

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

20th May 2010

Subject ST3 — General 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.*

AT THE END OF THE EXAMINATION

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

- Q. 1)** i) State the two main types of proportional reinsurance (1)
- ii) Explain by means of numerical examples, how the claim payment is divided between the direct writer and the reinsurer, in the event of a claim under each of the two types of proportional reinsurance. (3)
[4]
- Q. 2)** An insurance company has a portfolio for which aggregate claims have a compound Poisson distribution and individual claims are for a fixed amount m . The insurer calculates premiums using a proportional security loading θ_1 . The company is considering using a quota share reinsurance arrangement with retained proportion 'k' available from a reinsurer which applies a proportional security loading θ_2 . ($0 < \theta_1 < \theta_2$) to premiums.
- i) Show that the direct insurer's adjustment coefficient 'r' satisfies the equation $1 + [k(1 + \theta_2) - (\theta_2 - \theta_1)] * mr = e^{rkm}$ (3)
- ii) By differentiating the equation in part (a) find an expression in terms of θ_1 , θ_2 and m for the value of k that maximizes the adjustment coefficient 'r', considering r as a function of k (3)
- iii) If $\theta_1 = 0.2$, $\theta_2 = 0.35$ and $m = 5000$ determine the optimal value of k and show that the direct insurer's probability of ultimate ruin if it adopts the value and has an initial surplus of Rs. 75,000 is approximately 0.4% (2)
[8]
- Q. 3)** A general insurance company writing only motor insurance business has assets comprising equities, cash and index-linked government securities. Discuss the appropriateness of the investment portfolio. (8)
- Q. 4)** A general insurer uses a credibility formula to estimate the risk premium for a certain class of business.
- i) Explain the loadings you would apply to the risk premium to arrive at the office premium. Assume the office premium is determined by adding 30% to the risk premium to allow for insurer's expenses and profit requirements. Two risks are coming up for renewal. For risk P, the total amount of claims in respect of the past 5 years is 80% of the amount the insurer would have expected whereas for risk Q it is 20% higher than expected. The insurer uses a credibility factor of 50% for risk P and 75% for risk Q. (7)
- ii) Express the office premium for risk P as a percentage of the office premium for risk Q (2)
[9]

Q. 5) An insurance company accounts for all its business on a quarterly basis. The amounts of premium written for each quarter of the calendar year are:

- Q1: 100 Crore
- Q2: 120 Crore
- Q3: 150 Crore
- Q4: 120 Crore

In June, the company carried out a review of its expected claim experience for the year's business, and concluded that for business written during the year at the current premium rate, the combined ratio (Loss ratio + expense ratio) for the year would be 114%. As a result of this review, the company increased its premium rates by 20%, the increases taking effect on 1st August. During the third quarter, Rs 100 Crore was written on the old premium rate and the rest was written on the new premium rate.

- i) Explain briefly the terms UPR, URR and AURR. (3)
 - ii) Stating the assumptions you make, calculate the UPR and estimate the AURR as at close of play at the end of year assuming that the accounting method used by the company does not use a provision for DAC for calculation of UPR. (6)
 - iii) Explain briefly three reasons why a 20% increase in premium rates may result in a change in combined ratio which is significantly different from the decrease of 16.67% ($=20/120$). (4)
- [13]**

Q. 6) A newly formed general insurance company writing a wide range of general insurance business uses industry data to arrive at estimates for future claims experience, expenses and investment income.

- i) Explain the main areas of risk and uncertainty surrounding these estimates. (7)
- The company is in the process of finalizing its reinsurance arrangements for all lines of business and has approached several reinsurers for cover.
- ii) Discuss the issues that the company should consider when assessing the security of a reinsurer. (6)
- [13]**

Q. 7) You are the actuary of an established general insurance company which specializes in private motor insurance. Your company wishes to diversify its portfolio and write household buildings and contents insurance that covers domestic residential property against fire, theft, storm, flood and accidental damage. Your advice is sought on product design and rating for this new product.

- i) Describe the various moral hazards that can be associated with household buildings and contents insurance

Instead of setting the premium based on the value of contents chosen by the applicant, you propose to use number of rooms in the property. You retain other rating factors commonly used in the market such as location of the property, type of construction and security systems.

(3)

- ii) Discuss the advantages and disadvantages of this new rating approach from the point of view of the applicant and the company.

(8)

- iii) Describe controls that could be included in the product design or the underwriting process to mitigate any disadvantages to the company

(2)

[13]

Q. 8) You are the pricing actuary of a well established general insurance company which specializes in motor insurance.

- i) List twelve main rating factors which may be used to price personal motor insurance

(3)

- ii) State with reasons two risk factors which can be used to price personal motor insurance but cannot be used as rating factors.

(2)

While undertaking a motor portfolio review, you noted that claims management expenses as a percentage of total claim costs has increased steadily to 6.5% from 5% over the last five years.

- iii) Discuss why this increase may have occurred

(4)

- iv) State possible actions the company can take to reduce expenses

(2)

- v) List the motor portfolio movements you would normally monitor and state the reasons for monitoring them

(5)

[16]

Q. 9) An insurance company calculates its IBNR reserves based on quarterly data. The following is the incremental number of claims reported triangle for its commercial Fire line of business.

Occurrence Quarter	Lag in quarter					
	1	2	3	4	5	6
Q1 2008	12	5	0	2	0	2
Q2 2008	15	7	2	3	1	
Q3 2008	12	1	1	4		
Q4 2008	59	7	3			
Q1 2009	46	6				
Q2 2009	55					

The claim number run-off triangle is based on occurrence quarter cohorts. The average amount of claims applicable to all claims reported in the second quarter of 2009 is Rs 100,000. Assume that the average claim size of claims reported in subsequent quarters increases at an inflation rate of 10% per annum.

i) Describe briefly the simple proportion method and the delay table method for calculating IBNR reserves and when they can be used. (5)

ii) Using the chain-ladder method for projecting the number of IBNR claims, calculate the IBNR reserve (excluding IBNER) for the two quarters of occurrence year 2009. (7)

iii) Comment on the data used and the reliability of the result (4)

[16]
