# INSTITUTE OF ACTUARIES OF INDIA

## EXAMINATIONS

## 26th May 2009

## Subject CA3 – Communications

### Time allowed: 3 Hours (14.15 - 17.30 Hrs)

### Total Marks: 100

### *INSTRUCTIONS TO THE CANDIDATES*

1. *Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception*

2. *You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have 3 hours to complete the paper.*

3. *You must not start writing your answers until instructed to do so by the Supervisor.*

4. *Attempt BOTH the questions.*

5. *Mark allocations are shown in brackets.*

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**AT THE END OF THE EXAMINATION**

**Please return your answer book and this question paper to the supervisor separately.**

**Q 1)**  You work as a product development actuary in a life insurance company.  The Company has recently appointed a new manager with a marketing background to head the Product Development Group.  He does not have any prior life insurance experience.

In anticipation of a meeting to discuss two product proposals, he has asked you to prepare a memorandum comparing the two products.

To help you prepare for the meeting a student actuary who has worked on both proposals has summarized the following information.

| Table 1: Comparison of product design | | |
|---|---|---|
| | **Product A** | **Product B** |
| Product type | Regular premium unit-linked insurance | Regular premium unit-linked insurance |
| Term | 10 | 10 |
| Premium Term | 10 | 10 |
| Sum assured | 10 times annual premium | 5 times annual premium |
| Death Benefit | Sum assured plus fund value | Higher of fund value or sum assured |
| Maturity Benefit | Fund value | Higher of fund value or total premiums paid |
| Surrender Benefit | Fund value less surrender charges | Fund value less surrender charges |

| Table 2: Comparison of product charges | | |
|---|---|---|
| Fund management charge | 1.00% | 1.75% |
| Premium allocation charge | Year 1: 30%<br>Year 2: 20%<br>Year 3: 10%<br>Year 4 onwards: 0% | Year 1: 15%<br>Year 2: 10%<br>Year 3 onwards: 5% |
| Administration charge | Rs500 per annum increasing at 5% every year | Rs750 per annum increasing at 5% every year |
| Surrender charges | As % of premium:<br>Year 1: 50%<br>Year 2: 35%<br>Year 3: 20%<br>Year 4: 10%<br>Year 5 onwards: 0% | As % of fund value:<br>Year 1: 25%<br>Year 2: 20%<br>Year 3: 15%<br>Year 4: 10%<br>Year 5 onwards: 5% |

Note that the rate of mortality charge under both products is identical.

**Table 3: Point of Sale Illustration at three hypothetical rates of interest - Product A**

| Year | Premium | Allocation Charge | Admin Charge | Mortality Charge | Fund Value projected at: | | |
|---|---|---|---|---|---|---|---|
| | | | | | 0% | 6% | 10% |
| 1 | 25,000 | 7,500 | 500 | 250 | 16,583 | 17,588 | 18,258 |
| 2 | 25,000 | 5,000 | 525 | 275 | 35,425 | 38,627 | 40,829 |
| 3 | 25,000 | 2,500 | 551 | 300 | 56,503 | 63,289 | 68,100 |
| 4 | 25,000 | - | 579 | 325 | 79,793 | 91,755 | 100,494 |
| 5 | 25,000 | - | 608 | 350 | 102,797 | 121,587 | 135,745 |
| 6 | 25,000 | - | 638 | 375 | 125,516 | 152,853 | 174,108 |
| 7 | 25,000 | - | 670 | 400 | 147,951 | 185,622 | 215,861 |
| 8 | 25,000 | - | 704 | 425 | 170,105 | 219,968 | 261,308 |
| 9 | 25,000 | - | 739 | 450 | 191,977 | 255,968 | 310,780 |
| 10 | 25,000 | - | 776 | 475 | 213,569 | 293,703 | 364,637 |

**Table 4: Point of Sale Illustration at three hypothetical rates of interest - Product B**

| Year | Premium | Allocation Charge | Admin Charge | Mortality Charge projected at: | | | Fund Value projected at: | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0% | 6% | 10% | 0% | 6% | 10% |
| 1 | 25,000 | 3,750 | 750 | 105 | 105 | 105 | 20,039 | 21,262 | 22,078 |
| 2 | 25,000 | 2,500 | 788 | 92 | 90 | 89 | 40,930 | 44,707 | 47,307 |
| 3 | 25,000 | 1,250 | 827 | 73 | 69 | 66 | 62,664 | 70,433 | 75,953 |
| 4 | 25,000 | 1,250 | 868 | 51 | 41 | 34 | 83,998 | 97,238 | 106,951 |
| 5 | 25,000 | 1,250 | 912 | 25 | 7 | - | 104,942 | 125,172 | 140,497 |
| 6 | 25,000 | 1,250 | 957 | - | - | - | 125,500 | 154,253 | 176,762 |
| 7 | 25,000 | 1,250 | 1,005 | - | - | - | 145,650 | 184,521 | 215,966 |
| 8 | 25,000 | 1,250 | 1,055 | - | - | - | 165,399 | 216,022 | 258,350 |
| 9 | 25,000 | 1,250 | 1,108 | - | - | - | 184,750 | 248,807 | 304,174 |
| 10 | 25,000 | 1,250 | 1,163 | - | - | - | 203,708 | 282,928 | 353,718 |

