INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE **MAY 2006 EXAMINATIONS**

MARKING GUIDE

Level of Difficulty

PAPER ONE

Question	Syllabus Aims	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1 (a)	1, 2, 12	1, 6		3		3
1 (b)	4, 6	2, 3	2			2
1 (c)	1, 4, 6, 12	1, 2, 3, 6			6	6
2 (a)	5	3	2			2
2 (b)	5	3		8		8
2 (c)	2A, 1	2A, 1		4		4
2 (d)	2A, 1,12	2A, 1, 6		3		3
2 (e)	2A, 1	2A, 1			3	3
3 (a)	1, 4	1, 2	10			10
3 (b)	3	2		3		3
3 (c)	1, 3, 4	1, 2			3	3
4 (a)	1, 3, 9, 11	1, 2, 5		5		5
4 (b)	1, 3, 7, 8, 9	1, 2, 4, 5			8	8
4 (c)	1,2 3,4,9,11	1, 2, 5	5			5
5 (a)	5	3			6	6
5 (b)	5	3			8	8
5 (c)	1, 2, 13	1, 6			2	2
6 (a)	3	2		5		5
6 (b)	3, 4, 12	2, 6		5		5
6 (c)	4	2			4	4
6 (d)	1, 7	1, 4			5	5
TOTAL			**19**	**36**	**45**	**100**

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QUESTION 1 **(11 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part (a)	1, 2, 12		3		3
Part (b)	4, 6	2			2
Part (c)	1, 4, 6, 12			6	6
Total		2	3	6	11

Question

It is valuation time at the Australian life company that you work for and you are involved in the valuation of a unit-linked product released to the market exactly one year ago. This is the only unit-linked product written by the company and the product is in its own Statutory Fund.

This product has an Administration Fee of 1.4% p.a., charged on a monthly basis as a percentage of the account balance. This is designed to cover the servicing expenses and support the product's profitability.

The best estimate assumption for servicing expenses used to price the product was 1.0% p.a., expressed as a percentage of account balance.

A recent expense analysis has indicated that the actual servicing expenses incurred during the year, calculated as a percentage of account balance, were 1.5% p.a.

The chief valuation actuary has decided, after a significant amount of argument with the CFO and the Board, to use the pricing assumption for servicing expenses in the valuation of policy liabilities. It has also been decided that the capital adequacy assumption for servicing expenses will be the pricing assumption plus a margin of 3%.

The rationale for choosing these assumptions is that:

- **the business is new and the expenses will settle down over time; and**
- **30% of all servicing expenses incurred during the year were spent on training the staff who manage the business, which is considered to be one-off in nature.**

Comment on the appropriateness of the following for your company:

(a) **The use of the pricing assumption for servicing expenses in the valuation of policy liabilities;** **(3 marks)**

(b) **The use of the pricing assumption for servicing expenses as the base to which a margin is applied for the capital adequacy assumption** **(2 marks)**

(c) **The margin applied to the assumption for servicing expenses for capital adequacy purposes.** **(6 marks)**

QUESTION 1: SOLUTION (11 Marks)

(a) Use of pricing assumption in the valuation of policy liabilities:

- The actual expense ratio adjusted for the one-off is 1.05%, which is above the best estimate being used. This would indicate that even after completely excluding the training cost, the profit is being eroded.
- Some staff will leave and new staff will require training. Thus there will be some ongoing training costs and even if an aggressive view was taken, these shouldn't be removed in their entirety. The fact that the cost of training was included in the analysis as a servicing expense confirms this view.
- On the other hand, economies of scale may reduce the servicing expense as a percentage of account balance as the business grows.
- AS1.03 states that the best estimate assumption should be the actuary's best estimate of servicing expenses over the coming year. It is not a long term view of expenses, i.e. should not be based on the view that expenses will settle down over time.

Marking guide:
- **1 mark for adjusted assumption above best estimate;**
- **1 mark for staff turnover and training issues;**
- **1 mark for economies of scale;**
- **1 mark for requirements of AS1.03;**
- **1 mark for any other reasonable points made;**

to a maximum of 3 marks (SJ).

(b) Use of pricing assumption as the base for the capital adequacy assumption:

- AS 3.03 states that the cap ad assumption for servicing expenses should be a margin that is applied to the greater of:
  - Actual expenses for the last 12 months adjusted for any one-off expenses; and
  - The Best Estimate assumption for the next 12 months.

  The greater of these two is the actual expense adjusted for one-off's for the last 12 months, so this is the minimum that should be used, i.e. 1.5% x 70% = 1.05%.

