INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **MAY 2007 EXAMINATIONS**

MARKING GUIDE

Level of Difficulty

Question	Syllabus Aims	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1 (a)	1, 8	1,3	6		1	7
1 (b)	1, 8	1,3		6		6
1 (c)	1, 8, 13, 14	1, 3, 4			4	4
2 (a)	1, 2, 4	1, 2	4			4
2 (b)	9, 10, 11	3		4		4
2 (c)	4, 5, 7	2			4	4
2 (d)	12, 13, 14	4		3		3
3 (a) (i)	2, 4, 8	1, 2, 3	4			4
3 (a) (ii)	2, 4, 8	1, 2, 3		4		4
3 (b)	4, 7	2			5	5
3 (c)	2, 3, 4, 9	1, 2, 3			4	4
4 (a)	1, 2, 3, 12	1, 4	5			5
4 (b)	4, 6, 12, 13	2, 4			5	5
4 (c)	9, 10, 11, 14	3, 4		5		5
4 (d)	9, 10, 11, 14	3, 4		3		3
5 (a)	8, 11	3	1			1
5 (b)	8, 9, 11, 13	3, 4		4		4
5 (c)	8, 11, 13	3, 4			3	3
5 (d)	6, 8, 14	2, 3, 4		3		3
5 (e)	11, 14	3, 4			5	5
6 (a)	1, 4, 8, 15, 16	1, 2, 3, 5		5		5
6 (b)	2, 7, 8, 15, 16	1, 2, 3, 5		4		4
6 (c)	3, 4, 7, 15, 16	1, 2, 3, 5			4	4
6 (d)	2, 4, 8, 15, 16	1, 2, 3, 5			4	4
TOTAL			**20**	**41**	**39**	**100**

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **MAY 2007 EXAMINATIONS**

QUESTION 1 **(17 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	1, 8	6		1	7
Part b)	1, 8		6		6
Part c)	1, 8, 13, 14			4	4
Total		6	6	5	17

Question

You are the appointed actuary of Risk Management Mutual (RMM), a medium sized Australian life insurance company specialising in risk products. RMM launched its first trauma product in 2001. The trauma rates used in the original pricing basis were based on the results from the IAAust Lump Sum Experience Investigation 1998-99. There are 43,486 policies in force for this product at the most recent valuation date.

You have recommended to RMM's Management Team that the morbidity experience for the trauma block of business be investigated, and it has been agreed that the work be done by one of the recent graduates who have joined RMM.

The nominated graduate is an actuarial student with no practical involvement so far in experience investigations, but has passed all of the Part I actuarial subjects, including those covering statistics, life tables and exposed to risk calculations.

To ensure the work is carried out in accordance with your requirements, as well as to document the process, you have agreed to provide the graduate with instructions.

a) **Draft a memo to the graduate, outlining clearly the main steps in the experience investigation that you expect the graduate to follow, from obtaining requirements to producing the results.** **(7 marks)**

b) In the following table the graduate has compared RMM's experience to the corresponding trauma results included in the IAAust Lump Sum Experience Investigation 1998-99. Describe the main features of these results from the point of view of RMM. (6 marks)

Curtate Duration	Ratio (%) of actual to expected claims by curtate duration.			
	Males		Females	
	IAAust 1998-99	RMM 2001-06	IAAust 1998-99	RMM 2001-06
0	53	65	68	78
1	66	70	67	76
2	62	63	68	74
3	59	61	84	68
4	58	61	61	65
5 – 9	54		67	
10 +	75		53	
5 +	55 (6)		66 (9)	
2 +	59 (3)	62 (45)	70 (4)	71 (68)

Notes:

- **Estimated standard errors are shown in parentheses.**
- **The same (population) incidence basis has been used throughout this table to calculate expected claim numbers.**

c) Explain the implications of these results for the profitability and re-pricing of the company's product. (4 marks)

QUESTION 1 : SOLUTION **(17 marks)**

(a) Memo to: Actuarial Graduate
From: Appointed Actuary
Date: 8 May 2007
Subject: Experience Investigation – RMM's Trauma Product

As discussed, it has been agreed that you should carry out an investigation of the morbidity experience for this product, which was first launched in 2001 and now has over 43,000 policies in force. For task assurance and documentation purposes, I have agreed to provide you with the following instructions.

An outline of the main steps that I expect you to follow is –

- Obtain copies of past investigations and related technical and peer reviews.
- Obtain copies of any methodology documents available for past investigations.
- Identify in force data requirements and obtain in force data from (…the relevant area: this may be Admin and/or IT, depending on particular organisation).
- Identify claims data requirements and obtain claims data (incl. reinsurance) from (…the relevant area: this may be Claims and/or IT, depending on the particular organisation).
- Identify financial/revenue information requirements and obtain claims data from (…the relevant area: this may be Accounts and/or IT, depending on the particular organisation).
- Check the data for obvious inconsistencies, and investigate and rectify any issues (e.g. dates, periods, products included/excluded).
- Split the in force data into the main groupings, i.e. by curtate duration and gender. Splitting the data any further than this, as the number of policies in force is small, could result in highly unreliable and possibly spurious results with large estimated standard errors.
- Work out the exposed-to-risk for each group using the appropriate methods that you have learnt from your Part I actuarial studies.
- Obtain the expected underlying incidence basis (this is usually population data by cause of claim) and identify the causes covered by our product, to calculate the assumed incidence basis for use.
- Multiply the exposed to risk by the assumed/expected incidence basis, to obtain the expected claims values.
- Split the claims data into the same groupings, i.e. curtate duration and gender, to determine the actual claims for each relevant grouping.
- Determine the ratio of actual to expected claims for each relevant grouping.
- The analysis should be done by number of claims and amount of claims.
- The analysis should be done on a gross and net of reinsurance basis, to analyse the impact of reinsurance.
- Calculate the standard error using the usual statistical methods for each relevant grouping.

Marking guide:

- ½ mark for results of past investigations, technical and peer review documents;
- ½ mark for methodology documents from past investigations;
- ½ mark for appropriate description of in force data;
- ½ mark for reinsurance data;
- ½ mark for appropriate description of claims data;
- ½ mark for comment on appropriate description of checking and cleaning data;
- ½ for example of checking and cleaning data;
- ½ mark for cause of claim;
- ½ mark for reinsurance recoveries;
- ½ mark for split in force into appropriate main groups;
- ½ mark for caution not to split too far (unreliable, spurious);
- ½ mark for calculate ETR;
- ½ mark for adjust population incidence for causes covered under product;
- ½ mark for obtain expected values;
- ½ mark for split claims in same way;
- ½ mark for obtain A/E results;
- ½ mark for calculate std. errors;
- ½ mark for analysis by number of claims;
- ½ mark for analysis by amount of claims;
- ½ mark for analysis by gross of reinsurance claims;
- ½ mark for analysis by net of reinsurance claims;
- ½ mark for any other reasonable points made;

to a maximum of 6 marks (KU). Plus 1 mark for formatting and language (CJ), to a total of 7 marks. Formatting and language should be appropriate for the situation.

Note: only part (a) is required in this (memo) format to earn the relevant mark.

(b) A description of the main features of these results for the interests of RMM are:

- RMM's overall experience is worse than that of the industry (as reflected in IAAust 1998-99), and more particularly so for males (2+) than females (2+).
- This result (overall, relative to industry) is present for every grouping in the investigation except for females CD3.
- The CD0 to CD2 results are generally considerably higher than the industry.
- The female experience for CD3 could be due to better underwriting standards when the product was initially introduced.
- The standard errors are very high when compared to the industry results, which means RMM's results lack statistical credibility due to the small volume of data available.
- The Duration 2+ results are very close to the year 2 and 3 results for both males and females, indicating that there may be little business in the CD3 and CD4 years for RMM's business. This makes later duration results even more statistically dubious.
- There is no marked selection trend in the industry data - in fact, taking into account the deferral period there seems to be a marked anti-selection trend.

- The anti-selection trend in RMM's data would seem to be worse than that of the industry.
- The types of trauma covered by RMM might be different from those considered in the IAA Aust Lump Sum Experience Investigation. This could invalidate the comparison
- The time periods covered by the IAA Aust Investigation and that of RMM's investigation will be different. As RMM's data is later, this could reflect a general industry worsening trend.

