

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

21st June 2019

Subject SP8 – General Insurance: Pricing

Time allowed: 3 Hours 15 Minutes (14.45 – 18.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

- 1. Please read the instructions inside the cover page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception.*
- 2. 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.*
- 3. Attempt all questions, beginning your answer to each question on a separate sheet.*
- 4. Mark allocations are shown in brackets.*
- 5. 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. You are not allowed to carry the question paper in any form with you.

- Q. 1)** Company LegalInsure offers liability insurance wherein the policy covers legal defense costs (A) and losses (L). Court verdicts for losses from this line typically include three components - punitive damage (P), payout for lost wages & earnings (W) and compensation for pain and suffering (S). Exposures are E, Reported and Paid claim counts are RC and PC respectively.
- i)** List the risk premium formula using the frequency-severity approach and the components constituting frequency and severity. (2)
 - ii)** Describe the various drivers of trends for each of the frequency/severity terms listed. (6)
 - iii)** The courts are discussing imposing a cap on the pain and suffering compensation and the reforms are due to be effective in one year's time. List the considerations in ratemaking given this new proposed legislative change. (3)
- [11]**

- Q. 2)** Given the following table of limits and ILFs, compute the narrowest permissible range of values for X

Limit	ILF
100,000	1
200,000	1.6
500,000	2.7
1,000,000	X
2,500,000	5.5
5,000,000	7
10,000,000	9

[4]

- Q. 3)**
- i)** What is the minimum increase in log-likelihood needed for AIC to be indifferent between two models where one model has twice the number of parameters as the other? (2)
 - ii)** The regulator requires that your class-plan include the use of a rating variable with two levels and that the discount indicated by the relativity of one level is 20%. How would you reflect this constraint in the GLM framework? (2)
 - iii)** A categorical variable with 5 levels has estimated relativities which when plotted appear like the letter 'W' (i.e. three levels have parameters that are high and two that are low). The AIC drops marginally at best (not materially) by including this variable. How would you proceed to handle this variable? (6)
- [10]**

- Q. 4)** Describe three visualization techniques to validate multivariate models. **[10]**

- Q. 5)**
- i)** Compare Classical and Bayesian credibility? (4)
 - ii)** Your company plans to provide fraud insurance cover to credit card holders of your bank partner. You are considering using average credit card portfolio fraud loss from the last three years as complement of credibility. Review whether this is a desirable complement of credibility. (5)
- [9]**

- Q. 6)** Describe the pricing process of property and casualty proportional covers. [6]
- Q. 7) i)** What are the different types of reserves maintained by a general insurer. (2)
- ii)** Briefly explain the components of Outstanding Claims reserves. (2)

Q. 8) Company X is a relatively new insurance company writing only motor insurance business. The business of the company is segregated into Commercial vehicle business and private vehicle business. The Company has arranged the following reinsurance program for the next year.

- 20% Quota Share treaty for total business
- Stop Loss cover of 200% in excess of 120%
- Quota Share has a loss corridor from 85% to 100% applicable only for commercial vehicles. (Loss Corridor: No recovery from the reinsurer for the treaty loss ratio in the given corridor)

The CEO of your Company has asked you to calculate the Reinsurance recoveries basis Gross Loss ratio for portfolio as per table below:

Vehicle Type	Gross Premium (in crores)	Gross Loss Ratio	
		Scenario (i)	Scenario (ii)
Commercial	500	100%	120%
Private	600	80%	125%

- Q. 9)** Public insure, a general insurance Company has proposed an insurance policy to cover Property and Fire risk in informal settlements i.e. slums, poor residential neighbourhoods etc. The target market is individuals in the income bracket of INR 10,000 to INR 30,000 per month. Suggest, with justification, three regulatory requirements that the regulator should consider introducing for this product, to encourage the fair treatment of policyholders. For each requirement suggest a method of checking/testing that the regulation is being adhered to. [6]
- Q. 10)** A large insurance company specializing in Motor Insurance is introducing a product to provide insurance cover to rare cars like vintage cars, collector cars, limited edition variants manufactured in small number etc.
- i)** Define Insurable Interest. (1)
- ii)** Discuss whether the proposed product complies with the conditions of the insurable risk and where possible suggest appropriate ways to improve the insurability. (5)
- Q. 11)** Consider two insurance companies A and B. Company A underwrites only Motor insurance and home insurance business directly to the policyholders. Company B underwrites only professional indemnity business for Doctors sold majorly through specialized agents. [6]
- i)** Outline the key factors leading to differences in the data system design and quality of data collected and maintained by the two companies. (5)

- ii)** For Company A, The number of claims arising from Motor insurance has a Poisson distribution with parameter 20 and the claim amounts have a Gamma (20, 5) distribution. The number of claims arising from Home insurance has a Poisson distribution with parameter 5 and the claim amounts have a Gamma (10, 2) distribution. For both the portfolios, assume the claim numbers and claim amounts are independent. Find the mean, variance and third central moment of the distribution of the aggregate claims from the total portfolio of the Company stating any assumptions that you make. (5)
[10]

- Q. 12)** You are the pricing actuary of your company and the Chief Marketing Officer of your Company has asked you to analyse the expense loadings that are being done on the premium rates of householder's insurance portfolio. Discuss the problems that you might face while subdividing the data basis different distribution channels. [4]

- Q. 13)** You work with an established general insurance company writing predominantly motor class of business. Your Company underwrites all types of motor vehicles. In the market, the premium rates for third party liability for each type of vehicle are decided by the Insurance Regulator and the insurers cannot deviate from the premium rates notified by the Regulator. Three years ago, the local Regulator allowed underwriting long term policies (policy term greater than 1 year) with policy term up to 3 years.

Your Company sells insurance for policy tenure ranging from 1 year to 3 years. For each policy, the entire premium is collected at the outset of the policy. The Company sells the insurance through all modes of distribution viz. Direct, Agents, Banks, and motor dealers etc. The experience of this line of business has deteriorated over the last two years.

- i)** Outline the investigations that you would perform to ascertain the reasons for this deterioration and how the results can be used to improve the performance. (10)
- ii)** The renewal retention department of your company has suggested increasing the sales of long term policies to improve the renewal retention rates. Discuss the risks associated with this suggestion and mitigation strategies. (6)
[16]
