# INSTITUTE OF ACTUARIES OF INDIA

# EXAMINATIONS

## 30<sup>th</sup> May 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.*

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**AT THE END OF THE EXAMINATION**

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

**Q. 1)** You work for a young general insurance company. Your company majorly sells motor insurance so far. They would like to start selling an employer's liability insurance on a claims-occurring basis. Reliable and relevant industry data is available, which you are planning to use to price the product.

A colleague from the Marketing Department has said "Employer's liability insurance is a yearly renewable cover. So why do we need to price it very precisely. Even if we make losses, one year, we could adjust the premiums later on."

Outline the points you would cover in replying to your colleague.

**[3]**

**Q. 2)** The following table shows the EML, office premium and claim amount for four risks in a property portfolio:

| Risk | EML | Office Premium | Claim information |
|------|-----|----------------|-------------------|
| 1 | 10,000 | 200 | One claim of 7,500 |
| 2 | 27,900 | 376 | No Claim |
| 3 | 15,000 | 540 | One claim of 18,000 |

For each of the above risks, with the given claims experience, what would be the premium payable to the reinsurer and the claim amount recovered from the reinsurer under:

**i)** 50% Quota Share

**ii)** Surplus with a maximum retention of 5,000 with maximum 4 lines.

Explicitly state any assumptions made.

**[3]**

**Q. 3)** You are performing a rate revision exercise for motor insurance portfolio of a large insurance company. Outline the various checks you will perform on the office premium rates for reasonableness, consistency and market acceptability.

**[4]**

**Q. 4)** **i)** State the differences between Classical credibility theory and Bayesian credibility theory.

(2)

**ii)** Discuss why 'expected' number of claims is used while calculating credibility instead of the 'actual' number of claims observed.

(2)

**[4]**

**Q. 5)** **i)** A portfolio is divided into two segments with expected number of policies from segment 1 at 75%. The pure risk premium per policy for segment 1 is Rs 5,000 and for segment 2 it is Rs 8,000.

If the expected loss ratio for segment 1 is 55%, what should be the expected loss ratio for segment 2 to achieve the portfolio loss ratio of 65%.

(2)

**ii)** Describe briefly the situations under which one segment may be made to cross subsidize another segment in a portfolio.

(3)

**[5]**

**Q. 6)** A recent claim made against a policyholder under a liability insurance policy was taken to court. The policy covered loss of income due to bodily injury. The claimant as well as your company preferred that the amount be settled as a lump sum payment. However, the court has insisted that the payment be made in form of structured payments.

    **i)** Outline reasons why the claimant, as well as your company might have preferred a lump sum payment instead. (3)

    **ii)** Describe briefly the impact you expect the court's decision to have on the future pricing. (2)

    **[5]**

**Q. 7)**   **i)** Describe the Individual risk model and Collective risk model of aggregate claim distributions stating the model assumptions. (4)

    **ii)** Outline scenarios in which each of the models may be used to model the total claim for a portfolio of policies. (2)

    **[6]**

**Q. 8)**   **i)** State the advantages and disadvantages of a fronting arrangement from the point of view of:

      **a)** The company that is acting as the front, i.e. the insurer. (3)

      **b)** The company that is taking on the actual risk, i.e. the reinsurer. (2)

    **ii)** Discuss why the regulator might not be in favour of a fronting arrangement. (2)

    **[7]**

**Q. 9)** You work for a small general insurance company that has started selling a new product last year. Its experience under the product has been somewhat erratic, with a few large claims distorting the profitability. The product has been covered under a quota share agreement, with 50% retention. Your senior management wishes to consider other reinsurance options, namely: Surplus and XS of loss.

Describe the factors you will mention in the report you will write for the senior management to consider.

    **[7]**

**Q. 10)** You are working on rate revision of comprehensive motor insurance portfolio of your company, which has started selling motor insurance five years back. State G has 10% higher risk premium per vehicle compared to the average for the entire portfolio. The motor underwriter suggested that a loading of 10% should be applied on office premium on all policies sold in state G.

Discuss the various analyses you will perform to evaluate the suggestion made by the underwriter and to come up with your recommendation of any pricing correction for State G.

    **[8]**

**Q. 11)** **i)** Define a Risk Factor and explain why all risk factors may not be used as rating factors.

(4)

**ii)** State the risk parameters and rating factors that might be used for the following:

**a)** Pet insurance (2)

**b)** Extended Warranty Cover (2)

**[8]**

**Q. 12)** Your company has recently undergone a merger with a young general insurance company. Significant differences have been observed in the information system used by the young company compared to your company, which is a bigger and an older company.

**i)** Outline why such differences may exist. (3)

A decision needs to be made regarding which system should be used going forward.

**ii)** State the factors that would influence the decision. (3)

It has been decided that the systems used by the newer company will be adopted.

