating the additional budgeted expenses? (3 marks)

QUESTION 5 **(27 Marks)**

You are a consulting actuary who has been hired to help XYZ Life complete its 30 June 2004 year end calculations for its YRT product. You have been provided with the following information regarding the YRT product:

- Policy Liability as at 30 June 2003 = -$24,189,000.
- The final net of tax profit margin at 30 June 2003 was 1.46%. The profit carrier used was claims.

YRT Projection Model Output as at 30 June 2004 ($000)			
Model Run Description	Gross Earning Rate	Gross Best Estimate Liability[1]	Present Value of Profit Carrier (Claims)
Residual In force Business[2] on Basis 0 Assumptions (i.e. using June 2003 Basis 2 assumptions)	5.0%	-23,769	42,192
Residual In force Business[2] on Basis 1 Assumptions	6.5%	-21,367	37,781
Residual In force Business[2] on Basis 2 Assumptions	6.5%	-20,117	36,282
2004 New Business At Inception[3] on Basis 2 Assumptions	6.5%	140	4,445
2004 New Business From Year End[4] on Basis 2 Assumptions	6.5%	-2,607	4,447

YRT Product - Cash Flows for Year Ending 30 June 2004 ($000)	**Actual Cash Flows**
Premium Income	9,862
Investment Earnings[5]	-1,293
Claim Payments	4,909
Acquisition Expenses & Commission	3,004
Maintenance Expenses & Commission	2,449

Notes:

1. The gross best estimate liability excludes tax. i.e. no tax is included in the cash flows used for discounting and a gross earned rate is used as the discount rate.
2. Residual In Force Business refers to those policies that were in force at 30 June 2003 and remain in force at 30 June 2004.
3. 2004 New Business At Inception refers to a projection from policy issue date of new policies issued since 30 June 2003.
4. 2004 New Business From Year End refers to a projection of new policies issued since 30 June 2003 using 30 June 2004 as the projection date.
5. Investment Earnings does not include earnings on capital in excess of policy liabilities.

(a) Calculate the policy liability and the MoS profit/loss after tax as at 30 June 2004 for the YRT product. (9 marks)

(**Hint:** Calculate the 30 June 2004 policy liability gross of tax and then allow for the impact of tax.)

(b) You have also been provided with the following information, in addition to the information provided above:

YRT Actual and Expected Items For Year Ending 30 June 2004			
	30/6/03 Basis 2 Assumptions	Actual Experience	30/6/04 Basis 2 Assumptions
Policies In Force 30 June 2003	9,602	9,602	9,602
Annual Premium In Force 30 June 2003 ($000)	9,655	9,655	9,655
Gross earning rate in period	5.0%	5.5%	6.5%
Inflation	3.0%	3.0%	3.0%
Maintenance Expenses[6] - % premiums - $ per policy pa	 5.0% 100	 5.3% 105	 5.2% 105
Policy Lapse Rate (year ending 30 June 2004)	15.0%	16.0%	15.5%
Claims Cost (as % of premium income)	51.5%	51.2%	51.5%
Residual Policies In Force 30 June 2004[7]	8,162	8,066	8,066
Residual Annual Premium In Force 30 June 2004[7] ($000)	9,191	9,083	9,083
Expected claims cost (year ending 30/6/04) ($000)	4,815		

Notes:
6. Maintenance expenses exclude maintenance commission of 10% of premium income.
7. Residual policies and premium in force statistics ignore new business written during the 12 months to 30 June 2004

Assuming that there are no experience profits or losses in respect of new business issued during the year, calculate the following for the year ending 30 June 2004:

(i) The planned profits, total experience profits and any other components of MoS profit after tax. (2 marks)

(ii) The experience profit/loss due to maintenance expenses. (3 marks)

(iii) The experience profit/loss due to lapse experience. (4 marks)

(iv) The experience profit/loss due to claims experience. (2 marks)

(v) The experience profit/loss due to investment/economic conditions. (4 marks)

(vi) Summarise the analysis of experience variations and determine the residual untraced amount. (1 mark)

(c) Briefly describe how you could use XYZ's projection models to improve the accuracy of your analysis (i.e. reduce your untraced amount). (2 marks)

END OF PAPER TWO

