**INSTITUTE OF ACTUARIES OF AUSTRALIA**

**COURSE 2A LIFE INSURANCE**
**MAY 2005 EXAMINATIONS**

**Answer all 6 questions.**

**QUESTION 1** **(9 Marks)**

You are a product actuary working for a company that is thinking of releasing a new single premium investment linked product (both super and non-super versions). The marketing manager is aware that dollar fee disclosure is likely to be implemented in the near future and has therefore requested the evaluation of three different fee structures for the new product.

Dollar fee disclosure means that the fees that are charged on the contract have to be shown as dollar amounts in the year they are charged. All Product Disclosure Statements (PDS's) must display the indicative cost of the fee structure in dollars for a 'standard' contract. A standard contract is defined as a single premium of $15,000 invested for 10 years with an investment return of 8.00% per annum (after tax but before fees) credited annually at the end of each year.

The fee structures to be evaluated are:

| | Structure 1 | Structure 2 | Structure 3 |
|---|---|---|---|
| Initial Fee | 5% | 1% | 0% |
| Management Fee | 1.5% | 1.3% | 1.98% |
| Annual Policy Fee | $0 | $120 | $0 |

Note: The Initial Fee is charged on the single premium.
The Management Fee is an annual fee, charged as a % of the end of year account balance.

One of the actuarial analysts has calculated the following prescribed tables (which have to be shown in the promotional material):

| Time | Total Fees ($) Structure 1 | Total Fees ($) Structure 2 | Total Fees ($) Structure 3 |
|---|---|---|---|
| 0 | 750.00 | 150.00 | 0.00 |
| 1 | 230.85 | 328.49 | 320.76 |
| 2 | 245.58 | 340.56 | 339.56 |
| 3 | 261.25 | 353.42 | 359.47 |
| 4 | 277.91 | 367.14 | 380.54 |
| 5 | 295.64 | 381.75 | 402.84 |
| 6 | 314.51 | 397.33 | 426.45 |
| 7 | 334.57 | 413.94 | 451.45 |
| 8 | 355.92 | 431.65 | 477.91 |
| 9 | 378.63 | 450.52 | 505.93 |
| 10 | 402.78 | 470.63 | 535.58 |
| Total | 3,847.64 | 4,085.44 | 4,200.49 |
| NPV at t=0 | 2,748.84 | 2,724.86 | 2,718.87 |

| Time | Account Balance Structure 1 | Account Balance Structure 2 | Account Balance Structure 3 |
|---|---|---|---|
| 10 | 26,449.33 | 26,501.11 | 26,514.03 |

The expected earning rate of 8% has been used to discount the cash flows.

(a) Provide your recommendation, with reasons, as to which fee structure you think the company should adopt with regard to dollar fee disclosure from a marketing perspective. (3 marks)

(b) You have now determined the following expense (including commission) information for this size of policy. Would you recommend a different fee structure if you were only considering the pattern of expense cash flow? (2 marks)

| Time | Expenses ($) |
|---|---|
| 0 | 600.00 |
| 1 | 233.40 |
| 2 | 247.27 |
| 3 | 262.06 |
| 4 | 277.84 |
| 5 | 294.66 |
| 6 | 312.62 |
| 7 | 331.79 |
| 8 | 352.26 |
| 9 | 374.12 |
| 10 | 397.48 |
| Total | 3,683.51 |
| NPV @ t=0 | 2,593.08 |

(c) What other considerations would you take into account before finalising your recommendation regarding the fee structure? (4 marks)

 

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**QUESTION 2** **(19 Marks)**

You are the product actuary for a life insurance company. To date the company has sold only whole of life insurance and yearly renewable lump sum risk products.

New business sales have not increased for a number of years. In addition equity markets have been volatile and have trended downwards over the past few years.

The marketing manager has decided that this is the ideal time to diversify the product range and launch a regular premium capital guaranteed investment product. This product will provide an account balance equal to the accumulation of premiums less fees, with interest credited annually. The fees will be a % of premium, an annual dollar policy fee and a % of assets. There will be no surrender charges. The rate to be declared is linked to the rate of interest earned on the assets as shown in the Company's accounts less the asset fee.

