INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

23rd May 2013

Subject ST2 — Life Insurance

Time allowed: Three hours (14.45* – 18.00 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 three hours to complete the paper.***
3. ***You must not start writing your answers in the answer sheet until instructed to do so by the supervisor.***
4. ***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.***
5. ***Attempt all questions, beginning your answer to each question on a separate sheet.***
6. ***Mark allocations are shown in brackets.***
7. ***Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.***

AT THE END OF THE EXAMINATION
Please return your answer book and this question paper to the supervisor separately.

Q. 1) A life insurance company specializes in selling term assurance products and without profit immediate annuities.

The Chief Risk Officer (CRO) recently read an article in an actuarial magazine regarding the continuously improving mortality of the population in the last couple of decades. He has expressed his concern on the company's exposure to longevity risk.

a. Outline the steps the company can take in order to manage its longevity risk.

The CRO recommends the use of a stochastic model to project future mortality rates on its annuity business (4)

b. Outline the sources of risk associated with the use of stochastic models to project mortality rates and ways in which this risk can be managed. (4)

[8]

Q. 2) A life insurance company sells only unit-linked business. There is a range of funds for the customer to choose from, all of which are invested in internal linked funds run by the company. The in-force business reflects a variety of different charging structures (guaranteed and variable charges) and offers switching options between different funds in all products.

a. Define the term "appropriation price" and how can it be determined. (4)

The company is to be audited by the regulator next month. The regulator has indicated that it will particularly look into the areas which determine whether the unit-holders are being treated fairly by the company or not.

b. List the areas of management of unit-linked business in which treating customers fairly (TCF) is a consideration. (4)

c. Describe how TCF considerations might affect the company's unit pricing when choosing between a bid and an offer pricing basis. (4)

[12]

Q. 3) A life insurance company has been selling all types of traditional endowment products for many years. It now intends to introduce a new type of regular premium endowment product with the structure as given below:

Each policyholder will have an individual Policy Account and all premiums paid by the policyholder will be invested into the Policy Account. A policy fee of 7.5% of the annual premium will be deducted at the start of every policy year, regardless of whether the renewal premium has been paid or not. The policy shall continue even if premiums are discontinued as long as the account value can support the charges.

An interest rate addition on the Policy Account will be declared at the end of every year, subject to minimum of 0%, but otherwise not guaranteed. All Policy Accounts will be backed by local 10-Year Government Securities which have a current gross redemption yield of 7.5% per annum. The other features of the product are:

Policy Term	:	10 years
Premium Frequency	:	Annual only
Death Benefit	:	Policy Account value at time of death
Maturity Benefit	:	Policy Account value at maturity
Surrender Value	:	Acquires a surrender value of 85% of Policy Account value only after second policy year.

The following formula has been proposed for calculating the supervisory reserve at time t:
Reserve (t) = Policy Account value (t) - PV (t)

where PV (t) = present value of outstanding policy fee of 7.5% premium, discounted at 7.5% per annum

Discuss how well the proposed formula meets the supervisory reserving principles.

[10]

Q. 4) A life insurance company has been selling all types of unit-linked and term assurance products for more than 10 years. It offers high First-Year Commission (FYC) across its product suite. Its new business volumes over the years have comprised 95% unit-linked products and 5% term products. Due to a recent change in local regulations, the FYC under its unit-linked products will drop significantly and hence there is an estimated decline in unit-linked new business volumes.

In order to avoid this decline and given the familiarity of the unit-linked products to the company's distribution, the company intends to launch a unitized with-profits product.

a. Outline the key features of a unitized with-profits product. (4)

b. Outline how the change in fund value of a unitized with-profit contract would be administered and how this differs from a unit-linked product. (4)

The company has decided to write retirement accumulation product on a unitized with-profits basis. The retirement age will be chosen at outset and may vary between 60 and 70 years. The product offers the fund value to the policyholder at the time of death, surrender and maturity. The maturity date is also defined as the retirement age of the policyholder. Under local regulations, at maturity of such products the policyholder will have to mandatorily buy an immediate annuity from the same company.