- The one-off adjustment is suspect due to the nature of the expenses being more in line with initial costs, with ongoing training being required. Thus it would be reasonable to think that the best estimate of what will be spent in the following 12 months would be likely to be somewhere between 1.05% and 1.5%.

Marking guide:
- **1 mark for requirements of AS3.03;**
- **1 mark for BE for next 12 months should be higher given information known;**

to a total of 2 marks (KU).

(c)

Overall, the 3% margin on servicing expenses (which is marginally above the minimum required margin of 2.5%) would seem inadequate based on the following:

- Since the business is new and there is no expense analysis or history of expense experience for this product, there is a degree of uncertainty around the true expenses.
- Even after assuming that all of the training costs are one-off in nature, the product is already over-budget on the adjusted basis.
- There is no clear evidence of expense management, which is important due to the low margins for this type of business.
- The expense risk is high due to the reliance on the difference between fees and expenses to provide profit.
- The base assumption which is used for the capital adequacy calculation is not adequate and below the required assumption for capital adequacy purposes.

Hence, a margin closer to the high margin of 20% would be expected due to the higher risk exposure. However, economies of scale may reduce expenses as a % of account balance going forward.

Marking guide:
- **1 mark for uncertainty;**
- **1 mark for already over-budget;**
- **1 mark for low margin business;**
- **1 mark for fees-expenses to provide profit;**
- **1 mark for best estimate below the assumption required for capital adequacy;**
- **1 mark for any other reasonable points made;**
- **1 mark for discussion of minimum and high margins;**
- **1 mark for recommendation;**

to a maximum of 6 marks (CJ).

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QUESTION 2 **(20 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	5	2			2
Part b)	5		8		8
Part c)	2A, 1		4		4
Part d)	2A, 1,12		3		3
Part e)	2A, 1			3	3
Total		2	15	3	20

Question

You are a valuation actuary at ABC Ltd, a large life insurer writing a wide range of business including an old portfolio of non-participating endowment insurance policies with the following characteristics:

- **in-force annual premium ("IFAP") is 2% of the total IFAP of the company;**
- **premiums are level and payable throughout the lifetime of the policy;**
- **the average term to maturity is currently 5 years;**
- **the product is closed to new business;**
- **the assumed surrender rate is 18%, based on past experience;**
- **a refund of premiums with interest is paid on surrender; and**
- **the ratio of total surrender value to policy liability for this portfolio is 50%.**

It is now the end of the financial year and you have been provided with the following information:

	Cash flows in $'000						Reserves in $'000	
	Premium	Expenses	Death claims	Surrender Claims	Maturity Claims	Interest	Policy Liability	Policy Liability
	BOY	BOY	EOY	EOY	EOY	EOY	BOY	EOY
Expected	1,557	195	289	934	0	215	1,801	1,937
Actual	1,557	125	289	700	0	210	1,801	2,401

Note: 'BOY' means beginning of year and 'EOY' means end of year.

(a) Calculate the expected profit and the actual profit for the financial year. **(2 marks)**

(b) Perform an analysis of profit. **(8 marks)**

(c) Due to the small size of the endowment portfolio in terms of IFAP, the policy of ABC Ltd is to review the assumptions for this portfolio every 5 years. The last review was performed 4 years ago. Comment on the appropriateness of ABC's policy of 5-yearly assumption reviews for this portfolio.
(4 marks)

(d) Comment on the appropriateness of the surrender rate assumption.
(3 marks)

(e) Explain how the lower than expected surrenders affect the policy liabilities by considering each of the items which are used to calculate the policy liability.
(3 marks)

QUESTION 2: SOLUTION (20 marks)

(a)

	Expected $'000	Actual $'000
Premium received	1,557	1,557
Investment earnings	215	210
Death claims	289	289
Surrender claims	934	700
Maturity claims	0	0
Expenses	195	125
Increase in Policy Liability	136	600
Profit	218	53

Marking guide:
- **1 mark for cash flow items;**
- **1 mark for movement in PL;**

to a total of 2 marks (KU).

(b) Analysis of profit

Expected earning rate = 215 / (1,557 – 195 + 1,801) = 6.80%
Actual earning rate = 210 / (1,557 – 125 + 1,801) = 6.50%

Investment result = (6.50% - 6.80%) * (1,557 – 125 + 1,801) = -9.7
Expense result = (195 – 125) * (1 + 6.8%) = 74.8
Death claims result = 0
Surrender claims result (cash flow) = 934 – 700 = 234
Surrender claims result (reserve) = -(234 * 2) = -468 (since the policy liability is twice the surrender value)
Maturity claims result = 0

Total explained = -9.7 + 74.8 + 234 – 468 = -168.9
Untraced = 168.9 – 165 = 3.9

Marking guide:
- **1 mark for earning rate;**
- **1 mark for investment result;**
- **1 mark for expense result;**
- **1 mark for death & maturity results;**
- **1 mark for surrenders cash flow result;**
- **1 mark for impact of surrenders on PL result;**
- **1 mark for total explained;**
- **1 mark for untraced;**

to a total of 8 marks (SJ).

