# INSTITUTE OF ACTUARIES OF INDIA

# EXAMINATIONS

**14th May 2008**

# Subject ST2 — Life Insurance

Time allowed: Three hours (14.15* pm – 17.30 pm)

**INSTRUCTIONS TO THE CANDIDATE**

1. *Enter all the candidate and examination details as requested on the front of your answer sheet/s.*
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 three hours to complete the paper.*
3. *The answers are not expected to be any country or jurisdiction specific However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*
4. *You must not start writing your answers in the answer sheet until instructed to do so by the supervisor.*
5. *Mark allocations are shown in brackets.*
6. *Attempt all questions, beginning your answer to each question on a separate sheet.*
7. *Candidates should show calculations where this is appropriate.*
8. *Fasten your answer sheets together in numerical order of questions. This, you may complete immediately after expiry of the examination time.*

**Professional Conduct:**

*It is brought to your notice that in accordance with provisions contained in the Professional Conduct Standards, If any candidate is found copying or involved in any other form of malpractice, during or in connection with the examination, disciplinary action will be taken against the candidate which may include expulsion or suspension from the membership of IAI.*

**Candidates are advised that a reasonable standard of handwriting legibility is expected by the examiners and that candidates may be penalized if undue effort is required by the examiners to intepret scripts.**

**AT THE END OF THE EXAMINATION**

Please return your answersheets and this question paper to the supervisor separately.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

**Q1)** List the components that it is likely would be used to determine the asset share of a conventional with profits endowment assurance policy. **[6]**

**Q2)** A man purchased a without profits endowment assurance with a 25 year term on his 40th birthday. The sum assured of Rs.500,000 is payable at maturity, or at the end of the year of death if earlier. He pays a premium of Rs.10,000 annually in advance.

He has just reached his 55th birthday and has not yet paid the premium due at that date. He has decided that he no longer wishes to use this type of policy for the purpose of savings and would prefer to invest directly in equities. He has therefore requested a calculation of the surrender value and paid-up sum assured for his policy.

The insurance company calculates surrender values using a prospective calculation method. Paid-up sums assured are based on an equation of value using the surrender value as the current policy value. The following assumptions are used:

Mortality AM92 Ult
Interest rate 6.0% p.a.
Renewal expense Rs.200 per annum for premium-paying policies
Rs.20 per annum for paid-up policies
Renewal expense inflation 1.92% p.a.
Claims expense 0.5% of benefit on death and maturity
Alteration expense Rs.500 on surrender and alteration

(i) Calculate the surrender value to which the policyholder would be entitled. (7)

(ii) Calculate the paid-up sum assured to which he would alternatively be entitled. (5)

(iii) Discuss the other key issues that the policyholder should consider before making a decision on whether to surrender or make the policy paid-up (5)
**[17]**

**Q3)**

(i) Describe how a life insurance company would analyse its withdrawal experience. (6)

(ii) A large proprietary life insurance company has been selling unitized with profits endowment assurances successfully for a number of years. Premiums for these policies are paid monthly by direct debit, and may be increased or decreased at any time. The policyholder can stop premium payments temporarily for a period of up to 12 months. After this period, the policyholder can choose to re-instate premiums, have the policy made paid-up, or surrender the policy.

To date the company's analysis of withdrawals only takes account of surrenders. The company is considering extending its withdrawal experience analysis to achieve a better understanding of the surpluses arising.

Discuss this suggestion. (5)
**[11]**

**Q4)** You are an actuary of a life insurance company. You have been asked by your Appointed Actuary to prepare a presentation for a group of actuarial students. The topic of the presentation is to cover the topic of reserving and valuation of life insurance policies.

(i) State the principles a life insurance company should follow when establishing supervisory reserves that you would include in your presentation. (3)

Your company is a life insurance company which sells only conventional with profits life insurance contracts. It uses a net premium method for its statutory valuation.

(ii) Describe the extent to which the net premium method meets the principles for establishing supervisory reserves. (6)

(iii) The market value of the assets backing the with profits liabilities has fallen by 25% since the last valuation. Explain why the statutory value of the liabilities is unlikely to have fallen by the same percentage. (5)
**[14]**

**Q5)** A life insurance company sells unit-linked products through insurance intermediaries.
The government of the country in which the company operates is to introduce new legislation. This will restrict the charges that can be applied to group endowment assurances sold to employers for the purpose of providing retirement benefits for employees.

The maximum charges that can be applied to a policy will be at a fixed rate throughout the policy term, and can be *either*:

(a) $x$% per annum of the value of the unit-linked fund, and no other charges or penalties; *or*

(b) $y$% of each premium invested, and no other charges or penalties

An employer is only permitted to have one such endowment assurance policy, but may transfer an existing policy.

The insurance company has decided that it wishes to continue to operate in this market, but its current product offering does not meet the proposed maximum charge regulations.

Discuss the factors that the insurance company should consider when designing its new group endowment assurance product. **[18]**

**Q6)** A life insurance company offers a minimum maturity guarantee on its regular premium unit-linked savings contract. Describe how the company would determine the charges to be taken for providing this guarantee using simulation techniques. **[5]**

**Q7)** A life insurance company has, for several years, been one of the leading providers in its country of without profits level immediate annuities. One of its actuaries has raised concerns regarding the level of mortality risk arising from this business.

(i) Discuss briefly the different types of mortality risk that the company faces. **(3)**

(ii) Describe how the company could mitigate these risks for new business. **(6)**

(iii) Describe briefly the other risks that the life insurance company might face as a result of selling this business. **(8)**

(iv) It has been suggested that the company should not worry about the risk of lower than expected future mortality, because the extra amount of annuity that would have to be paid would have a relatively small impact on profitability since the payments happen a long way into the future.

Discuss this suggestion. **(5)**
**[22]**

**Q8)** You have an actuarial acquaintance in a small firm which is unwilling to invest in any “off-the-shelf” model office software. Rather than construct a program himself, the actuary has decided to “buy” from a consultancy the monthly cashflows expected from the major product types sold by his company for a small number of specimen existing business and new business model points. The consultancy will assume a set of central parameters defined by him in line with the company’s experience.

He says that this will allow him to work on profit testing, profitability of existing business and financial projections during the next 12 months, after which time he will buy revised cashflows in line with any possible new parameterisation or other changes.

Discuss the advantages and disadvantages of this approach. **[7]**

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