INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

30th May 2014

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 you are required 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) General insurance organizations typically invest time and resources into analyzing the business they have recently written. Briefly explain the reasons or uses of monitoring business written. **[3]**

Q. 2) An insurance company calculates its UPR for each policy separately (policy-by-policy approach). Calculate the UPR, net of commission as on 31st March 2014 for the following annual policies:

   i) Premium INR 100,000 with commission of 10%. The policy is issued on 1st July 2013. The entire risk is expected to be in the second quarter of the financial year. (1)

   ii) Premium INR 150,000 with commission of 5%. The policy is issued on 1st Oct 2013. The risk starts at zero, and increases daily by a constant linear amount over the policy year. (3)

   [4]

Q. 3) A leading general insurance company uses GLM to analyze claims on motor insurance. The company uses two rating factors which are driver's age and car group and has produced a model for the claims cost per unit of exposure, with the relativities shown as below:

Car Group

Low	0.6
Medium	1.0
High	2.4

Driver's Age

Old	0.6
Young	1.0

Exposure

Car Group\Driver's Age	Old	Young
Low	8,000	20,000
Medium	10,000	10,000
High	12,000	200

Using the exposures and the two-way relativities above, derive one-way relativities for both the rating factors. Please state any assumptions that you make. **[5]**

Q. 4) Define the following terms:

   i) Subrogation

   ii) Moral Hazard

   iii) Discovery period

   iv) Escalation clause

   [6]

Q. 5) The motor third party insurance business is getting de-tariffed in a developing country. As per the Transport Department rules within the country, motor third party insurance is compulsory for all the vehicles. The insurance company charges an annual premium towards a policy covering third party liability that has minimum stipulated cover and also a policy that has higher coverage than stipulated by the Transport Department.

List the possible risk factors and also state which of them can be used as the rating factors by the insurance companies to set premiums.   **[6]**

Q. 6) You are the pricing actuary for a general insurance company which operates only in Southern India. You are being asked to calculate the premium rate for a new product covering major critical illnesses with indemnity cover starting from age 0. The product is to be launched in July 2014. The company doesn't have their own internal data in relation to the new risk. However, the appointed actuary has asked you to check and analyze the data published by the regulator in this regard. Following is the format and details of the data published by the regulator:

Age Band	Exposure (No of Policies)	No of Claims	Exposure (Total Sum Assured)	Claim Amount
18 to 30	XXX	XXX	XXX	XXX
31	XXX	XXX	XXX	XXX
32	XXX	XXX	XXX	XXX
And so on	XXX	XXX	XXX	XXX

The above data is based on the information collected from the life insurance companies covering 12 to 18 critical illnesses with fixed benefits for the period of 1992-94.

Discuss on the general limitation of industry data and also on the specific suitability of the above data in calculating the premium rates for the new product.   **[6]**

Q. 7) An insurance company is considering possible reinsurance options for its Group Personal Accident product. In this product, employees and in some cases their relatives are covered for accidental deaths and disabilities. The sum insured for one life varies from INR 10,000 to INR 10 Crore.

Outline, with reasons, the possible reinsurance arrangements for this product.   **[6]**

Q. 8) A motor fleet own-damage account with 1000 vehicles has come to you for premium quotation. Based on your company's overall portfolio experience, you expect the claim frequency to be 20% and claim severity to be Rs 20,000. Based on the analysis of the data submitted for quotation, you have estimated the pure risk premium per vehicle-year to be Rs 3500 based on 100 claims in last year. Assume that the number of claims follows Poisson distribution and claim severity follows Exponential distribution.

Using credibility theory, suggest a possible pure risk premium that might be used for this account. State assumptions you make in deriving the suggested pure risk premium.   **[6]**

Q. 9) You are the pricing actuary for a reinsurance company and you are being asked to quote for a reinsurance arrangement for a cedant. For the cedant's business, the number of claims arising from an individual policy in a year has a Poi (0.0075) distribution. The cedant expects to write 10,000 policies in the coming financial year.

Individual claim amounts for repairs are a random variable 100,000X where X has a distribution with probability density function:

$$f(x) = \begin{cases} \frac{1}{8}(4-x), & 0 < x < 4 \\ \\ 0, & \text{oherwise} \end{cases}$$

The cedant requires an individual excess of loss contract of INR 100,000 in excess of INR 100,000.

Calculate the premium that you should charge assuming an expenses margin of 15% and a contingency margin of 10% of the premium and also state the assumptions that you make. **[7]**

Q. 10) A general insurance company writes only motor insurance and fire insurance business through agency channel and broking channel. A significant portion of company's motor business comes from its agency channel whereas, almost entire fire insurance business is sold through broking channel. The company has experienced a gradual reduction in its market share over the past five years. The company recognizes the importance of an online channel and decides to use the internet with a view to preventing further reduction. It expects to achieve 50% of its sales through the online channel in next five years.

Discuss the possible effect this strategy may have in business mix, premium calculations, distribution channel arrangements and other areas, assuming that the company will be able to achieve the plan. **[7]**

Q. 11) You are the pricing actuary for general insurance company that writes health insurance business covering all the employees of large companies; where the coverage is linked to the basic salary of the employees. The following information is available on a particular client account that is due for renewal for the financial year (FY) 2013-14. Under the current terms of the policy, there is a limit for every loss of INR 500,000 with no deductible. The information also includes underwriting year wise incurred development pattern for similar risks.

FY	Number of Employees	Notified claim amount ('000)	% Incurred Development
2009-10	1,680	890	85%
2010-11	600	400	75%
2011-12	2,500	1,240	60%
2012-13	2,800	750	30%

  i) Calculate the risk premium for the FY 2013-14 using the burning cost methodology allowing for medical inflation of 15% per annum in the country and assuming there are 3,500 employees. (6)

  ii) State any assumptions that you made in the above calculation. (3)

  iii) State the limitations of the premium rate calculated in (i) above. (3)

  [12]

Q. 12) You are the pricing actuary for a large general insurance company in its 10th year of operation, working on a pricing assignment for motor comprehensive coverage product. Your chief actuary asked you to prepare a list of possible sources of uncertainties which may cause the actual claim experience to be different than pricing assumption in the first year after the new premium rates are implemented.

   i) Outline the possible sources of risks and uncertainties which you would include in your note to the chief actuary. (7)

   ii) Discuss the ways these risks and uncertainties may be mitigated during the process of pricing. (8)

[15]

Q. 13) An established insurer writes all lines of business with a major part in motor insurance. As a means to increasing business volumes, the sales force has asked for extended warranty product for motor insurance. The product will indemnify for warranty-related expenses incurred by the insured after expiry of manufacturer's warranty period, for a period as selected by the insured. The period of insurance can be 1 to 3 years.

As an actuary in the motor underwriting department, you have been asked to price this product.

Briefly describe the features of such a product, in terms of

   i) basis for cover (1)

   ii) measures of exposure to which premiums are related (1)

   iii) claims characteristics (4)

   iv) risk and rating factors (4)

   v) exclusions (2)

Once the features have been agreed, you are now required to price the product.

   vi) State briefly how this product is expected to be different from the existing motor insurance products, in terms of policy term and the time to commencement of risk. (2)

   vii) State how the differences outlined above can be dealt with in pricing and reserving. (3)

[17]

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