(c) 5-yearly reviews

- Review for assumption change can be a major undertaking, so the potential benefits must be weighed up against the resources required.
- However, inaccurate assumptions could lead to large experience profits or losses, which would likely require analysis and explanation for the auditors / Board further down the road.
- As these policies approach maturity it becomes less likely that policyholders will choose to surrender them. This will have an impact on expected surrenders and the expenses associated with surrenders and a review of these assumptions should be undertaken.
- The policy, regarding the frequency of review of assumptions based on IFAP, may not be appropriate since IFAP does not always reflect the profit potential of a product. In this particular case while IFAP is small, the liabilities are quite large and the impact of inaccurate assumptions could be significant.
- Changes in the market environment (such as tax, new products being launched, interest rate environment) could have a significant impact on surrender rates, which should be investigated as they occur.

Marking guide:
- **1 mark for effective resource use;**
- **1 mark for more analysis later;**
- **1 marks for decreasing surrender rate as policies mature;**
- **1 mark for inappropriateness of IFAP as trigger;**
- **1 mark for impact of market changes on assumptions;**
- **1 mark for other relevant points;**

to a maximum of 4 marks (SJ).

(d) Surrender rate assumption

- The current year experience, although limited, suggests that the assumption is out of date.
- In addition, a surrender rate for a block of endowment policies approaching maturity should take the term to maturity into account and a sliding scale should be adopted.
- This is particularly true in this case where the same surrender value formula is used regardless of the term to maturity (i.e. a pre-maturity formula is not used), which would make policyholders even less likely to surrender as the policy approaches maturity.
- It may even be appropriate to assume zero surrenders for policies that are close to maturity.

Marking guide:
- **1 mark for experience suggesting lower surrender rate than assumed;**
- **1 mark for decreasing surrenders approaching maturity and sliding scale;**
- **1 mark for recognising effect of SV formula;**
- **1 mark for zero surrenders close to maturity;**
- **1 mark for other relevant points;**

to a maximum of 3 marks (SJ).

(e) The lower than expected surrenders affect the policy liability as follows:

- The lower surrenders have resulted in a higher than expected number of lives in-force at the end of the year;
- The higher than expected number of in-force lives results in an increase in expected future claims and maturities;
- The higher than expected number of in-force lives also results in a pro rata increase in premiums.
- As PV premiums is lower than PV death claims and maturities, the policy liability will increase on a per policy basis.

Marking guide:
- **1 mark for increase in number of policies in-force;**
- **1 mark for increase in future claims and maturities;**
- **1 mark for increase in premiums;**
- **1 mark for net effect of PV of changed future cash flows;**

to a maximum of 3 marks (CJ).

QUESTION 3 **(16 Marks)**

Analysis

Component	**Aim**	**KU**	**SJ**	**CJ**	**Total**
Part (a)	1, 4	10			10
Part (b)	3		3		3
Part (c)	1, 3, 4			3	3
Total		10	3	3	16

Question

Retro Funds Management is a large funds manager with a small life insurance subsidiary writing only Yearly Renewable Term Insurance.

It is the end of the current financial year and you have been asked to calculate the Solvency Reserve for this business in accordance with the Australian Solvency Standard (AS2.03).

You have been provided with the following valuation information and assumptions (all figures are in $'000):

- **the statutory fund currently has assets of 6,530 which are invested 20% in a mixed portfolio of Australian equities and 80% in zero coupon bonds with a term to maturity of exactly 1 year;**
- **the dividend yield on equities is 4.0% and the yield on the zero coupon bonds is currently 4.5%;**
- **the tax rate is 30% and expenses will be fully deductible in a solvency situation;**
- **the full Management Capital offset is available in accordance with AS6.02;**
- **the acquisition expenses for the current financial year are as follows:**

  – **18,675 commission paid to agents**
  – **7,145 marketing department salary**
  – **6,100 underwriting department salary**
  – **11,325 advertising expenses**
  – **2,641 other fixed acquisition expenses**

- **the policy liability is -39,358;**
- **the solvency liability is -50,058;**
- **there are no other liabilities or inadmissible assets; and**
- **all premiums are paid monthly and no refunds or surrender values are available.**

(a) Calculate the Solvency Requirement. **(10 marks)**

(b) Shortly after the year end the Reserve Bank has increased interest rates in Australia by 1.5% p.a. This has had a flow on effect to nervous equity markets where values have fallen by 15%.