Further analysis carried out by the student actuary to compare the illustrations of the two products is set out in tables 5 and 6.

| Table 5: Effect of charges on customer returns – Product A | | | |
|---|---|---|---|
| **Gross Fund Return** | **0%** | **6%** | **10%** |
| **Customer IRR** | **-2.9%** | **2.9%** | **6.8%** |
| **Reduction in Yield** | **2.9%** | **3.1%** | **3.2%** |
| Allocation Charge | 1.1% | 1.4% | 1.6% |
| Fund Mgt Charge | 1.0% | 1.0% | 1.0% |
| Administration Charge | 0.5% | 0.4% | 0.4% |
| Mortality charge | 0.3% | 0.3% | 0.2% |

| Table 6: Effect of charges on customer returns – Product B | | | |
|---|---|---|---|
| **Gross Fund Return** | **0.0%** | **6.0%** | **10.0%** |
| **Customer IRR** | **0.00%** | **2.24%** | **6.22%** |
| **Reduction in Yield** | **0.00%** | **3.76%** | **3.80%** |
| Allocation Charge | 1.20% | 1.30% | 1.30% |
| Fund Mgt Charge | 1.75% | 1.75% | 1.75% |
| Administration Charge | 0.80% | 0.70% | 0.70% |
| Mortality charge | 0.02% | 0.02% | 0.02% |
| Maturity guarantee | -3.77% | 0.00% | 0.00% |

Your manager has asked you to cover the following aspects in particular:

- Key product design differences between the two products
- Comparing the charging structure of the two products
- Why does Product B illustrate different mortality charges under the three hypothetical rates of interest whereas Product A only shows one column? What rate of interest has been used in the projection of mortality charge for Product A?
- What impact does offering the return of premium maturity guarantee under Product B have for the customer? Please elaborate on the negative reduction in customer IRR under the 0% scenario for Product B.

Draft a memorandum in about 500 – 600 words in response to your manager's request.

Customer IRR is defined as the internal rate of return on cash flows considering a policyholder pays annual premium in advance and receives fund value at the end of the policy term. You can assume that the calculations carried out by the student actuary are correct and that no further information is required.

                                                                                                    **[60]**

**Q 2)** Your friend has read the following note from a friend who works in the actuarial department of a life insurer and is unable to understand the concepts explained

"**Economic capital**

Economic capital is commonly taken as the excess assets measured in market value terms over the market-consistent value of liabilities that needs to be held by an entity to be assured of economic solvency (ie market value of assets being in excess of market value of liabilities) over a specified timeframe at an agreed probability level.

In the absence of a deep and liquid market for insurance liabilities where market prices can be readily observed market-consistent values of liabilities are usually computed using stochastic modeling techniques involving various economic scenarios and with appropriate linkages between demographic assumptions and the scenarios generated.

It is important to ensure the scenario generator is market consistent which is commonly done by testing its ability to reproduce prices of financial instruments particularly derivatives appropriate to the liability structure of the entity being valued. In emerging markets the dearth of such instruments makes calibration a particularly challenging task and underscores the need to show sensitivities of the capital to the various parameters.

Policyholder behaviour should be linked to the economic scenarios particularly in the case of policies where options and guarantees exist. Financial anti-selection can be expected to be exhibited and this linkage should be incorporated in the model otherwise the value of liabilities may be significantly understated.

Economic capital is required to allow the entity to absorb a variety of risks while remaining solvent. In computing the economic capital the level of stress tests applied to the various parameters (eg, equity markets, interest rates, mortality, lapses) has a large bearing on the resulting economic capital requirement. The desired probability confidence level is often measured against corporate bond defaults of the rating that the institution targets. Shock tests should therefore be appropriate for the confidence level targeted and the calibration of such tests should be carefully carried out.

Finally, in terms of the timeframe considered internationally there seems to be a preference for one-year with the assumption being that the liabilities can be transferred to another entity within a year."

Redraft the note in about 450-550 words to make it suitable for sending it to your friend who is not conversant with financial matters. You can assume that the information contained in the note is correct and that no further information is required.

**[40]**

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