Marking guide:

- 1 mark for RMM overall worse than industry (½), and more so males (½);
- 1 mark for females CD3+ odd one out;
- 1 mark for early duration considerably higher for RMM than for industry;
- 1 mark for comment on the good female experience for CD3;
- 1 mark for issue with size of data, lacking statistical credibility;
- 1 mark for little volume CD3 and CD 4 for RMM's product, even lower statistical reliability at those durations;
- 1 mark for no selection effect in industry, possibly small anti-selection;
- 1 mark for much larger anti-selection effect in RMM's data;
- 1 mark for types of trauma illnesses covered by RMM when compared to the IAA Aust Investigation;
- 1 mark for the different time periods between the IAA Aust experience and RMM's experience;
- 1 mark for any other reasonable points made;

to a maximum of 6 marks (SJ).

(c) The implications of these results for the profitability and re-pricing of RMM's product are:
- With risk products such as trauma insurance there are no surrender values provided and no savings component to the premium. The result of this is that the insured risk (mortality/morbidity) incidence basis makes up a reasonably large proportion of the total premium and of the prospects for the company's profits.
- Current underwritng guidelines/standards should be investigated to identify potential changes to improve experience.
- Claims above those expected from the pricing basis would result in a reduction in profits and a need to increase the premium rates if the product were to be re-priced.
- It seems likely that RMM's experience is significantly "out of line" with that of the industry, which would require the company to carefully assess its competitive position as regards its premium rates and policy benefits provided against those in the market.

Marking guide:

- 1 mark for need to compare with pricing basis to obtain true effect on profitability;
- ½mark for insured risk incidence makes up a large component of premium/price;
- ½ mark for general effect of poor insurance risk results on pricing and profitability;
- ½ mark for underwriting guidelines/standards;
- ½ mark for recognising incidence basis not same as pricing basis due to different pools of lives in each respective base;
- ½ mark for comparison of RMM premium rates against the market;
- ½ mark for comparison of RMM policy benefits against the market;
- ½ mark for any other reasonable points made;

to a maximum of 4 marks (CJ).

END OF QUESTION 1

COURSE 2A LIFE INSURANCE **MAY 2007 EXAMINATIONS**

QUESTION 2 **(15 Marks)**

Analysis

Component	**Aim**	**KU**	**SJ**	**CJ**	**Total**
Part a)	1, 2, 4	4			4
Part b)	9, 10, 11		4		4
Part c)	4, 5, 7			4	4
Part d)	12, 13, 14		3		3
Total		4	7	4	15

Question

You are a product actuary at Aussie Life Re (ALR), a life reinsurance company that operates in Australia.

Emu Life (Emu) is a medium sized life insurer, writing only Yearly Renewable Term insurance. Emu has a surplus reinsurance treaty with ALR. Emu's sales of new business have been declining, and their newly appointed marketing director is considering ways of reversing this trend by innovative ideas for product distribution. Up until now, all of Emu's new business sales have been made through independent advisers. The proposal he wishes to discuss with ALR (as Emu's primary reinsurance provider) involves Emu running Direct Marketing campaigns to community-based groups such as sporting clubs, community service groups and charitable associations.

a) **In general terms, list the reasons for life insurers to use the services of a reinsurance company, and outline the products and services that reinsurers offer to meet those needs. (4 marks)**

b) **How may the assumptions for products to be sold in the proposed manner need to differ from those for the products currently sold through advisers? (4 marks)**

c) **Identify the risks faced by ALR in offering reinsurance to Emu for products to be sold in the proposed manner, and suggest how ALR could structure its reinsurance terms to mitigate those risks. (4 marks)**

d) **You are concerned about the viability of the Direct Marketed Yearly Renewable Term insurance product proposed by Emu, and therefore wish to determine the profitability of this product (i.e. the gross of tax yield on transfers) to Emu. To do this, you are about to instruct a new analyst in your team, who is numerically competent but has no experience with projections.**

   Prepare a worksheet for these projections, giving headings of and clear definitions for the column headings. Also define the calculation of the yield on transfers. (3 marks)

QUESTION 2 : SOLUTION (15 marks)

(a) The reasons for life insurers to use the services of a reinsurance company include –

- Protecting fund solvency by limiting amounts at risk on any one life insured;
- Reducing range of fluctuation in profit due to size of amounts at risk;
- Reducing amounts of new business strain as well as limiting potential amounts of loss on early lapses;
- Protecting fund surplus from exposure to mis-pricing risk on new types of contract where claims expectation is more uncertain;
- Obtaining access to ancillary services, such as advice on underwriting or claims management, intelligence on local and/or overseas markets and developments, and assistance with developing or introducing new types of contract.
- Allows life insurers to accept larger cases that the insurer otherwise may not take; and
- For Direct Marketed business, reinsurers may provide the direct office with marketing and up front financing costs for the campaigns.

The products and services that reinsurers offer to meet those needs include –

- Proportional reinsurance, via facultative or treaty arrangements;
- Non-proportional reinsurance, for catastrophe or stop loss covers;
- Financial reinsurance (not a necessary part of the model answer, but can be mentioned);
- Assistance with meeting expenses – this is generally factored into the terms of reinsurance and incorporated into the determination of any first year/selection discount and/or any commission terms offered;
- Technical advice and assistance with underwriting and claims support, e.g. by providing procedure manuals and/or training, conducting reviews of specific large risks at acceptance and/or claims stage; and
- Access to expertise, up-to-date research and developments, and support with aspects of business operations. The partnership of a reinsurance provider may assist with the wider experience and technology that a reinsurer has access to, including assistance with developing or introducing new types of contract.

Marking guide:

Reasons
- ½ mark for protecting fund solvency;
- ½ mark for reducing profit volatility;
- ½ mark for reducing new business strain;
- ½ mark for reducing mis-pricing risk;
- ½ mark for ancillary services;
- ½ mark for helping finance DM business;

To a maximum of 2 marks (KU)

Products offered by reinsurers -

- ½ mark for proportional reinsurance/ non proportional reinsurance;
- ½ mark for treaty or facultative reinsurance
- ½ mark catastrophe reinsurance ;
- ½ mark stop loss reinsurance;
- ½ mark for financial reinsurance;

Services offered by reinsurers -

- ½ mark for meeting expenses ;
- ½ mark for technical advice – underwriting ;
- ½ mark for claims support ;
- ½ mark for access to expertise ;

To a maximum of 1 mark for products and 1 mark for services (KU)

(b) The assumptions for life insurance products to be sold in the proposed manner may need to differ from those for products currently sold through advisers, as follows –

- Underwriting is expected to reduce the level of claims so without it (or with only a short form..) you would expect higher claims.

- Depending on the size and nature of the target market, specific allowance for different experience may, or should, be allowed for. E.g. sporting clubs may draw additional risks due to the nature of the sports and whether club members are mostly participants in the sport or purely social members. Community service groups may include people affected by particular conditions that the group exists to help, such as AIDS support groups. Charitable associations may involve similar considerations, and may also exhibit some bias along the lines of age, sex, and other rating/risk factors.

- As the method of selling involves direct marketing rather than intermediation, there is implicitly a much weaker selection effect (and possibly anti-selection bias) due to the different sales approach. This will tend to sway underlying insurance risk experience assumptions more towards population (rather than "select"), if not possibly worse than population due to potential anti-selection; as well as the above questions of the size and nature of the target market.

- Expenses may need to differ: (a) because there is a different method of selling (or "marketing costs"); (b) reduced costs due to no/reduced underwriting; (c) may also involve different commissions and/or fees; (d) probably produce a very different average size of policy; and (e) may well have very different lapse experience.

- Again, the projected sales of products sold in this manner (as "take-up" rates for direct marketing) may very likely differ, and will have important implications for overhead expenses (including any product development costs) as well as for profits.

Marking guide:

- ½ mark for comment on underwriting (plus ½ mark for quality of explanation);
- Implications of direct marketing, including population mortality (½ mark) and/or anti-selection (½ mark);
- ½ mark for consideration of size and nature of target market (plus ½ mark for quality of explanation);
- Expenses differing due to
  - ½ mark for "marketing costs";
  - ½ mark for no/reduced underwriting;
  - ½ mark for "commissions and/or fees";
  - ½ mark for "average policy size" effect on expenses/overheads;
  - ½ mark for "lapse experience" being different;
- ½ mark for "projected sales/take up rates" important for overheads/profits (plus ½ mark for quality of explanation);
- ½ to 1 mark for any other reasonable point made, depending on whether it is explained (1) or just mentioned (½);

to a maximum of 4 marks (SJ)

(c) The risks faced by ALR in offering reinsurance to Emu for products to be sold in the proposed manner, and mitigations, are as follows –

- Due to the likely smaller size of business sold in such a manner, ALR may end up with a very small share of the business sold if it continues to offer reinsurance on a surplus basis. The appropriate mitigation may be to structure its reinsurance terms on a quota share basis for the proposed Direct Marketed new business.

