

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

22nd November 2013

Subject ST8 - General Insurance: Pricing

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)** State the likely reasons for personal accident premium rates to be generally quoted as non - age specific rates. [2]
- Q. 2)** Define the following:
- i) Balance of a treaty
 - ii) Bordereau
 - iii) Facultative Reinsurance
 - iv) Rate on line [6]
- Q. 3)** Out of the 35% (of office premium) margin built over pure risk premium to derive office premium of Rs 100, 10% (of office premium) was commission.
- i) The sales department now wants to build a commission of 15% keeping everything else same. What will be the increase in office premium? (1)
 - ii) At 10% commission level, the product development team wants to offer another benefit in the product. If the pure risk premium of the new benefit is Rs 5, what will be the increase in office premium, if everything else is kept same? (1)
 - iii) In what circumstances the increase in office premium may be decided to be lower than the answer in (ii) above. (2)
- [4]
- Q. 4)**
- i) Show that the pure claim cost using burning cost is same as the pure claim cost using frequency-severity method if number of claims and amount of claim variables are independent. (1)
 - ii) Outline the causes of claim frequency trends over time. (2)
 - iii) Outline the factors due to which adjustments may be required to claim severity estimate derived from past claims data. (2)
- [5]
- Q. 5)** You are the reinsurance pricing actuary for a large reinsurer responsible for pricing Employer's Liability reinsurance treaties. Discuss the practical considerations to be done while reinsurance pricing. [7]
- Q. 6)** What is a captive insurance company? State any four reasons for setting up one? [4]
- Q. 7)** Let N , the number of claims in a year in an Auto insurance portfolio, follow the Negative Binomial distribution of Type II with parameters p and k .
- i) Show that a and b in the recursive formula $P_r = \left(a + \frac{b}{r}\right)P_{r-1}$ are p and $(k-1)p$ respectively. (2)
- Let the estimates of p and k be 10% and 2 respectively. Let the claim amount be 100 with probability 20% and 50 with probability 80% in case of a claim.

- ii)** Using the Panjer's recursive formula, derive the probability that the total claim in a year is less than 200. (3)
- iii)** List the steps you would use to estimate the probability that total claim in a year is less than 200 using the simulation method. (4)
- Q. 8)** You met your cousin at a family event, who appears to have had a bad experience with his insurance policy and after exchanging pleasantries says "Why do insurance policies have so many exclusions? If insurers don't want to cover anything why don't they just sell something other than insurance?"
Explain to him how exclusions put in policies actually work in the interest of the insured. [9] (6)
- Q. 9)**
- i)** Describe briefly how credibility theory may be used for rate setting. (1)
- ii)** State the basic formula for calculating a credibility weighted statistic defining the terms used. (1)
- iii)** List the practical considerations when using credibility theory in practice for rate setting. (5)
- Q. 10)**
- i)** State the reinsurance basis (out of risk attaching, claims occurrence and claims made basis) that proportional reinsurance is likely to be arranged on. Explain briefly the reason why? (2)
- ii)** A reinsurer is examining whether to get into a quota-share arrangement with a direct insurer
- a)** State the aspects that the reinsurer would be concerned to find out about the cedant before getting into the reinsurance arrangement. Explain briefly the reason why? (2)
- b)** Explain the measures that the reinsurer should take to safeguard itself from adverse claim experience on the treaty. (4)
- iii)** Comment on the claim experience for the both the ceding Insurer and the reinsurer for surplus reinsurance (1)
- Q. 11)** In the context of GLM modelling: [9]
- i)** What is scaled deviance? (2)
- ii)** Why is scaled deviance a better statistics than deviance for comparing between models? (1)
- A rating exercise is being done with Age and Car type as rating variables. Age has three levels - Young, Medium and Old. Car type has two levels - One and Two.
- iii)** Write down the covariate matrix for the model equation with covariates Age, Car Type and their interaction. (4)
- iv)** Describe ways for model validation after a GLM exercise. (4)

[11]

- Q. 12)** The following table is a summary prepared by a reinsurer for Employer's Liability line of business based on data collected from cedants. The data collated has been grouped by three types of claims – with limit applied at 1 Crore, 5 Crore and 10 Crore. In units of Crore, following three tables summarize the claim severity experience from the three groups:

Limit applied at 1 Crore,

Lower (Rs)	Upper (Rs)	Amount of claims	Number of claims
0	1	202	352

Limit applied at 5 Crore,

Lower (Rs)	Upper (Rs)	Amount of claims	Number of claims
0	1	75	300
1	2.5	225	150
2.5	5	270	78

Limit applied at 10 Crore,

Lower (Rs)	Upper (Rs)	Amount of claims	Number of claims
0	1	125	500
1	2.5	375	250
2.5	5	300	100
5	10	200	30

- i) To estimate the average cost of claim at limit 1 Crore, should you consider only the claims from claims with limit 1 Crore or you should also use the claims with higher limits? Discuss the reason why? (2)
- ii) To estimate the ILF factor for limit 5 Crore with a basic limit of 1 Crore, we have two options for method to use:
- a) option 1: Average cost of claim at limit 5 Crore / Average cost of claim at limit 1 Crore
- b) Option 2: (Average cost of claim at limit 1 Crore + average cost of claim in layer 4 Crore xs 1 Crore) / Average cost of claim at limit 1 Crore
- Which option would you choose in the above scenario? Explain the reason why? (2)
- iii) In case you decide to use option 2, to estimate the average cost of claim for layer 4 Crore xs 1 Crore, should you consider only the claims which are above 1 Crore or all claims with limit more than 1 Crore? Explain the reason why? (2)
- iv) Estimate the average loss to the layer 4 Crore Xs 1 Crore based on the above tables. (3)
- v) Using the answer in (iv), calculate the ILF factor for limit 5 Crore if the basic limit is 1 Crore. (1)
- vi) Outline the practical consideration to be made about suitability of the ILF table while using an ILF table to estimate the premium for a layer. (2)

[12]

- Q. 13)** Aided by attractive government incentives and the promise of lower energy bills and a greener environment, solar energy projects have picked up in a big way. Solar panels convert solar radiation (sunlight) into usable direct current (DC) electricity. A Solar Park owner is an electricity generator.

Anticipating demand for this insurance your company is considering writing insurance that would provide cover to Solar Park operators. The company has not written this type of insurance before.

- i)** Describe the covers that could be included in a comprehensive insurance policy for Solar Parks. (5)
- ii)** List the sources of external information that you could use to help price this insurance product. (2)
- iii)** Discuss the likely problems with using external data for calculating premium rates for this class of business. (4)
- iv)** Describe the rating factors that could be used to determine the premium to be charged. (7)

[18]
