INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

22nd March 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 large non-life insurance Company underwriting motor Own Damage (OD) portfolio uses several rating factors to track the underlying loss experience. One of the key rating factor is RTO code of the vehicle. You have recently joined the Company as a Pricing Actuary and have observed that there is not much exposure in most of the RTO codes. Hence you have asked 2 members of your team to group RTO codes such that experience in only 15 RTO codes within western and northern region are tracked instead of hundreds of RTO codes being tracked currently.

Both the team members came up with different RTO allocations - say A and B. They modelled the burn cost relativity for these RTO codes (say 1 to 15, with 1 being least risky and 15 being riskiest) using a GLM model, keeping all the other factors identical. Following are the relativities for Model A and B:

RTO Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Model A	0.2	0.7	0.8	0.7	0.9	1	1.2	1.3	1.6	1.8	2	2.5	2.7	2.9	3.1
Model B	0.01	0.5	0.6	0.61	0.72	0.8	0.82	0.91	1.5	1.8	2.4	3	3.2	3.9	4.5

i)   Mention the assumptions that you think might have been made for this GLM relativity modelling.   (2)

ii) Explain the GLM matrix form with definition of each term.   (4)

iii) Describe further analyses needed to be performed and discuss the aspects that the insurer should consider while choosing one of the two models.   (10)

iv) The team members have removed nil claims from data during GLM modelling. Discuss advantages and disadvantages of removing nil claims from data.   (4)

[20]

Q. 2)   In view of recent cyber-attacks growing in the country, a large bank has approached the general insurance company seeking a policy to cover risks relating to external non-physical attacks on a bank's data and systems. The Company has recently launched this product in its portfolio.

i)   Suggest the losses that the banks may experience that may be covered by this product.   (4)

ii) Discuss the risks to the insurance Company of introducing this new product.   (5)

[9]

Q. 3)   A vehicle finance company with 1.2 lakh loanees has approached a general insurance company for a premium quote. From the experience of the insurer, it is observed that claim frequency is 5% and claim severity is Rs 20,000. From the experience of the finance company, risk premium turned out to be Rs 800 per vehicle per year, based on 8,000 claims last year. It is assumed that claim numbers follow a binomial distribution and claim severity follows an exponential distribution. There is 80% probability that the true risk premium is within 10% of mean.

i)   Calculate the risk premium for this quote using Classic credibility theory showing all workings.   (4)

ii) State the fundamental assumptions under Classical Credibility theory and any assumptions made in calculation.   (3)

iii) Discuss the additional data requirements to arrive at the credibility rated risk premium if Bayesian credibility model is to be used.   (3)

[10]

Q. 4) An insurer offers a discount on the premium charged by its competitor for its retail fire insurance policy. Discuss the advantages and disadvantages of such a pricing approach. **[5]**

Q. 5) An insurance company determines the loading for catastrophic claims basis the following methodology:

- the average catastrophic incurred claim amount over latest 5-years is divided by the exposure of its portfolio and multiplied by 10 (assuming that the existing book will continue for 10 years)

Discuss the approach taken by the Insurer in respect of the catastrophic claim and suggest any suitable alternatives that can be used by the Insurance company. **[5]**

Q. 6) ABC is a small general insurance company writing only personal lines motor insurance business. The Company wishes to review the premium rates of its motor portfolio. It has maintained a full database of the policy and claims data required to analyse the experience for a particular risk group. The actuarial analyst was asked to check the claims data for errors before performing the rating analysis.

i) Explain with examples the different kind of errors which might be made in entering data into a claims system, and suggest solutions which would reduce the likelihood of such errors occurring in the future. (5)

ii) Describe with reasons the different kind of adjustments he should made in the base data before doing rating analysis. (12)

iii) Describe the business risks to the insurer from writing motor portfolio. (4)

iv) The Company has recently started writing commercial property business and observed a lot of variability in its claims experience. Describe the measures with examples that the insurance company could put in place to control its variability. (7)

[28]

Q. 7) The broker has given you following details about a client who has a fleet of vehicles:

Year	# vehicles	Paid claims (INR)	% Claims developed
2016	1,200	5,00,00,000	99.0%
2017	1,225	6,75,00,000	97.5%
2018	1,308	9,20,00,000	92.0%
2019	1,598	12,15,00,000	85.0%
2020	1,100	9,40,00,000	79.0%

Annual inflation of claims is 5%. Further, the expected no. of vehicles for the client in 2022 and 2023 are 1,200 and 1500 respectively.

i) Estimate the risk premium for years 2022 and 2023 using burning cost method clearly mentioning the assumptions made. (7)

ii) Suggest other details which may be useful to further refine the premium determined. (3)

[10]

Q. 8) A general insurance company is keen to buy Surplus reinsurance compared with Quota Share reinsurance.

    i) Discuss the reasons highlighting any benefits and limitations. (4)

    ii) Define profit commission and explain its use. (2)

    iii) The company secures a reinsurance policy with an annual premium of INR 140,000, with an expense allowance of 18% and a 40% profit in the event of no losses. If a loss of INR 15,000 occurs, the profit percentage drops to 30%. The reinsurance company's actual expenses are only 15% and a INR 16,000 loss occurs. Compute profit commission under this contract. (3)

    iv) The Company has arranged a surplus reinsurance treaty with six lines and a maximum retention of INR 10,00,000. The following risks are ceded to the treaty:

(Amounts in INR)

Risk #	Estimated Maximum Loss	Retention	Original premium	Gross loss
1	50,00,000	10,00,000	38,000	20,000
2	100,00,000	800,000	75,000	25,000

Calculate the total gross loss ratio and total ceded loss ratio for the Company. (4)

[13]

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