- As stated in (b), specific allowance for different experience may, or should, be allowed for. In other words, the risk to ALR is that it may find itself in a share of unprofitable business unless this is recognised and allowed for. The appropriate mitigation may be to offer its reinsurance terms on its own (risk premium) rates rather than on Emu's (original terms) rates. ALR may also consider reflecting its expectation of underlying experience in the discount and/or commission terms it offers to Emu. Another possible mitigation is inclusion of profit-sharing on an experience premium refund (EPR) basis.

- Similar comments apply to ALR allowing for its own assessment of Emu's risk exposure to population and/or anti-selection effects and the implications of that risk for ALR's share. Other possible mitigations include training Emu's staff on the differences (e.g. requesting a minimum short-form health statement), insisting on specific policy terms and conditions that may limit or exclude the degree of exposure to specific conditions, insisting on signing off any rates before they are released (e.g. to ensure appropriate rating factors are used), etc.

- ALR may be exposed to "operational risk" within Emu, and its potential effects on the profitability (to ALR) of its reinsurance treaties with Emu. Examples of this risk include lax underwriting and poor claims management by EMU. Possible mitigation to this is inclusion in the treaty terms and conditions that ALR may audit some of the operational processes in Emu – this provision can be of mutual benefit in such a "partnership".

- One of the main risks to ALR relates to its share of the expected expense/lapse/ take up experience of the business to be sold in the proposed manner. If lapses are too high (risk business) or too low (business with expected surrender profits), or take up rates too low, it may find the reinsurance arrangements offered to Emu are very unprofitable to ALR. As a mitigation, ALR may include treaty performance hurdles which reimburse Emu for a share of marketing costs depending on how productive the business becomes, in sales and/or lapse rate terms.

- There is a risk (perhaps "strategic risk") that Emu's product range continues to decline on the old series (adviser-based) and is replaced by the new series of products sold in the proposed manner. The risk to ALR is that it loses its share of the old business (on presumably more profitable terms) and picks up a much less profitable share of business under the new series. A mitigation to this may be for ALR to re-negotiate the entire reinsurance treaty arrangements with Emu and seek to keep them under a single arrangement. This may backfire, unless the renegotiated terms are at least as profitable to ALR.

Marking guide:

- ½ mark for risk of ALR continuing to offer the existing surlus treaty;
- ½ mark for mitigation to offer quota share rather than surplus terms;
- ½ mark for risk of ALR arising from different experience to expected;
- ½ mark for mitigation to offer risk rates instead of original terms;
- ½ mark for mitigation to allow for in discount and/or commission terms;
- ½ mark for "profit sharing" on EPR basis;
- ½ mark for risk of ALR arising from population and/or anti-selection;
- ½ mark for mitigation to train Emu's staff;
- ½ mark for mitigation to request short-form health statement;
- ½ mark for mitigation to insist on specific policy terms and conditions;
- ½ mark for mitigation to insist on signoff of rates before release;
- ½ mark for ALR exposure to operational risk within Emu;
- ½ mark for mitigation to include provision for audit of Emu operations;
- ½ mark for ALR exposure to expense/lapse/take up risk of new series;
- ½ mark for a reasonable mitigation to this risk (the answer above is just one possibility);
- ½ mark for ALR exposure to strategic risk with respect to Emu;
- ½ mark for a reasonable mitigation to this risk (the answer above is just one possibility);
- ½ mark for any other reasonable point made;

to a maximum of 4 marks (CJ).

(d) The yield on transfers for the Yearly Renewable Term insurance policy sold by Emu is determined as follows:

Year	Valuation Reserve at Start of Year	Premium	Expenses	Claims	Interest	Valuation Reserve at End of Year	Transfer
1	0	P1	E1	C1	I1	V1	T1
2	V1	P2	E2	C2	I2	V2	T2
3	etc.						

where

Pt = premium receivable by Emu from its policy owner in year t for the YRT policy;
Et = expenses assumed (including commissions payable) by Emu in year t for the YRT;
Ct = claims assumed payable by Emu in year t;
It = interest assessed as earned (positive) or payable (negative) by Emu in year t;
Vt = valuation reserve required to be held by Emu for YRT at time t; and
Tt = Vt-1 + Pt – Et – Ct + It (with its positive or negative sign included) – Vt

and

the above calculations relate to a block of business with allowance for assumed decrements.

Claims (Ct) will include any amounts payable on death or in the case of surrender (the latter generally not applicable for YRT).

As the objective is to look at this from the perspective of Emu, it is NOT necessary to allow for reinsurance in any way. The yield on transfers therefore relates entirely to the direct business.

The yield on transfers is then defined as the internal rate of return i (assuming a finite rate exists) such that PV (Tt) at rate i = NIL.

Marking guide:

- 1/4 mark for each correct column heading
  to a maximum of 1 mark for column heading;

- 1/4 mark for each correct definition or formulae;
  to a maximum of 1 mark for definitions and formulae;

  1 mark for defining yield on transfers

to a maximum of 3 marks (SJ) for part (d).

END OF QUESTION 2

QUESTION 3 (17 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a) (i)	2, 4, 8	4			4
Part a) (ii)	2, 4, 8		4		4
Part b)	4, 7			5	5
Part c)	2, 3, 4, 9			4	4
Total		4	4	9	17

Question

As the appointed actuary for one of the medium-sized Australian life insurers, you are reviewing the company's sales and lapse experience over the period 2001-06. The experience has been affected by the introduction in mid-2003 of a new sales outlet when the company issued a master agreement to JR & Associates (JRA), a national group of advisers operating under an agency management structure.

An experienced actuarial analyst has provided you with the following results (where all amounts are shown as $A'000):

Year	Total Company Actual Amounts			Total Company Target Amounts			Actual Amounts for JRA business		
	Sales	Lapses	Ratio	Sales	Lapses	Ratio	Sales	Lapses	Ratio
2001	9,824	1,695	17.3%	12,000	1,700	14.2%	-	-	-
2002	7,962	1,536	19.3%	11,000	1,550	14.1%	-	-	-
2003	7,585	1,311	17.3%	11,500	1,400	12.2%	1,485	46	3.1%
2004	11,108	1,804	16.2%	12,000	1,400	11.7%	3,861	754	19.5%
2005	13,457	2,865	21.3%	13,000	1,750	13.5%	5,019	1,698	33.8%
2006	16,019	3,560	22.2%	14,500	2,250	15.5%	5,898	2,190	37.1%

For the purposes of adviser remuneration, a lapse is defined as the termination of a contract before it has acquired a surrender value. Again for the purposes of adviser remuneration, the lapse ratio for any given period (as shown above) is defined as the proportion of lapses to sales in that period.
(Note: you may treat this as an acceptable basis of measurement.)

a) Describe the main features of -

i. the company's overall sales and lapse experience in the period 2001-06. (4 marks)

ii. the introduction of JRA as a new sales outlet, on the company's sales and lapse experience. (4 marks)

b) Discuss the risks that the company may be exposed to as a consequence of JRA's contribution to the company's sales and lapse experience. (5 marks)

c) Outline strategies which the company should consider in determining its response to the risks discussed in part (b) of the question. (4 marks)

QUESTION 3 : SOLUTION **(17 marks)**

a)

i) The main features of the company's overall sales and lapse experience in the period 2001-06 are –

- **Sales:**
  - Well below ***target*** for the period 2001-03 (by up to a third, i.e. 33%);
  - Declining in ***actual*** terms for the period 2001-03, especially in 2001-02 (by almost 20% in one year, or almost a quarter lower across those two years);
  - Dramatic reversal of downturn evident in 2003-06 with significantly higher sales in ***actual*** terms (more than doubling over that period);
  - Closes the gap on ***target*** in 2004, then exceeds target in 2005 (by 4%) and in 2006 (by 10%);
  - Non-JRA sales ***actually*** declined even more sharply, reaching a low of just above $6m in 2003;
  - Non-JRA sales also picked up over 2004-06, from the 2003 low of $6m up to a high in 2006 of $10m in ***actual*** terms.

- **Lapses:**
  - Close to or even slightly under ***target*** for the period 2001-03 (within about 0-6% below);
  - Declining in ***actual*** terms for the period 2001-03 (most likely in line with the lower sales achieved over those three years);
  - Increasing in ***actual*** terms for the period 2003-06, with significantly higher levels evident towards the latter part of that period;
  - Significantly above the ***target*** levels during 2004-06, to an alarming degree in the latter part of that period (55-65% above);
  - In very simple terms, the ***ratio of lapses to sales*** (which is not an accurate "lapse rate", but simply taken as the relevant measure) has deteriorated from about 17% in the earlier parts of the period under review to about 22% in the latter parts of the period;
  - Following the above point a bit further, that simplistic ratio for actual results is also well above the corresponding ratio for ***target*** figures over the period, which sits at around 12-14% for most years, but drifts up to 16% at the end;
  - Lapse rates could be mis-leading for periods when new business volumes are growing or shrinking.