You have been asked to determine the appropriate expense assumptions for this new product and are about to commence your expense analysis.

(a) What are the main categories of expenses to be considered (i.e. into what categories would you would divide the expenses into)? (2.5 marks)

(b) How would you express the results of your analysis in a form suitable for use as the expense assumptions used in pricing your existing contracts. (2.5 marks)

(c) Discuss what adjustments you make to the results of this analysis to determine pricing assumptions for the new capital guaranteed product. (3 marks)

(d) Describe how each of these expense components would relate to the fee structure for the new contract, and how you would check to ensure your fee structure was adequate. (5 marks)

(e) The CFO has announced that he intends to introduce an extensive cost cutting program next year. He expects expenses will reduce by 20% across the company. The marketing manager having heard this announcement thinks that you should reduce your expense assumptions, and hence fees on the new product by the same 20%. Draft a memorandum to the marketing manager outlining your opinion on his request. (6 marks)

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**QUESTION 3** **(12 Marks)**

The product actuary of your company has asked an actuarial analyst to calculate premium rates for a new product the company wishes to release.

The product is a level premium term insurance for terms up to 10 years. The sum insured remains level throughout the policy term.

The analyst has been given the following assumptions:

| | | | |
|---|---|---|---|
| Mortality | | 100% | IA 90-92 (Male) ultimate |
| Expenses | | | |
| | Initial | $90 | per policy |
| | Renewal | $23 | per policy from year 2 onwards |
| Commission | | | |
| | Initial | 2.5% | of annual premium x term of policy |
| | Renewal | 1.0% | of each annual premium including the first |
| Interest | | 6.5% | per annum |
| Sum insured | | $100k | (average) for all policies |

All premiums are annual.

A set of premium rates has been determined which meets the company's profit requirement. However, the actuarial analyst has noticed an issue with the premium rates and has asked you for help. A snapshot of the premium rates causing the issue is below:

| Entry Age | Term | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 35 | 171.59 | 135.60 | 122.73 | 116.05 | 111.96 | 109.22 | 107.40 | 106.19 | 105.31 | 104.75 |
| 40 | 200.71 | 166.65 | 155.82 | 150.62 | 147.86 | 146.33 | 145.58 | 145.31 | 145.33 | 145.64 |
| 45 | 259.95 | 226.89 | 216.91 | 212.62 | 210.86 | 210.40 | 210.69 | 211.62 | 213.07 | 214.89 |
| 50 | 332.25 | 300.26 | 291.46 | 288.87 | 288.99 | 290.49 | 293.07 | 296.50 | 300.67 | 305.48 |

The analyst's calculations have been checked and verified.

(a) What issue did the analyst identify and why did it arise? (3 Marks)

(b) Why does this make these rates inappropriate to use in practice? (3 Marks)

(c) Suggest 3 different ways to resolve the problems and what issues may arise from each suggestion. (6 Marks)

**QUESTION 4** **(18 Marks)**

You are the product actuary for a medium sized life insurance company in Australia. A newspaper article in this morning's financial press has announced that a cure has been found for cancer. This involves the administration of a new drug as a single injection to someone diagnosed with cancer. Testing of the cure indicated a 98% success rate in effecting a complete cure. The drug is not effective when used as a vaccine, as, although it is not harmful, it is only effective when administered post diagnosis. The cost of the injection is expected to be less than $AUD100.

Your company writes the following products:

i) Term insurance
ii) Trauma insurance
iii) Annuities
iv) Unit linked investment products

The Senior Management team is concerned about the effect this new drug may have on the company's business and have asked you to provide them with your views on the following:

(a) How are each of the above products likely to be impacted in the short-term (i.e. less than 12 months)? (4 marks)

(b) Apart from these short-term impacts, how are each of the above products likely to be impacted in the longer term? (6 marks)

(c) Discuss 4 new risks facing the company as a result of this new treatment. (4 marks)

(d) What actions could the company take to mitigate these 4 risks? (4 marks)

 

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## QUESTIONS 5 & 6

**Questions 5 and 6 both refer to the following scenario.**

**Scenario**

Magic Life Pty Ltd is a medium sized life insurance company operating in Australia. The Chief Executive Officer and several of the directors have used their authority to remove money from the company's statutory funds and have relocated to a country without an extradition treaty with Australia. As a consequence, the company has just been placed under Judicial Management in accordance with the Life Insurance Act 1995. The company has ceased writing new business, although premiums under existing policies can continue to be accepted.