**iii)** Discuss briefly the practical steps that would need to be followed, and the concerns that might arise as a result of this. (5)

**[11]**

**Q. 13)** You are the pricing actuary for a reinsurance company. You have been provided the below data of past 5 years from a cedant's commercial property portfolio on underwriting year basis

| Year | Earned Premium | Attritional claims | Large claims | Natural Catastrophic claims | Rate changes | Inflation |
|------|------|------|------|------|------|------|
| 2008 | 50 | 27.5 | 0 | 0 | | |
| 2009 | 60 | 35.0 | 16.0 | 0 | -2% | 5% |
| 2010 | 70 | 49.0 | 10.0 | 21.5 | 10% | 5% |
| 2011 | 80 | 52.0 | 0 | 0 | 5% | 5% |
| 2012 | 90 | 50.0 | 4.0 | 0 | 0% | 5% |
| 2013 | | | | | 8% | 5% |

Rate change and inflation shown in year X in the table are from year (X-1) to X. The reinsurance coverage sought is for the year 2013. Based on the exposure details provided by the cedant, the expected cost of catastrophic claims is 3% of written premium for 2013. Assume the expense ratio to be 5%.

**i)** Calculate the maximum ceding commission which can be paid to the cedant if the minimum profit target is 4% of the reinsurance premium. (7)

You chief pricing actuary wants to evaluate an option of lower ceding commission combined with profit commission as opposed to only ceding commission.

**ii)** Calculate the reinsurer's profit % for the past 5 years after adjusting the premium rates and claims for rate changes and inflation if the ceding commission is 20%.

(2)

**iii)** Calculate the reinsurer's profit % for the past 5 years after adjusting the premium rates and claims for rate changes and inflation if the ceding commission is 5% and profit commission is 25%.

(3)

**iv)** Comment on the volatility of reinsurer's profit in (ii) and (iii) above.                (2)

**[14]**

**Q. 14)** You work with a large reinsurance company in a market with access to large 'from ground up' claims data for all types of property risk from your cedants. You have been asked to build exposure curves which can be used for reinsurance pricing of various types of properties using this data.

**i)** Outline the data fields you will require to perform the analysis.                (4)

**ii)** Outline the challenges you may face in using the data for the exercise.                (3)

**iii)** Derive a formula for exposure curve G(X) at X = 10% using the various statistics from the market data.

(4)

**iv)** Which of the curves 1 and 2 below will give higher risk premium for a layer which is 50% xs 50% as % of PML of the risk?                (1)
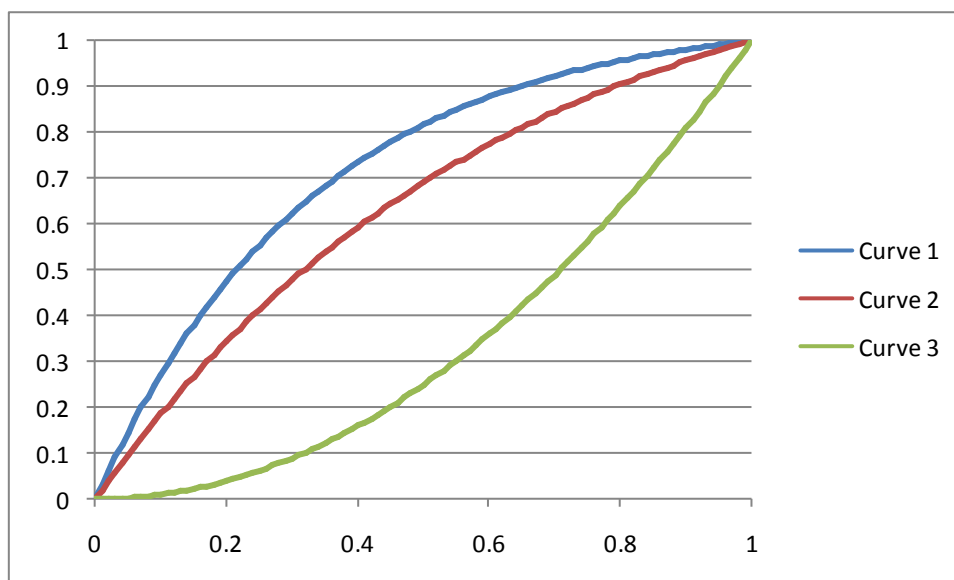


**v)** State why curve 3 is not a suitable exposure curve.                (1)

**vi)** You have been given curve $G(x) = \left( \dfrac{1 - 0.1^x}{1 - 0.1} \right)$ *for* $0 \le x \le 1$. Derive the risk premium rate as a percent of original risk premium for the risk for the layer Rs 50M XS Rs 50M for a risk with PML Rs200M.

(2)

**[15]**

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