<u>Marking guide</u>:

- <u>Sales</u> –
  - ½ mark for sales well below target 2001-03;
  - ½ mark for sales declining in actual terms 2001-03;
  - ½ mark for dramatic reversal in declining sales 2004-06;
  - ½ mark for sales catching up and overtaking target 2004-06;
  - ½ mark for non-JRA sales declining more sharply in actual terms 2001-03;

- ½ mark for non-JRA sales recovering from declining sales 2004-06;
- ½ mark for any other valid sales features not noted in the above model solution;

to a maximum of 2 marks for sales

- Lapses –
  - ½ mark for lapses close to or below target 2001-03;
  - ½ mark for lapses declining in actual terms 2001-03;
  - ½ mark for lapses increasing in actual terms 2004-06, more in the latter part;
  - ½ mark for lapses well above target 2004-06, alarmingly in the latter part;
  - ½ mark for simple lapse ratio deteriorating in actual terms 2001-06;
  - ½ mark for actual lapse ratio exceeding implied target lapse ratio 2001-06;
  - ½ mark for lapse rates could be mis-leading;
  - ½ mark for any other valid lapse features not noted in the above model solution;

to a maximum of 2 marks (Lapses),

For a total of 4 marks (KU) for part (a) (i).

ii) The main features which are apparent in the company's sales and lapse experience due to the introduction of JRA as a new sales outlet are described as follows –

- **Sales:**
  - In 2003 (measured over the whole of that year), JRA boosts the company's ***actual*** sales results by about 24% - that will be even more significant when translated to an annual result, in line with the next point.
  - In 2004-06, JRA boosts the company's ***actual*** sales results by around 50-60% - that results in JRA-sourced business representing more than a third of the company's total sales over those years.
  - The sales achieved by JRA allow the company to meet its ***target*** sales levels, and to ***increase*** those targets in the later years (prior to JRA joining the company's agency lists, it had static or declining sales targets).
  - While unclear as to the cause (or driver) of this next observation, we can note that non-JRA sales have also picked up – this may be due to "associated sales" (e.g. referrals), or may be unrelated. It may reflect "cumulative success", e.g. greater awareness, confidence, etc.

- **Lapses:**
  - It is clear that the company's lapse experience has deteriorated over the period 2003-06, whether assessed in ***actual*** terms or relative to ***targets***. It is also clear by reference to the very simple ***ratio of lapses to sales*** (which as

noted above, is not an accurate lapse rate, but a reasonable proxy for the purposes of discussion, and also taken as the relevant measure).

- While that ratio has deteriorated from about 17% in the earlier parts of the period under review to about 22% in the latter parts of the period, it is a lot worse for the JRA business (about 37% in the latter parts) than for the non-JRA business (which in fact improves to about 14%).
- The clear implications of this pattern of experience are that the JRA business is of a much lower sales quality, which may suggest that the master managing agency is pushing a sales approach that achieves higher levels of poorer quality business.

Marking guide:

- Sales –
  - ½ mark for JRA boosts actual sales by 24% in 2003 (plus ½ mark for quality of discussion);
  - ½ mark for JRA boosts actual sales by 50-60% in 2004-06 (plus ½ mark for quality of discussion);
  - ½ mark for JRA sales enable company to meet its targets and then to *increase* those targets (plus ½ mark for quality of discussion);
  - ½ mark for noting that non-JRA sales recovered over 2004-06 (even if not sure whether JRA helped this at all) (plus ½ mark for quality of discussion);
  - ½ mark for any other valid sales features not noted in the above model solution (plus ½ mark for quality of discussion);

to a maximum of 2 marks (sales)

- Lapses –
  - ½ mark for lapses clearly deteriorated over 2003-06, in actual terms and/or against targets (plus ½ mark for quality of discussion);
  - ½ mark for lapses also clearly deteriorated over 2003-06 in lapse ratio terms (plus ½ mark for quality of discussion);
  - ½ mark for lapses clearly much worse for JRA than non-JRA, in lapse ratio terms (plus ½ mark for quality of discussion);
  - 1 mark for clear implications of overall pattern for lower quality of JRA business;
  - ½ to 1 mark for any other valid lapse features not noted in the above model solution;

to a maximum of 2 marks (lapses)

For a total of 4 marks (SJ), for part (a)(ii)

b) Discussion of the risks that the company may be exposed to as a consequence of the introduction of JRA as a sales outlet for its products would include –

- Concentration risk - While we are not sure of the degree of concentration in the company's sales prior to the JRA arrangement, we can see that JRA now accounts for a significant share of the total company sales (around 37% in 2005 & 2006).

This represents a large direct dependency on a single source of business, with potential for risks of conflict of interests, strategic and reputation risk, etc.

- Termination risk - As the remuneration of this agency group is to a greater or lesser extent dependent on the quality of business (which is poor and may be deteriorating), there would be an incentive for the group to move itself to another carrier at some stage (perhaps very soon) to escape the lapse claw-backs and loss of bonuses. That will add to the degree and potential impacts of “concentration risk”.

- Profitability risk - There is potentially profitability risk associated with the much higher lapse rates of this agency group; that would put pressure on the company’s premium rates and fee structures, e.g. to meet the higher costs and related loss of profits due to failure to adequately recover its expenses.

- Legal and compliance/regulatory risk - There may also be legal and compliance/regulatory risks, depending on the underlying reasons for the “high sales & poor quality” business model that is apparently associated with JRA business. If it is related to poor sales management, there may be a much higher instance of legal disputes, resort to complaints services such as FICS, and enquiries by the regulator, etc.

- Reputation risk - (and perhaps other types mentioned above) may not only apply to the JRA business, but by implication or inference may have the potential to affect the non-JRA business. Public perception and/or agent dissatisfaction may arise more broadly than just this large agency group.

Marking guide:

- ½ mark for Concentration risk (plus ½ mark for quality of discussion);
- ½ mark for Termination risk (plus ½ mark for quality of discussion);
- ½ mark for Pricing risk (plus ½ mark for quality of discussion);
- ½ mark for Legal/compliance/regulatory risk (plus ½ mark for quality of discussion);
- ½ mark for Reputation risk (plus ½ mark for quality of discussion);
- ½ mark for any other reasonable risk (plus ½ mark for quality of discussion)

to a maximum of 5 marks (CJ).

c) Strategies which the company should consider in determining its response to the risks associated with this situation include –

- Focused management of the sales, servicing and conservation practices within the JRA group, with the objective of remediation around the apparent poor quality of business. This may be difficult in practice, due to the structure of the agency itself, and would need to be approached in a manner that included significant incentives for JRA to co-operate with the process.

- Re-pricing its products to allow for the actual lapse experience that is evident in the results since JRA has been selling its products. This may alienate some or many other of its (non-JRA) agents, so there may need to be a compensation system offered to those distributors, e.g. premium/fee discounts, differential commissions/bonuses, etc.

- Amending and/or re-negotiating (if legally and strategically possible) its agency terms with JRA, so that the costs and consequences of poor quality business are recognised and discouraged much earlier in the remuneration process (e.g. by withholding any advances against commissions/bonuses until the lapse results are clearer or more focus on renewal/on-going commission – this may be extremely difficult and even counter-productive.

- Terminate the group's agencies if this is in the best interests of the company and its shareholders. Termination is a very difficult "cost/benefit" exercise, weighing off the financial consequences of one course of action against another.

- Restructure the Master agreement to have a more individual adviser focus rather than a national or master focus. Each adviser can than be managed on his/her merits,

- Seek guidance from APRA and/or ASIC. It may be possible (depending on the extremity of the situation) to submit this situation under the guidance of one or other of the regulators who may have the power to issue directions that assist in resolving this situation. It is a very extreme step, but may not lead to such an extreme result and would engender co-operation between company and regulator.

- Focus and cultivate alternative distribution channels to reduce reliance on JRA.