Determine your solvency position, assuming the resilience reserve does not change. (3 marks)

(c) Suggest some practical measures the company could employ to reduce its risk position in relation to its solvency position. (3 marks)

QUESTION 3: SOLUTION (16 Marks)

(a)

Solvency liability = - 50,058
MTV = 0, since no refunds or surrender values apply.

Expense Reserve is calculated as (1- tax rate) * fixed acquisition expenses for this year's new business, less the Management Capital offset.

= (1-30%) * (7,145 + 6100 + 2,641) – 5,000
= 6,120

Resilience Reserve is calculated as:

	% of assets	**Yield**	**Adverse Change**		**DF**	**Adjusted Yield**	**A'**
Equity	20	4.0%	1.25%	E = 0.0625	0.842189	5.0527%	968.98
FI	80	4.5%	1.75%	F = 0.0134		5.9738%	4,827.91

RR = 6,120 * (6,120 / (969 + 4,828)) – 6,120
= 341

Note that L' = L since the solvency liability to this point consists solely of the expense reserve which has a duration of 0.

Solvency Requirement is calculated as:

	$'000
a) Solvency Liability	- 50,058
b) MTV	0
c) Max of a) and b)	0
d) = c) + Expense Reserve	6,120
e) Max of d) and CTV	6,120
f) = e) + Other liabilities	6,120
g) = f) + Resilience reserve	6,461
h) = g) + Inadmissible assets	6,461
i) Max of h) and Policy Liability	6,461

Marking guide:
- **1 mark for MTV = 0;**
- **2 marks for expense reserve;**
- **2 marks for DF;**
- **3 marks for A';**
- **1 mark for RR;**
- **1 mark for final liability figure;**

to a total of 10 marks (KU).

(b)

The asset position is calculated as follows:

$'000	**Old Value**	**New Value**	**Working**
Equity	1,306	1,110	= 1,306 * 0.85
Fixed Interest	5,224	5,150	= 5,224 * 1.045 / 1.06
Total	6,530	6,260	

The solvency requirement will remain constant at 6,461 since the expense reserve is unaffected by asset movements.

Therefore the Solvency Requirement has been breached as the value of assets is now below the 6,461 required. While the assets are sufficient to support the expenses of the company, they are no longer sufficient to support the required reserve.

Marking guide:
- **1 mark for new value of assets;**
- **1 mark for unchanged solvency requirement;**
- **1 mark for recognising the breach;**
- **1 mark for recognising that the assets are sufficient to pay the expenses, i.e. asset mismatch is the cause of solvency breach;**

to a maximum of 3 marks (SJ).

(c) Some practical measures to reduce the risk with regards to the solvency position include:

- Holding assets in cash would provide a better match and reduce the resilience reserve since the expense reserve has an effective duration of zero.
- Hold additional capital in this fund to support risky assets and allow higher return potential.
- Invest in derivative positions to place a floor on the value of assets.
- Investigate whether any acquisition expenses can be reallocated as servicing expenses to reduce the expense reserve.

Marking guide: 1 mark for each point made plus any other reasonable suggestions to a maximum of 3 marks (CJ).

QUESTION 4 **(18 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part (a)	1, 3, 9, 11		5		5
Part (b)	1, 3, 7, 8, 9			8	8
Part (c)	1,2 3,4,9,11	5			5
Total		5	5	8	18

Question

You work for the Asian subsidiary of an American life insurance company. This company has one Statutory Fund and only sells level premium guaranteed term insurance that provides lump sum benefits. This product is characterised by very high initial commissions paid to agents (150% of first year's premium) and is experiencing rapid growth as a result.

The subsidiary is required to report the profit of its Statutory Fund on a Statutory Reporting Basis, being a cash accounting basis, as follows:

Statutory profits:	**Premiums received + Investment Income – Commission – Expenses – Claims paid – Tax paid – Increase in Statutory Reserve**

Investment Income assumes assets are held at market value and includes unrealised capital gains and losses. The Statutory Reserve is set by the regulator as the minimum capital requirement and is calculated as follows:

Calculation method:	**Gross premium valuation**
Mortality assumption:	**Company's best estimate assumption plus 25%**
Expense assumption:	**Company's most recent year of experience plus 25%**
Interest Rate assumption:	**Previous year's 10 year Government bond yield (7%) less 2%**

The subsidiary is also required to report the profits of its Statutory Fund to its parent using a change in Embedded Value basis. The Embedded Value comprises:

Net Worth:	**Market Value of Assets – Statutory Reserve**
Value of In-Force:	**The present value of future profits on a Statutory Reserve Basis at a risk discount rate of 15% p.a.**

It is proposed that in the future, profits of the subsidiary will be passed on to the American parent based on the change in Embedded Value.