In order to increase the marketability of the product, the chief marketing officer suggests considering offering one of the following additional features:

i. A guaranteed minimum annuity rate of 4% per annum of the accumulated fund at the time of maturity.

ii. Providing an option to the policyholder of changing the maturity age at any time during the contract provided the policyholder is between the ages of 60 to 70 years old at the date of maturity.

iii. Providing a guarantee that at the time of retirement, the annuity rate will be determined using the current mortality assumption under its term products. However the interest rate used to calculate the annuity will depend on the interest rates at the time of retirement

c. Discuss the issues arising from adding the above features and suggest how the product design or pricing of the product could be amended to minimize the cost to the company of adding them. (8)

[16]

Q. 5) A life insurance company has been writing variety of conventional without-profit business for past 10 years. The solvency ratio of the company has been falling over the last six quarters, though the solvency ratio is still significantly higher than the minimum required as per the regulations. The company maintains a shareholder fund and a conventional fund. The conventional fund contains assets that back the regulatory valuation liabilities. The shareholder fund contains the company's free assets and working capital, including assets that back the solvency requirements.

The investment strategy of the shareholder fund is 100% investment in fixed-interest securities with major proportion into government securities.
The investment strategy of the conventional fund over the years has been as below:

- 70%-80% of the assets to be invested in fixed-interest securities, mix of government securities and corporate bonds
- 20%-30% of the assets to be invested in equities

Given that the solvency ratio has been falling steadily, the chief actuary carried out an investigation to project the future financial position of the company using a cash flow projection model. Based on the investigation, the chief actuary recommended a change in investment strategy for the conventional fund, to:

- 85%-95% of the assets to be invested in fixed-interest securities, mix of government securities and corporate bonds
- 5%-15% of the assets to be invested in equities

No change in investment strategy for the shareholder fund was considered.

Describe the process the chief actuary would have used to arrive at the recommendation using cash flow projections.

[12]

Q. 6) In a certain country, regulators allow the life insurance companies to hold negative non-unit reserves for unit linked business and to use a Zillmerised net premium valuation for conventional business.

a. Define non-unit reserves and discuss the conditions and considerations the regulator might have imposed before allowing negative non-unit reserves. (4)

b. Define Zillmerisation and discuss the conditions and considerations the regulator might have imposed before allowing Zillmerisation

A medium sized life insurance company predominantly writes a variety of conventional with-profit contracts for past few years. The bonuses are in the form of addition to benefits. (4)

c. Explain the consideration to be taken while allowing for bonuses in reserving. (8)

[16]

Q. 7) A medium sized life insurance company has been selling term assurance business successfully for the past few years. The company has reinsurance on a risk premium individual surplus basis.

For existing business, the reinsurance rates are guaranteed for the term of the policy and the treaty is obligatory for both the direct insurer and reinsurer.

The company is approached by another reinsurer with rates about 30% cheaper than the existing reinsurer. The only difference to the existing treaty would be that the rates would not be guaranteed and can be reviewable only once during the policy term for in force business. The rates will not change in the first 3 years and will not increase by more than 50% of the initial offered rates if they are reviewed. At the time of any review, the direct insurer has the option to change the reinsurer for its existing business.

a. Discuss the factors the chief actuary of the insurance company would consider before accepting or rejecting this proposal.

For the past few years the premiums paid to the reinsurers have been significantly higher than the claims recovered. The finance director has asked why the company is considering reinsuring instead of retaining the profit passed to the reinsurer. (9)

b. Discuss the factors you would consider in drafting a response to the Finance director to address his concerns on profitability. What adjustments to the reinsurance arrangements could be made to reduce the profit to reinsurer. (9)

Recently the regulations have put a restriction that a minimum sum at risk has to be retained by the direct insurer both in absolute amount and in percentage terms at policy level for any new business sold. The proposed regulations do not differentiate between pure protection and investment products.

c. Discuss the impact of the changes in regulations to the company. (8)

[26]

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