Marking guide:

- ½ for remediation efforts focused on culture within the JRA group (plus ½ mark for quality of discussion);
- ½ mark for re-pricing the company's products to allow for the JRA experience (plus ½ mark for quality of discussion);
- ½ mark for amendment/renegotiation of agency terms with JRA (plus ½ mark for quality of discussion);
- ½ mark for termination of JRA's agency agreements (plus ½ mark for quality of discussion);
- ½ mark for restructuring the Agreement (plus ½ mark for quality of discussion);
- ½ mark for appropriate consultation with regulators over the issue (plus ½ mark for quality of discussion);
- ½ mark for alternative distribution channel (plus ½ mark for quality of discussion);
- ½ mark for each of any other reasonable points made (plus ½ mark for quality of discussion);

to a maximum of 4 marks (CJ).

END OF QUESTION 3

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **MAY 2007 EXAMINATIONS**

QUESTION 4 **(18 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	1, 2, 3, 12	5			5
Part b)	4, 6, 12, 13			5	5
Part c)	9, 10, 11, 14		5		5
Part d)	9, 10, 11, 14		3		3
Total		5	8	5	18

Question

The Assurance Beneficial Company (ABC) and the Equity Financial Group (EFG) were two Australian life insurers, that have recently merged.

Prior to the merger, ABC specialised in Ordinary risk products (comprising of individual term insurance and disability income) and lifetime annuities, while EFG specialised in investment linked business. EFG's product range comprised of two ordinary savings products (a regular contribution and a single contribution plan), marketed by financial advisers.

The combined entity now operates as Assurance Equity Life (AEL). Its product range is a combination of ABC's product range with that of EFG.

You have just joined AEL as the pricing actuary. As your first assignment, the Chief Executive Officer has asked you for advice about a memo from the marketing department, recommending that a new product be introduced.

Relevant extracts from the memo are:

"…We recommend that a superannuation investment account product be introduced as soon as possible to provide financial advisers with a product to meet the retirement needs of their customers. It should include a guarantee that the account balance will never be reduced, which will appeal very strongly for retirement planning purposes."

"…The asset mix should be aligned to high returns with growth prospects, to provide high crediting rates. In order to expedite introduction of this product, we recommend that the pricing structure from the existing investment linked products be applied, without change, to this new product. That would allow us to introduce both a regular contribution and a single contribution version of this new superannuation product."

"…Initial illustrations can be based on the track record from our High Growth Fund, which has the same asset mix as we propose for this new product. We could simply use gross (pre-tax) returns, adjusted for a lower tax rate applicable to superannuation instead of ordinary business."

"…As an introductory offer, we recommend that a minimum crediting rate of 6% p.a. (or 2% p.a. below the five year average returns achieved by the High Growth Fund)

be guaranteed to apply each year over the next five years. That would allow AEL to guarantee the surrender values for policy owners who choose to retire early."

"…We look forward to your early approval to proceed with these proposals."

a) Outline the normal process for developing a new product of this type. (5 marks)

b) As AEL's pricing actuary, provide (with reasons) your assessment of the approach suggested by the marketing department. (5 marks)

c) List the key factors that you would need to consider in order to recommend a pricing basis to be applied to the proposed product. (5 marks)

d) Explain briefly how your consideration of the key factors in part (c) would change if the proposed new product was recommended to be investment linked, rather than capital guaranteed. (3 marks)

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

(a) The normal process for developing a new product of this type is one which has an appropriate and sufficient degree of discipline and rigour, such as –

- 1 – Obtain/Prepare a Marketing Assessment:
  - a – Consider broad marketing strategy and company objectives;
  - b – Assess market situation based on research; and
  - c – Determine segments and targets.

- 2 – Product Development ("the ten stages"):
  - 2.1 – <u>Idea</u>: clearly define "the need" and driving factors for a new product;
  - 2.2 – <u>Screening</u>: identify a wide range of options, and specify criteria to be satisfied by preferred option, e.g. administrative, systems constraints;
  - 2.3 – <u>Proposal</u>: appoint team to coordinate, develop and prepare a proposal;
  - 2.4 – <u>Initial decision</u>: prepare initial pricing on a provisional basis, and look at sensitivity of profit to variations in underlying assumptions;
  - 2.5 – <u>Design</u>: determine product rules & limits, compensation structure, fit of product into existing systems, projected sales, business mix, profit etc;
  - 2.6 – <u>Project organisation</u>: establish project group to develop, build and implement, up to introduction of the new product ("project management");
  - 2.7 – <u>Final decision</u>: provide senior management with costs & benefits, sales projections, profit indications, launch proposals, etc. for approval;
  - 2.8 – <u>Implementation</u>: establish legal documentation, systems changes, data for training sales force and administration staff, capital support, etc;
  - 2.9 – <u>Product launch</u>: promotional and publicity impetus to product release; and
  - 2.10 – <u>Post-implementation review (feedback)</u>: assess how product has been received, how sales and budgets are tracking to projected levels, etc.

As the company apparently has not had Superannuation business before, the above process (or a similarly well-structured approach) should be followed diligently.

<u>Marking guide</u>:

- ½ mark for 1. obtain/prepare marketing assessment;
- ½ mark for a. consider marketing strategy, company objectives;
- ½ mark for b. assess market situation based on research;
- ½ mark for c. determine segments and targets;
- ½ mark for 2. the ten stages of product development;
- up to ½ mark for each of the ten stages (¼ mark for heading only, ½ mark for heading and what it entails);
- up to 1 mark for any other valid point made, depending on whether it is well explained (½) or just mentioned (¼);

to a maximum of 5 marks (KU).

(b) As AEL's pricing actuary, my response (with reasons) to the above extracts from the memo are as follows –

- will the suggested product require establishment of a separate statutory fund (as it must be kept separate from the current investment business), or will it be acceptable to utilise the existing non unit linked fund? This has implications for administration, expenses, systems, etc;
- the strong assertion that it should be capital guaranteed has significant implications as there is higher risk associated with offering the guarantee and higher capital requirements (but the marketing area may not be consciously aware of that);
- the combination of capital guarantee and high return/growth assets will tend to exacerbate the capital requirements and impose significant strain;
- the suggestion that the pricing structure of the existing investment linked products could be adopted without change or further examination is highly inappropriate, due to (a) the capital guarantee, (b) the superannuation class of business and (c) different administration requirements to cater for the capital guarantee e.g. minimum crediting rate for any one perod is 0. The crediting rate cannot be negative;
- basing initial illustrations on an existing unit linked fund for a product that is intended to be capital guaranteed is misleading and deceptive, even if they are adjusted for superannuation tax – the guarantee is highly significant, and therefore costly to provide. This would need to be allowed for;
- providing guaranteed rates of return is a major point of concern. This would require careful, detailed and robust costing, and is generally regarded as a highly inadvisable product feature.
- There has been minimal capital guaranteed product development over recent years. As such, the marketing department may need to show the market need as well as the supporting research.

Marking guide:

- ½ mark for considering whether a separate statutory fund is required (plus ½ mark for quality of discussion) ;
- ½ mark for noting capital guarantee as significant investment risk, (plus ½ mark for quality of discussion);
- ½ further mark for commenting on higher capital requirement associated with a capital guaranteed product (plus ½ mark for quality of discussion);
- ½ mark for different administration requirements (plus ½ mark for quality of discussion);
- ½ mark for noting high return/growth asset mix as a point of concern (plus ½ mark for quality of discussion);
- ½ mark for noting proposed pricing approach as highly inappropriate (plus ½ mark for quality of discussion);
- ½ mark for noting proposed illustration approach as highly inappropriate (plus ½ mark for quality of discussion);

- ½ mark for noting guaranteed rates of return and/or surrender values as major point of concern requiring careful assessment and costing (plus ½ mark for quality of discussion);
- ½ mark for minimal capital guaranteed product development in recent past (plus ½ mark for quality of discussion); and
- up to ½ mark for any other valid point made (e.g. professional obligations etc).

to a maximum of 5 marks (CJ).

As the question requires application to this product, the marks are noted as CJ, and markers should assess how the candidate applied their answer to the product given.

(c) The key factors that I would need to consider in order to provide a recommended pricing basis as applied to the above product can be listed as follows –

- 1 – <u>Economic factors (investment returns, risk discount rate and tax)</u>:

  - ➢ Assumed (target or benchmark) asset mix will strongly influence the expected future investment returns, along with the outlook for future investment yields on each asset class;
  - ➢ Risk discount rate will reflect the very different profile of shareholder risk in providing the capital guarantee or alternatively an explicit charge can be made for the cost of the capital guarantee;
  - ➢ Tax at superannuation instead of ordinary rates of tax, as well as several of the underlying aspects of taxation structure, e.g. deductibility of expenses; and
  - ➢ The proposed investment policy and strategy for the new product.

These assumptions are particularly important in assessing the cost of providing a capital guarantee, as well as assessing the cost of securing the required financing capital support for the product. The proposed product is very different to the existing investment linked business.