(a) Explain why the profit calculated on the Statutory Reporting Basis may not accurately reflect the subsidiary's performance for a particular year.
(5 marks)

(b) Compare the Statutory Reporting Basis and the Embedded Value basis of reporting profit and discuss any problems that the use of two different bases would cause with regard to repatriation of profit. **(8 marks)**

(c) Discuss the similarities and differences with regard to capital requirements between the Statutory Reserve and the Capital Adequacy Requirement (AS3.03) for this subsidiary.
(5 marks)

QUESTION 4: SOLUTION **(18 Marks)**

(a) The profit calculated on a Statutory Basis may not accurately reflect the subsidiary's performance for the following reasons:

Unrealistic assumptions:
- The reserves are calculated using conservative assumptions and would therefore defer the release of profits.
- The statutory reserve is a conservative liability and could result in significant new business strain if sales are high.

Cash accounting:
- IBNR. Delays in the processing of claims may lead to fewer claims being paid and therefore increased profits in an earlier year.
- RBNA / outstanding claims. Delays in the payment of claims would also lead to increased profits in an earlier year.
- Premiums earned but not received. Delays in the collection or processing of premiums will result in reduced profits.
- Other liabilities. Movements in liabilities other than the Statutory Reserve will not be captured in the profit.

Marking guide:
- **1 mark for conservative assumptions resulting in deferral of profit;**
- **1 mark for new business strain;**
- **1 mark for IBNR;**
- **1 mark for RBNA;**
- **1 mark for premium earned but not received;**
- **1 mark for other liabilities;**
- **1 mark for any other relevant points;**

to a maximum of 2 marks (SJ) for unrealistic assumptions and a maximum of 3 marks (SJ) for cash accounting.

(b) A comparison of the Statutory Reporting Basis and the Embedded Value basis is as follows:

- Looking at existing business only (i.e. excluding any new business written during the year)

  Statutory profit = cashflow + change in SR
  Change in EV $= VIF_1 - VIF_0 + NW_1 - NW_0$
  $= VIF_1 - VIF_0 +$ statutory profit

  – Since VIF1 < VIF0, (for existing business) the statutory profit is going to be higher than the change in EV.

  – An alternative way of expressing the difference is that the release of the margins in the Statutory Reserve over time is likely to be greater than a 15% return on the VIF (on the EV basis).

- Regarding the value of new business added during the year:
  – Using the statutory reporting basis, new business written will have a large cash outflow at inception due to high initial commission. The Statutory Reserve will not offset this cash outflow because of the margins incorporated in the Statutory Reserve. Hence new business will cause a loss in the first year, followed by profits in later years.
  – Assuming that new business written is profitable, this will have a positive impact on EV – net worth will reduce due to the initial cash outflow, but the present value of future profits will more than offset that. Given that the company is growing rapidly, EV would be going up substantially during the year.
  – The key point is that the change in EV recognises future profits in the current year, while the Statutory Reserving Basis does not. Hence any new business written will have a positive effect on EV and a negative effect on profit.

The problems with using two different bases with regard to repatriation of profit are:

- The company may not be able to repatriate profits based upon a change in EV if there is a lot of new business written, given that the statutory reserving basis is mandatory and cannot be breached.
- As the company has been experiencing rapid growth, problems with repatriation are likely because of high capital requirements.
- There may be local regulations limiting the distribution of profit which don't correspond to the EV basis.

Marking guide:
- **3 marks for any reasonable explanation of difference in existing VIF;**
- **4 marks for difference in NB;**
- **1 mark for net impact;**
- **1 mark for regulatory restrictions;**
- **1 mark for any other reasonable points made;**

to a maximum of 8 marks (CJ).

(c) Similarities and differences between the Statutory Reserve and the Capital Adequacy Requirement:

Similarities:

- Margins applied to best estimate assumptions in both;
- Both specify a minimum amount of capital that a company is required to hold.

Differences:

- Discount rate in SR is based upon Government Bond yield. Cap Ad is based upon expected earning rate for backing assets;
- No allowance made for certainty around assumptions under SR – Cap Ad specifies a range;
- No current termination value requirement under SR;
- No explicit new business reserve under SR;
- No allowance for other liabilities under SR;
- No allowance for inadmissible assets under SR;
- No allowance for asset-liability mismatch under SR (resilience under Cap Ad).

