INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

23rd July 2022

Subject SP8 – General Insurance: Pricing

Time allowed: 3 Hours 30 Minutes (14.30 – 18.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. ***Please read the 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. ***Mark allocations are shown in brackets.***

Q. 1) A General Insurance Company is planning to launch a drone insurance product.

i) List the basic insurance coverages that can be offered under a drone insurance product. (4)

ii) List the additional optional coverages that can be offered to enhance the coverages under a drone insurance product. (3)

iii) Outline the key rating factors used for pricing of drone insurance product. (2)

iv) Suggest key exclusions which should form part of the policy while pricing the product. (4)

v) Discuss the risks to the insurance Company of introducing this new product. (6)

[19]

Q. 2) **i)** Define an experience rating system. (1)

ii) Differentiate between number-based and cost-based experience rating with two examples of lines of business where each of these methods are more applicable. (4)

[5]

Q. 3) A General Insurance Company has witnessed that its Health portfolio mix during the current year has increased to 45% from around 35% in previous few years.

i) Outline the probable reason of this movement. (7)

You are the Pricing Actuary for the company and has received a proposal to quote premium for a group health insurance policy with 500 members. Basis Company's overall health portfolio, the claim frequency is expected to be 15% and claim severity is Rs. 50,000. The estimated pure risk premium per member-year is estimated to be Rs 9,000 based on 50 claims in last year.

ii) Assuming that the number of claims follows Poisson distribution and claim severity follows Exponential distribution, estimate pure risk premium that can be proposed using the credibility theory and clearly list out the various assumptions made. (8)

[15]

Q. 4) A General Insurance Company underwriting Medical Malpractices portfolio has per loss retention of Rs. 30 million. Based on the latest 10-years data, the Company has experienced 1000 losses up to Rs. 30 million, 1400 losses up to Rs. 40 million, 1450 losses up to Rs. 80 million and 1 loss above Rs. 80 million.

The Company wants to structure an excess of loss reinsurance treaty with an ABC reinsurer as follows:

Layer 1 – Rs. 10 million x/s Rs. 30 million
Layer 2 – Rs. 40 million x/s Rs. 40 million
Layer 3 – Rs. 120 million x/s Rs. 80 million

The actuarial department of ABC reinsurer has 20 years of ground-up claims experience for this line of business.

i) Explain the advantages and disadvantages of using a frequency-severity method for pricing each of the layers as compared to a burning cost approach. (6)

ii) Discuss the challenges while estimating trend factors for the historical frequencies and severities specific to Medical Malpractice lines of business. (6)

iii) Elaborate the possible approaches for developing the individual losses to ultimate. (3)

[15]

Q. 5) An initial GLM model with 20 parameters fitted on 50 observations pertaining to pet insurance data has deviance of 200,000. One factor i.e. Pet colour having 5 levels is removed from the model and the revised model has deviance of 215,000.

i) Suggest with reasons which model is preferred. (3)

A pet insurance provides coverage for medical expenses due to accident and advertisement, reward and searching related expense in case of Theft of the pet. A separate frequency and severity multiplicative GLM model has been built for each of these benefits based on claims occurring in 2020. There are no IBNR in these lines of business as claims generally gets reported immediately. The base and relativities of the rating factors in each of these models is provided below.

	Accident		**Theft**	
	Frequency	**Severity**	**Frequency**	**Severity**
Base values	2%	50,000	5%	100,000
Rating Factors and relativities				
Age of Pet				
>=4	1	1	1	1
<4	1.25	0.85	1.3	1.02
Pet Colour				
White	1	1	1	1
Black	0.90	1.5	0.95	1.2
Other	0.8	1.7	0.90	1.4
Sum Insured				
Low	1	1	1	1
High	1.1	0.9	2	1.9
Safety Device Installed*				
Yes		0.75		
No		1		

*Safety Device Installed only affects the severity of loss due to Accident.

ii) Assuming 10% annual medical inflation and 5% annual decrease in frequency, estimate the base and relativity of the total claims cost model for each of these coverage for the business written in 2023. (7)

iii) Discuss the advantages and disadvantages of building a total claims cost model for a coverage compared to building multiplicative frequency and severity model separately and combining it at later stage. (5)

[15]

Q. 6) In a Country ABC, the pricing for Fire risks historically has been undertaken basis market burn costs. All General Insurance companies in the country recently launched two standard Fire products for SME business i.e. Laghu (risks having Sum Insured between Rs. 5 crores and Rs. 50 crores) and Sukshma (risks having Sum Insured up to Rs. 5 crores). The policy conditions and coverages are same across the market; however, company is free to charge different premium rates in-line with their product filing.

i) Outline the Actuarial Investigation that can be performed while analysing the performance of business underwritten by your Company. (12)

ii) Outline the use of the results of the above actuarial investigations for improvement of performance. (4)

An Insurance Company sold 3 Sukshma policies with probability of claims 0.02, 0.03 and 0.04 respectively and uniform distribution in claim amounts. The probability of more than one claim per policy is Nil.

iii) Calculate the mean and variance of the aggregate claims mentioning all the assumptions made. (4)

iv) How would these results change if only total losses were to occur? (4)

[24]

Q. 7) A General Insurance Company underwriting a Two-Wheeler motor portfolio for last 10 years is struggling to maintain its market share. Based on a market and customer survey findings, they decide to reduce the premium for all new, renewal and roll-over business in own damage. The Head of Motor UW has suggested the following two options:

- A minimum compulsory % co-pay for each claim and voluntary higher % co-pay offering further discounts in premium.
- A minimum compulsory excess for each claim and voluntary higher excess offering further discounts in premium.

List the pricing approach to estimate the premium rates in each of the options from the current premium levels for different categories of customers. **[7]**

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