- 2 – <u>Expenses and inflation</u>:

  - ➢ Assumed initial (acquisition) expenses and commission;
  - ➢ Assumed renewal (maintenance) expenses and commission;
  - ➢ Assumed inflation of future expenses, net of efficiency gains for scale;
  - ➢ If a separate fund (and related processes eg catering for the capital guarantee) is required, it will add to costs; and
  - ➢ Product development expenses need to be recovered.

As this is different to any existing products, a number of accounting, administrative and actuarial procedures to support the product would be very different to current procedures. There will also be some functions that relate to superannuation that are not currently part of the existing operations, e.g. preparation of fund returns, trustee duties, administering SCT, etc.

- 3 – Assumed experience of the business:

    - Assumed (target) sales and business mix will vary due to the superannuation nature of this product, and will have important implications for profitability;
    - Size of business (average contributions) and volumes of sales may therefore differ significantly from the current investment linked ordinary products;
    - Discontinuances (lapses and surrenders) are highly likely to differ markedly from the current products, again due to both the class of business and the proposed (Capital Guarenteed) style of investment for the product;
    - Discontinuances are particularly important given the nature of the "introductory offer" of guaranteed crediting rates for the first 5 years;
    - Mortality and/or morbidity are not as important as other experience factors listed above. However, they will not be completely irrelevant due to the cost of the capital guarantee, and would probably be relatively more important than in the case of a unit linked investment product.

- 4 – AEL's profitability requirements:

    - As this is a capital intensive product, AEL's required return on capital should be allowed for in the pricing basis;
    - AEL's Board/Management's target profitability requirements should also be allowed for.

These assumptions are critical in assessing the premium rate/fee structure and the cost of providing a capital guarantee, as well as the cost of financing capital for the product. The proposed product is very different to the existing business, particularly considering its superannuation classification. The underlying experience is likely to be very different.

Marking guide:

- Up to 1 mark for Economic factors, *as applied to this product*;
- 1 mark for commenting on higher capital requirement associated with a capital guaranteed product, as well as financing capital;
- 1 mark for explicitly costing the capital guarantee;
- Up to 1 mark for Expenses and inflation, *as applied to this product*;
- Up to 1 mark for Experience elements, *as applied to this product*;
- Up to 1 mark for meeting profitability requirements, *as applied to this product*;
- 1 mark for commenting on differences compared to current business; and
- up to 1 mark for any other valid point made, depending on whether it is well explained (1) or just mentioned (½).

to a maximum of 5 marks (SJ).

(d) If the proposed new product was recommended to be investment linked rather than capital guaranteed, my consideration of the key factors would change as follows –

- 1 – Economic factors (investment returns, risk discount rate and tax):

- Risk discount rate no longer needs to reflect the element of shareholder risk in providing a capital guarantee or alternatively, there is no need for an explicit charge for the capital guarantee; and
- Other aspects of economic factors as listed in (c) still need to reflect the change of focus from ordinary to superannuation. That may entail a different asset mix to the current products; as well as tax-related differences.

• 2 – Expenses and inflation:

- Would save on cost of setting up a new fund (if that was required under the approach in (c));
- Product development expenses may be smaller, but still need to be recovered; and
- Other aspects of expense factors as listed in (c) still need to reflect the change of focus from ordinary to superannuation. That may save a number of "new" procedures, but would still entail those functions that relate to superannuation that are not currently part of the existing operations.

• 3 – Assumed experience of the business:

- Assumed sales and business mix will still vary due to the superannuation nature of this product, but may have less significant implications than in (c) for profitability, given the absence of the capital guarantee;
- Size of business (average contributions) and volumes of sales will still differ significantly from the current investment linked ordinary products;
- Discontinuances (lapses and surrenders) are highly likely to differ markedly from the current products, but only to the extent due to the class of business rather than the proposed (Capital Guarenteed) style of investment for the product; and
- Mortality and/or morbidity are still not as important as the other experience factors listed above. While not completely irrelevant, in the absence of a capital guarantee they would probably be as important as in the case of the current unit linked investment products.

Marking guide:

- 1 mark for Economic differences;
- 1 mark for commenting on lower capital requirement associated with absence of a capital guarantee
- 1 mark for no explicit charge for the capital guarantee;
- 1 mark for Expenses and inflation differences;
- 1 mark for Experience elements differences, most of which still apply equally; and
- up to 1 mark for any other valid point made, depending on whether it is well explained (1) or just mentioned (½);

to a maximum of 3 marks (SJ).

END OF QUESTION 4

QUESTION 5 (16 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	8, 11	1			1
Part b)	8, 9, 11, 13		4		4
Part c)	8, 11, 13			3	3
Part d)	6, 8, 14		3		3
Part e)	11, 14			5	5
Total		1	7	8	16

Question

You are a pricing actuary working for an Australian life insurer that is preparing to re-price its individual Disability Income (DII) product, and you are required to determine the economic assumptions for this purpose.

The following tables relate entirely to the individual DII portfolio:

Year	Calculated claims indexation rate	Calculated actual earning rate
2003	2.2%	7.8%
2004	1.9%	7.5%
2005	2.6%	7.6%
2006	2.1%	

Note: Claims Indexation Rate is calculated as the ratio of the average claim size at the end of the year to the average claim size at the start of the year.

Financial Management Accounts for DII	$’000
Opening balance of assets (1/1/2006)	198,300
Premium revenue for 2006	181,500
Investment revenue for 2006	14,700
Claims payments for 2006	127,900
Operating expenses for 2006	49,600
Tax assessed for 2006	3,900
Closing balance of assets (31/12/2006)	213,100

The latest annual morbidity experience investigation shows DII claims incidence rates close to expected. However, DII claims termination rates have decreased significantly over the past 3 years, resulting in significant variations of the actual levels of disabled life reserves from their expected levels.

The economic outlook in the medium to long term is for current conditions to prevail for all asset classes. Note: You may assume that actual assets held are those required to support total policy liabilities both for active lives and disabled lives.

When the DII product was last re-priced (in 2004), the following pricing assumptions were used:

Previous pricing assumptions for DII product (as adopted in 2004)			
Inflation rate	**Claims indexation rate**	**Earning rate**	**Risk discount rate**
2.5%	**2.8%**	**7.2%**	**8.7%**

a) Calculate the 2006 actual earning rate. (1 mark)

b) State (with reasons) whether the claims indexation rate assumed for pricing should agree with, or may differ from, those calculated for recent periods. (4 marks)

c) It has been drawn to your attention that the calculated actual earning rates relate to assets backing both the active life and disabled life (or open claims) reserves. State (with reasons), for current pricing purposes whether the earning rate should be adjusted to represent active lives only. (3 marks)

d) Describe the effects on policy liabilities and the assets backing these liabilities that the lower than expected claims termination rates would have had, and the possible effects on the benchmark allocation for assets backing this product. (3 marks)

e) Recommend and explain your economic inflation, earning rate and risk discount rate assumptions for the purpose of re-pricing this product. (5 marks)

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

(a) The 2006 actual earning rate is calculated as:

Rate = 2I / (A+B-I)
= 2* 14,700 / (198,300 + 213,100 - 14,700)
= 7.41%

Where
A = Opening Balance at 1/1/2006
B = Closing Balance at 31/12/2006
I = Investment Revenue for 2006

Marking guide:

- ½ mark for correct formula & rate;
- ½ mark for definition;

to a maximum of 1 mark (KU).

Note: Tax should not affect the above formula or rate, as DII is taxed on the emerging profits. Candidate forfeits ½ mark (formula), rather than full mark.

(b) The claims indexation rate assumed for the pricing basis may differ from those calculated for recent periods, because:

- The pricing assumption is forward-looking rather than historic, and as such it should reflect the expected future rates of claims indexation;
- The assumption is for the purposes of pricing, and therefore may differ from the observed historic rates, or even from the expected future central best estimate rates, e.g. by inclusion of an implicit margin;
- The claims indexation rates calculated for recent periods may be calculated from data that includes a number of short-term claims where no indexation of the claim benefit has occurred or also includes claims having no indexation;
- Timing differences between the claim year and the financial year would result in newer claims not experiencing any claim indexation until part-way through the following year;
- The method of calculation does not allow for the fact that the average claim size for recent claims could be higher than those for earlier claims due to larger benefits being taken out;

Marking guide:

- 1 mark for forward-looking / expected future, vs. historic experience;
- 1 mark for pricing purpose / implicit margin vs. central best estimate/observed;
- 1 mark for short-term claims may skew data and/or calculated indexation rates;

- 1 mark for benefit reverting to original amount / non-linked claims;
- 1 mark for claim year / financial year differences may skew data and/or rates;
- 1 mark for increased average claim size due to larger benefits for more recent claims;
- 1 mark for any other reasonable points made;

to a maximum of 4 marks (SJ).