Overall, the Statutory Reserve is similar to the Capital Adequacy Requirement, but does not have the additional reserves and tests that comprise the Capital Adequacy Requirement.

Marking guide:
- **1 mark for margins to BE assumptions;**
- **1 mark for minimum capital requirement;**
- **1 mark for discount rate;**
- **1 mark for no allowance for certainty of assumptions;**
- **½ mark for CTV;**
- **½ mark for NB reserve;**
- **½ mark for other liabilities;**
- **½ mark for admissibility of assets;**
- **½ mark for resilience reserve;**
- **1 mark for any other relevant points made;**

to a maximum of 5 marks (KU).

QUESTION 5 (16 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	5			6	6
Part b)	5			8	8
Part c)	1, 2, 13			2	2
Total				16	16

Question

You are an actuary working for Benevolent Funds Group (BFG), a global funds manager and life insurer operating throughout Europe and Asia.

The company has decided to introduce a Long-term Care product into an Asian market with a regulatory requirement that profit from participating business be split between policyholders and shareholders on an 80/20 basis, identical to the Life Insurance Act 1995 in Australia.

The main features of the product are:
- **pays for medical and carer expenses if the policyholder becomes disabled for any reason, including old age;**
- **benefit payments are made monthly and are subject to an annual benefit limit;**
- **the policy must be purchased with a single premium before the 65th birthday;**
- **the policyholder is underwritten at purchase; and**
- **no surrender value or death benefit is payable.**

Your company's pricing stance is to load all assumptions to ensure the product is highly profitable due to its long-term nature and uncertainty around the assumptions used for pricing. There are, as yet, no competitors issuing a similar product in your market.

A suggestion has been made that a bonus system be implemented on these contracts to return excess profit to loyal policyholders. The suggested method is as follows:
- **a cash bonus would be paid to all in-force policyholders that are not on claim at the end of the financial year;**
- **the bonus amount would be a percentage of the annual benefit limit;**
- **the company would aim to pay a smooth bonus rate from one year to the next.**

(a) Provide reasons for and against the proposal to make this a participating product. **(6 marks)**

(b) Discuss the equity issues raised by the proposed bonus distribution method. **(8 marks)**

(c) How could customer/market behaviour change should this product prove to be popular with consumers and what could the impact be on assumptions? **(2 marks)**

QUESTION 5: SOLUTION **(16 marks)**

(a) Opinion on sharing of profit

Reasons for sharing with policyholders:

- Policyholder shouldn't have to pay for excessive risk margins:
  - If the true assumptions, or something close to them were known, the premium would be able to be calculated more accurately.
  - The policyholder should not be penalised by excessive premiums to cover the company's lack of confidence.
  - The source of any 'super' profits would be from the additional premiums provided by the policyholders.
- Sharing the profits rewards policyholders for not claiming, providing a disincentive to make smaller claims.
- Profit sharing has the effect of discouraging lapses on policies with good experience.
- A participating product may be easier to sell.
- Risks associated with a new benefit are shared with the policyholder. Premiums would need to be loaded for expected bonuses.

Marking guide:
- **1 mark for sharing profit from excessive risk margins;**
- **1 mark for disincentive to claim;**
- **1 mark for disincentive to lapse;**
- **1 mark for easier to sell;**
- **1 mark for sharing the risk;**
- **1 mark for any other reasonable arguments;**

to a maximum of 3 marks (CJ).

Reasons against sharing with policyholders:

- The assumptions used are very conservative to cover risk, which is borne by the shareholders. Hence any profits should go to shareholders since they took on the risk.
- The product is more complicated, hence harder to explain to the market and harder to administer. The company should therefore load premiums for this additional risk.
- If the market accepts this product as being fairly priced, there is no reason to share profits with policyholders.

Marking guide:
- **1 mark for conservative to cover risk;**
- **1 mark for complication of product;**
- **1 mark for purchase means fair price for risk ceded;**
- **1 mark for any other reasonable arguments;**

to a maximum of 3 marks (CJ).

(b) Equity

Equitable because:
- policyholders with larger policies receive larger bonuses;
- policyholders who claim early share in fewer distributions;
- policyholders who die without claiming receive a share of the profit they have contributed to prior to their death.