You are a consulting actuary. The Judicial Manager has retained your services to provide independent actuarial advice.

The status of the Statutory Funds, both before and after the directors' action, is as follows:

| Fund | Assets prior to Directors' action ($'m) | Solvency Requirement ($'m) | Assets after Directors' action ($'m) |
|---|---|---|---|
| SF 1 | 1,275 | 1,260 | 1,225 |
| SF 2 | 750 | 740 | 650 |
| S/H | 25 | 10 | 25 |
| Total | 2,050 | 2,010 | 1,900 |

Note: SF is an abbreviation for Statutory Fund.
S/H is an abbreviation for Shareholders' Fund.

From the recent valuation (prior to the directors' action), the Judicial Manager has also been able to provide you with the following breakdown of the business:

| Fund | Product group | Class | Policyholder Account Balances ($'m) | Minimum Termination Value ($'m) | Value of In Force Business ($'m) |
|---|---|---|---|---|---|
| SF 1 | Investment Linked | Super | 1,240 | 1,240 | 55 |
| SF 2 | YRT & riders | Non-Super | n/a | 40 | 200 |
| SF 2 | YRT & riders | Super | n/a | 25 | 125 |
| SF 2 | Defined Contribution | Super | 655 | 655 | 30 |
| Total | | | | 1,960 | 410 |

Note: YRT is an abbreviation for Yearly Renewable Term.

The Defined Contribution product is an investment account product where the employee and employer contribute fixed amounts and the benefit is defined as an account balance that accrues with credited interest. The account balance plus accrued interest is guaranteed by Magic Life not to decrease. The interest rate is reviewed monthly and interest is also credited monthly.

The superannuation YRT product is only offered in conjunction with the defined contribution product with premiums being deducted from the account balances.

The Minimum Termination Value is equal to the surrender value for the investment products and unearned premium for the risk products.

**QUESTION 5** **(18 Marks)**

The Judicial Manager is concerned with the appropriateness of the investment policy. As Statutory Fund No 1 is investment linked, with published asset allocation ranges for each of the investment options, the Judicial Manager does not believe it is appropriate to consider changing these allocations.

For Statutory Fund No 2 he has provided you with the following asset allocation:

| Asset Class | Current Allocation | Benchmark Allocation | Allocation Range |
|---|---|---|---|
| Australian Equity | 22.5% | 20% | 15% - 25% |
| International Equity | 12.5% | 10% | 0% - 20% |
| Australian Fixed Interest | 43% | 55% | 40% - 70% |
| International Fixed Interest | 9% | 5% | 0% - 10% |
| Property | 10% | 5% | 0% -10% |
| Cash | 3% | 5% | 0%-10% |

The Judicial Manager is now seeking your view on the appropriateness of the investment policy for all funds.

(a) Have you been provided with sufficient information? If not, what additional information would you seek and why? (6 marks)

(b) Comment on the appropriateness of the asset allocation for Statutory Fund No 2 and recommend, with reasons, the need for any changes. Also recommend how these changes, if required, could be implemented. (8 marks)

(c) What are the main considerations regarding the setting of crediting rates for the next 3 to 5 years for the Defined Contribution product? (4 marks)

 

**QUESTION 6** **(24 Marks)**

The Judicial Manager has also requested you to calculate the Value of the In Force business allowing for the potential changes as a result of the directors' actions.

(a) How, and why, would the mortality/morbidity decrement assumptions change for the company from those used at the previous valuation? (2 marks)

(b) How, and why, would the lapse/surrender decrement assumptions change for the company from those used at the previous valuation? (6 marks)

(c) How, and why, would the expense assumptions change for the company from those used at the previous valuation? (2 marks)

(d) How, and why, would the economic assumptions change for the company from those used at the previous valuation? (4 marks)

The Judicial Manager has also requested you to provide some suggestions on other courses of action that should be considered for the company.

(e) What other actions would you recommend the Judicial Manager consider? (10 marks)

**END OF PAPER**

 