(c) The earning rate should relate to assets that cover both active lives and disabled lives (i.e. open claims) and therefore does not require adjustment to reflect active lives only, because:

- Although the ongoing valuation process splits the portfolio, at each point in time, between active lives and disabled lives (i.e. open claims), at the commencement of a new product series, all policies are by definition active lives. The product pricing approach therefore models the cost of those policies that become claims at various future points in time (indeed, over the life cycle of a policy, it may move back and forward from an active to disabled life policy several times) - thus open claims are effectively included with active lives in an integrated pricing approach;
- While the balance between current active and disabled lives may require different target asset benchmarks, the "expected future assets" backing the portfolio cover all "expected future policies". Current assets must support current open claims, as well as supporting the expected future claims on the currently active lives.

<u>Marking guide</u>:

- 2 marks for recognising, *and explaining*, that open claims are effectively included in the pricing model;
- 1 mark for the current (or expected future) assets support the whole of the current (or expected future) policies under the product [if the point is repeated in respect of each context, there would be a mark for each];
- 1 mark for any other reasonable points made;

to a maximum of 3 marks (CJ).

(d) The effects on policy liabilities, assets backing the policy liabilities and possible effects on benchmark asset allocation, that the lower than expected claims termination rates would have had are as follows:

- Total policy liabilities will have increased (relative to what they would otherwise have been) as a result of lower claims termination rates, and therefore more claims staying disabled than expected;
- Higher claims costs may also be a factor in increasing expenses, e.g. for claims management;
- The policy liabilities may be of longer duration (depending on the duration at which the lower claims terminations are occurring) compared to a portfolio with a higher claims termination rate;

- Potentially the decrease in termination rates may lead to a change in assumptions which could result in increased policy liabilities due to loss recognition. This could result in increased assets financed by shareholders;
- The higher claim payments due to the lower termination rates will reduce assets;
- The assets will need to be increased to back the increased policy liabilities (eg capital injection);
- The duration of assets would also need to be increased to ensure that the portfolio remains reasonably matched by duration;
- The asset allocation for active and disabled lives will not change if the assets for them are maintained in separate pools;

Marking guide:

- 1 mark for increase in policy liabilities (with explanation);
- 1 mark for total assets may decrease (with explanation);
- 1 mark for total assets may need to be increased (with explanation);
- 1 mark for liability duration may increase;
- 1 mark for increase in assets due to loss recognition;
- 1 mark for assets may need to increase in duration, to match;
- 1 mark for no change in asset allocation if separate pools of assets exist for active lives and disabled lives;
- 1 mark for any other reasonable points made;

to a maximum of 3 marks (SJ).

(e) The recommended assumptions are:

Inflation -

- This assumption could remain unchanged, in the absence of any credible data to infer that a change is necessary. However, that would be at the lower end of the range, given the trend and outlook for inflation from 2004 up to now. Recent CPI rates have shown inflation at around 3-4%, as compared with 2.5% in 2004. The latest outlook from the RBA was for 3% as a central rate (Nov'06), so a pricing basis in the range of 3-4% could be justified;
- Given the reasonable range is 2.5% to 4%, a basis of 3-3.5% is most reasonable. In the broader range of 2.5% to 4%, a higher rate would be prudent, depending on competitive pressures and potential economies of scale achievable by the company;
- Outside this broader range, rates are probably unreasonable;

Earning rate -

- As the investment return experience has been better than expected on the current portfolio, this may have contributed to favourable profit results in recent periods. On the basis that the medium to long term economic outlook is for current conditions to prevail for all asset classes, a small increase in the earning rate may be justified;
- The increase in duration of the assets would be expected to result in a higher return in the future, thus also warranting an increase in the assumed earning rate;

- Therefore it could be recommended that the earning rate be set at up to (say) 7.5% for pricing purposes;
- An alternative approach would be much more bottom up approach whereby the long term expectations of bond yields and the differentials for each asset class based on the current asset allocation are set and aggregated. The final results should be similar as the current economic conditions are expected to continue;

Note to markers: an unchanged earning rate can be justified provided that both the recent investment return experience and change to the portfolio duration are commented upon. Full marks should be given for answering this way. No reduction can really be justified unless the student answered some of parts a) to c) incorrectly and then proceeds to base their answer in part d) on incorrect premises from preceding parts of the question.

Risk discount rate -

- As the earning rate is likely to have increased, the risk discount rate would be expected to be a risk premium above the earning rate and thus would also increase accordingly;
- The risk discount rate will not change if it is mandated by the board.

Marking guide:

- 1 mark for inflation unchanged, or increased by between 0.5% and 1%, and reasoning;
- 1 mark for earning rate recommendation, including appropriate justification;
- 1 mark for recent history and economic conditions;
- 1 mark for extended duration effect anticipated on earning rate;
- 1 mark for risk discount rate being consistent with earning rate, allowing for an appropriate risk premium margin;
- 1 mark for no change in risk discount rate if it is mandated by the board.
- 1 mark for any other reasonable points made;

to a maximum of 5 marks (CJ).

Note to markers: To get full marks the candidate must recommend and explain all three economic assumptions (inflation, earning rate and risk discount rate).

END OF QUESTION 5

QUESTION 6 **(17 Marks)**

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	1, 4, 8, 15, 16		5		5
Part b)	2, 7, 8, 15, 16		4		4
Part c)	3, 4, 7, 15, 16			4	4
Part d)	2, 4, 8, 15, 16			4	4
Total			9	8	17

Question

Essex Life Ltd (ELL) is a medium-sized Australian life insurer whose No.1 Statutory Fund includes a significant block of Whole of Life and Endowment policies issued on a participating basis since 1970. Sales volumes were significant until 1992, with lower sales since then.

You recently joined ELL as retail product actuary, and have just learnt that its sales of annual premium paying traditional business have increased sharply in the last 3-4 years. The main source of recent sales have been endowment policies which are used for insurance against mortgage loans.

Under this arrangement, the amount of the first year's premium is included as part of the mortgage loan provided to the investor. The policy insures the borrower in the event of death and also provides part of the repayment of the mortgage loan upon maturity or surrender.

Policy loans can be taken for up to 90% of the available surrender value of the policy. Illustrations by intermediaries have indicated that increases in surrender values would be sufficient to pay the interest on the policy loan and the annual premium. The experience so far has been that the full loan is borrowed from ELL for each policy at the earliest possible date.

Intermediaries selling this product, receive a large initial "up front" commission and are also eligible to earn additional over-riders which are dependent on the achievement of high sales and low lapses. To date, intermediaries have earned the maximum possible over-riders.

You are provided with the following analysis prepared by a senior actuarial analyst for the 'benchmark' policy (Male aged 30 at entry, Endowment to age 60, Sum Insured $200,000) comparing surrender values as illustrated in sales material with actual current surrender values and the asset share (which represents the accumulated policy cash flows allowing for actual experience) at each duration.

Duration in force	Illustrated SV ($)	Actual SV ($)	Asset Share ($)
1	0	0	– 672
2	4,560	4,130	3,370
3	8,870	8,420	7,530

4	**13,340**	**12,880**	**11,950**
5	**17,990**	**17,510**	**16,550**

a) Describe the main features in the above comparisons and identify the most likely reasons for these results. (5 marks)

b) You are reviewing the surrender value basis for this block of business. What are the implications of the features evident in the table shown? (4 marks)

c) What are the potential implications of the current situation for ELL's profit distributions via bonuses on its traditional business? (4 marks)

d) Explain the main risks and issues that the current situation might raise

i. for ELL; and
ii. for the retail product actuary. (4 marks)

QUESTION 6: SOLUTION (17 marks)

(a) Main features of above comparisons, and most likely reasons for these results, are –

- Actual current surrender values are consistently below those illustrated in sales material, by a fairly constant (or slightly increasing) amount [~ $450], by a larger proportion at earliest durations [~ 10%] and tapering off to a smaller percentage difference at later durations [~ 3%].

  - ➢ The most likely reason for this result is bonus rate(s) in the illustrated SVs being higher than actual declared rates reflected in current SVs. This may be because the company has focused its bonus policy for traditional business on longer durations.
  - ➢ Also a likely reason is that actual SV basis is different (i.e. lower) than that of the illustrated SVs. This may be due to a feature of the actual SV basis (e.g. it may exclude the first year's bonus, or contain a specific deduction factor for expenses) that is not reflected in illustrations. As ELL has not focused on sales of traditional for a long period, its illustrations may not have been kept up to date and in sync with its actual SV basis.