Inequitable because:
- policyholders who claim one day before year end will not receive a bonus for that year;
- policyholders who have contributed to good experience and the build up of equalisation reserves over many years no longer receive a distribution once on claim;
- policyholders who die very soon after commencement forfeit the entire single premium, which goes toward the profit of others;
- the investment experience profit does not get shared with policyholders who are on claim, even though they paid the premium and contributed to the return;
- older policyholders will pay a higher premium while receiving the same benefits as younger policyholders. Since the bonus is distributed by benefit amount, the distribution is inequitable to older policyholders that paid a larger premium and contributed more to the investment experience profit;
- if the product is re-priced in the future there is no equity between the different generations of policyholders;
- Future re-pricing to reflect more certainty around assumptions also disadvantages shareholders, as the reason for the bonus scheme will no longer be applicable.

Marking guide:
- **1 mark for equity with respect of size of policy;**
- **1 mark for those claiming early receive fewer profits;**
- **1 mark for those dying without claiming receiving some profit;**
- **1 mark for not taking into account timing of claims;**
- **1 mark for issue with losing past value once on claim;**
- **1 mark for those dying early in contract forfeiting large share of profit;**
- **1 mark for inequity of investment experience distribution;**
- **1 mark for inequity by age;**
- **1 mark for re-pricing policyholder inequity;**
- **1 mark for re-pricing shareholder inequity;**
- **1 mark for any other reasonable points made;**

to a maximum of 2 marks (CJ) for equitable aspects and a maximum of 6 marks (CJ) for inequitable aspects.

(c) Change in behaviour and flow-on impacts to assumptions:

- The ability to claim may encourage some people to obtain assistance when they wouldn't if they were paying themselves, increasing incidence assumptions.
- The presence of the policies may encourage the prolongation of treatment or over-servicing of patients by medical carers, thus lowering termination assumptions.
- The presence of these policies may encourage the growth of industries to service the market, ultimately reducing costs due to competition and efficiencies.
- Margins for uncertainty may be able to be reduced given growth in experience.

Marking guide:
- **1 mark for encouraging claiming;**
- **1 mark for prolonging treatment;**
- **1 mark for industries to service;**
- **1 mark for reduction in margins for uncertainty;**
- **1 mark for any other reasonable points made;**

to a maximum of 2 marks (CJ).

QUESTION 6 **(19 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	3		5		5
Part b)	3, 4, 12		5		5
Part c)	4			4	4
Part d)	1, 7			5	5
Total			10	9	19

Question

Transit Life (TL) is a medium sized Australian life insurer. The company has three Statutory Funds, two of which are open to new business. Statutory Fund No.1 (SF1) is closed to new business and has a collection of liabilities including traditional policies and capital guaranteed investment account business.

The company is currently up for sale. SF1 makes up 40% of the current appraisal value of the company.

The asset allocation backing the valuation of liabilities of SF1 is as follows:

Asset class	Value $million	Percent
Australian Equity	171.6	52%
Overseas Equity	16.5	5%
Australian Property	33.0	10%
Australian Fixed interest	59.4	18%
Overseas Fixed Interest	26.4	8%
Cash	23.1	7%
Total	330.0	100%

The policy liability for SF1 is $315 million and the Capital Adequacy Requirement is $325 million, including a Resilience Reserve of $16 million. No reserve is held for inadmissible assets.

The company's SF1 investments include a $16.5 million holding of government debt of Avada, a small country in Asia which has particularly attractive long term bond yields. The company's SF1 property and equity investments are well diversified.

(a) **Give your opinion on the suitability of this asset allocation.** **(5 marks)**

(b) **Comment on whether there is any evidence that the company is non-compliant with the Resilience Reserve and admissibility of assets requirements of AS3.03.** **(5 marks)**

An article in this morning's news has caught your eye. There has been a coup in Avada and the new government has announced it will seize all foreign investments in its country, with these assets becoming the property of the new government.

(c) Comment on the solvency position of SF1 following the coup and suggest possible courses of action. (4 marks)

(d) How will the coup, and any actions taken following the coup, affect the company's appraisal value? (5 marks)

QUESTION 6: SOLUTION (19 marks)

(a) Asset allocation

The assets are 67% growth and 33% defensive.

This is inappropriate for a closed book of these types of liabilities, because:

- Only 1.5% of the assets of the fund are free – i.e. above the cap ad requirement. This is a small level of free reserves to support such a risky investment strategy.
- There is a growing durational mismatch between assets and liabilities. The closed book means that there are no new funds to invest, which gradually reduces the duration of the liabilities whereas the assets held have fairly long durations.
- The traditional liabilities are likely to have reasonably long durations. While the growth of participating liabilities can be managed using the bonus rates, there is a minimum legal amount payable that could be compromised with such a high level of risky assets.
- The investment account can be managed using the crediting rate and any discretion available, however there is a much higher risk of a (or a series of) negative returns with such a risky investment allocation, thus risking the guarantee.
- The market for the products in SF1 is in run-off, hence there is little competitive pressure to generate the highest possible returns.
- The holding of 13% of fund assets in overseas investments when liabilities are denominated in $AUD would expose the fund to a high degree of currency risk alone, which would not be suitable.
- 5% of the fund held in essentially one asset is quite large for any fund.

Marking guide:

- **1 mark for free reserves;**
- **1 mark for closure effect on duration;**
- **1 mark for minimum legal payments;**
- **1 mark for risk to guarantee;**
- **1 mark for recognising competitive situation;**
- **1 mark for mentioning currency margin;**
- **1 mark for concentration of Avada asset;**
- **1 mark for any other reasonable points made (note various opinions as to suitability are valid);**

to a maximum of 5 marks (SJ).

(b) Evidence that the company is not compliant with the Resilience and Inadmissible Assets Reserves of AS3.03 includes:

- The asset concentration risk in respect of AS 3.03 10.3.1 i) is not breached as the total assets in Avada do not exceed 5%.
- Given that equity and property assets are diversified, a breach of AS 3.03 10.3.1 is not likely.
- The actuary has the scope under AS 3.03 10.3.2 to increase the reserve where the prescribed reserve does not adequately address the risks, particularly credit risk. Arguably this should have been employed, but hasn't.
- Hence there is no evidence that an inadmissible assets reserve should be held.
- AS 3.03 11.8.1 requires an additional margin to be held for the effect of currency risk. This margin is 15% of all currency risk exposed assets. In this case this is $6.435 million. It appears likely that the resilience reserve includes this margin.
- Hence there is no evidence that the company is non-compliant with these provisions of AS3.03, but only just. It is debatable whether an additional reserve should be held under 10.3.2 of AS3.03.

Marking guide:
- **1 mark for Avada asset concentration;**
- **1 mark for diversified equity & property portfolio;**
- **1 mark for scope to increase 10.3.2;**
- **1 mark for currency risk margin in RR;**
- **1 mark for no evidence of non-compliance;**
- **1 mark for any other reasonable points made;**

to a maximum of 5 marks (SJ).

(c) The solvency position of SF1 post coup is as follows:

- The asset value backing liabilities is now $313.5 million. The policy liabilities are $315 million, hence the fund is insolvent.
- Possible courses of action include:
  - investigate the use of discretions to see if the value of policy liabilities can be adjusted, such as cutting terminal bonuses;
  - reduce distribution of shareholder profit margins;
  - seek capital from other statutory funds and the shareholders' fund;
  - shift to less risky assets to reduce the resilience reserve and the amount of capital to be raised;
  - seek capital from outside sources.

Marking guide:
- **1 mark for asset position and breached solvency;**
- **1 mark for considering discretion available for liabilities;**
- **1 mark for shareholders' fund capital or transfers from other statutory funds;**
- **1 mark for raising capital;**
- **1 mark for lower resilience;**
- **1 mark for any other reasonable points made;**

to a maximum of 1 mark for correct solvency position and a maximum of 3 marks for courses of action (CJ).

(d) Appraisal value

- The net worth will decrease as the free assets of this statutory fund have been eroded and free assets from other statutory funds will possibly be required.
- The fund concerned is closed to new business, so this change will not affect the business prospects of this fund.
- The reputational impact, though, would impact on the new business prospects of the company as a whole. This would justify lower new business volumes which would reduce the appraisal value.
- The risk discount rate is likely to increase to reflect the exposure of:
  - management’s attitude to risk; and
  - possible lack of internal controls and operational risk.
- Alternatively the risk discount rate may fall:
  - Arguably the risks taken by management were already factored into the risk discount rate. Now that the company is no longer exposed to Avada, the risk discount rate may fall.
- The discretion around the bonus rate could result in a flow on effect to the ability to distribute profit to shareholders (80/20 Act restrictions). Even though profit margins could be changed when bonus rates change, they cannot change to the extent that more than 20% of profit is distributed to shareholders. This would potentially reduce the VIF.
- Overall the AV would be expected to reduce.

Marking guide:
- **1 mark for reduced net worth;**
- **1 mark for no effect on VNB of this stat fund;**
- **1 marks for impact on NB volumes for other stat funds;**
- **2 marks for risk discount rate change;**
- **1 mark for 80/20 effect if reduce bonus rates;**
- **1 mark for overall effect;**
- **1 mark for any other reasonable points made;**

to a maximum of 5 marks (CJ).

END OF SOLUTIONS