  - ➢ <u>NOT VALID</u>: the Act Minimum SV basis is not at all a likely reason.

- Asset shares are consistently below SVs – both Actual current and Illustrated – by significant and increasing amounts; again, larger proportions at earliest durations tapering off to smaller percentage differences at later durations.

  - ➢ Most likely reason for this result is actual incurred expenses reflected in the asset shares being much higher than those allowed for in the SV basis (both Actual and Illustrated). This may be due to the earning of maximum over-riders while SV basis reflects average (lower than maximum) incidence. As ELL has not specifically targeted sales of traditional for a long time, the SV basis may be out of date or poorly attuned to short-duration business.

  - ➢ <u>Other valid reasons include</u>: acquisition expenses (level of commission, per policy initial costs, etc.) being higher than expected for this category of business; premium rate discounts for large sums insured being overly generous because they have not been kept up to date over a long period for this category of business; focus of Bonus Policy for traditional business on longer durations, where most traditional business exists; etc.

  - ➢ <u>NOT VALID</u>: again, Act Minimum SV basis is not at all a likely reason.

<u>Marking guide</u>:

- 1 mark for well-described comparison between Actual and Illustrative SVs;
- 1 mark for explaining most likely reason due to bonus rates being different;
- 1 mark for explaining other factors in SV basis being different, e.g. expense factor or treatment of bonus in SV formula;

- 1 mark for well-described comparison between Asset shares and SVs, particularly Actual SVs;
- 1 mark for explaining most likely reason due to difference between maximum and average over-ride, and/or SV basis being out of date at short durations;
- 1 mark for explaining other valid reasons, e.g. expenses, premium discounts, Bonus Policy focused on the longer durations, etc;
- ½ or 1 mark for each other valid point made, depending on whether it is well explained (1) or just mentioned (½);

to a maximum of 5 marks (SJ).

(b) The potential implications of these results for the SV basis of ELL's traditional business are –

- Client dissatisfaction (from policy owners and/or intermediaries) regarding the difference between Illustrated and Actual SVs. This may lead to reputation risk as well as regulatory/compliance risk, arising from complaints to authorities, media, etc. on the apparent misrepresentations in sales material.

- This (along with reliance on amounts of Illustrated SVs to support 90% as a loan on the policy) may lead to pressure to maintain and possibly increase Actual SVs.

- There is clear financial strain implied in early surrenders, by comparison of Asset shares with SVs (both Actual and Illustrated), which puts opposite pressure in terms of the need to reduce early SVs.

- The SV basis appears significantly inequitable (early surrenders are significantly subsidised); tends to deplete or erode available solvency margins (due to losses at early durations); is inherently unstable (due to conflict between Illustrated SVs and Asset shares, putting significant and opposing pressures on the SV basis); would appear to fail "Ease of Calculation" test, if it proves true that the SV basis has not been kept up to date; also appears clearly to fail consistency (between the Illustrated and Actual values); and raises serious issues against marketability, due to risks of reputation and/or regulatory detriment.

- Clearly the SV basis needs to be reviewed in order to effectively address the above failings. There may need to be a definite separation between the SV basis for the older series of business and this relatively new series of policies.

Marking guide:

- 1 mark for client dissatisfaction leading to reputation/regulatory risk;
- 1 mark for results in putting upward pressure on Actual SVs to match sales basis;
- 1 mark for financial strain putting pressure to reduce Actual SVs into line with Asset shares;
- ½ mark for each observation of the SV basis against each of the relevant SV basis criteria (Inequity; tend to weaken Solvency; inherent Instability; lacking Ease of calculation; lack of Consistency; and contradictory Marketing indications);
- 1 mark for need to review SV basis and differentiate between old and new series;

- ½ or 1 mark for any other reasonable points made;

to a maximum of 4 marks (SJ).

(c) Potential implications of this situation for the company's profit distributions via bonuses on its traditional business are –

- Losses appear to arise at short durations under this situation, which may result in pressure to reduce profit distributions in this area. ELL may need to treat the new series of policies as a separate one for bonus rate purposes; may need to introduce a two-tier (or even three-tier) bonus system, if it doesn't have one already; it may need to reduce its rate of bonus on Sum Insured (and review its rate of bonus on Bonus, for the existing business); or it may need to introduce a term-related factor for bonus rates. For any of these strategies, the object is to reduce the profit distribution to the new series, while maintaining the equity for longer duration business.

- Again, client dissatisfaction (from policy owners and/or intermediaries) regarding the difference between Illustrated and Actual bonuses. As in the case of SVs, this may lead to reputational risk as well as regulatory/compliance risk, arising from complaints to authorities, media, etc. on the apparent misrepresentations in sales material. Moreover, reduction in bonuses may act in tandem with any revision of the SV basis, so the combined effect (on Policy Loans, as well as SVs) is even more severe. Also, bonuses affect all clients, not just surrenders or those who take loans. The estimated future values of all policies are effectively reduced.

- As we have not been given any specific information about the degree to which the current bonuses are (or are not) supported for the business as a whole, it is not appropriate to assess any implications of the situation along specific lines of equity, acceptability to the policy owner, benefit to the office, etc.

<u>Marking guide</u>:

- 2 marks for losses at short durations, resulting in downwards pressure on bonus rates in the early policy years, including some description of means for achieving that while looking after longer duration business;
- 1 mark for client dissatisfaction leading to reputation/regulatory risk;
- 1 mark for recognising cumulative effect on SVs if bonus rates & SV basis both reduce;
- 1 mark for bonus rates affecting ongoing business as well as surrenders;
- NO marks to be given (but also not to be deducted) for attempts to assess bonus rates against the usual criteria, due to lack of information; and
- 1 mark for any other reasonable points made;

to a maximum of 4 marks (CJ).

(d) Main risks and issues that this situation might raise for the company and for the retail product actuary are –

- Financial risk from losses at short duration: As recent sales of traditional business are not primarily focused on life insurance (but rather on investment loans) as the primary contract, they may exhibit very different experience to that assumed in the SV basis and Supportable Bonus basis. It is likely that they will show earlier, and much higher, rates of discontinuance - leading to increased prospects for loss. Current lapse rates would seem to be low (even after 3-4 years) as maximum commissions (which are based on sales & lapses) are being earned. However these may increase sharply, especially as the business is based on loans for investment properties and changes in interest rates, taxation policy and relative attractiveness of other investment opportunities (e.g. stock market) may result in the underlying properties being sold. There should significant claw-back arrangements in place in respect of the commission if lapse rates deteriorate.

- Legal & compliance / regulatory / reputation risk from overstated Illustrated SV and Bonus rates: This may lead to complaints to authorities, media, etc. on the apparent misrepresentations in sales material; very bad publicity, which will affect not only its traditional business, but its whole "public profile". On top of that, you have Management time taken up by regulatory inquiries, disputes with the agent and its customers (who are also your policy owners), etc.

- Strategic risk from the impact on sales/distribution, and on existing business: Other intermediaries may perceive an issue of justice, depending on whether they think intermediaries selling this product have been given unreasonably favourable treatment, or alternatively dealt with unfairly. This may also result in diminished sales (not just in the traditional products) as well as increased discontinuances.

- Operational Risk related to managing this business in general as it has not been sold for many years and past corporate history and experience would have been lost. As a retail product actuary there may be potential challenges as expertise/experience with this product would be limited. May need to ensure that they develop/have the required expertise with this product.

- Unless dealt with very carefully, it has potential to result in real professional conflict for the retail product actuary in his/her responsibilities to balance obligations to the policyowner (i.e. accurate sales disclosure, fair and equitable surrender values etc) while maintaining good relations with management of the company and the marketing department.

- The actuary also has responsibilities to promote and uphold the reputation of the actuarial profession as being able to add value by managing risks appropriately in a commercial context.

Marking guide:

- ½ mark for financial risk (plus ½ mark for quality of explanation);
- ½ mark for L&C / regulatory / reputation risk (plus ½ mark for quality of explanation);
- ½ mark for strategic risk (plus ½ mark for quality of explanation);
- ½ mark for operational risk (plus ½ mark for quality of explanation);
- ½ mark for potential for professional conflict (plus ½ mark for quality of explanation);

- ½ mark for the actuary's professional responsibilities (plus ½ mark for quality of explanation);
- ½ mark for any other reasonable points made (plus ½ mark for quality of explanation)

to a maximum of 4 marks (CJ).

END OF EXAMINATION