INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

24 September 2013 (am)

Subject ST8 – General Insurance: Pricing Specialist Technical

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before 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 booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all 10 questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

> *In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.*

© Institute and Faculty of Actuaries

1   A general insurer underwrites cover for powerboats.

Explain why the insurer may choose to adopt a non-linear earnings pattern for premiums when analysing underwriting performance for this product. [4]

2   Under the collective risk model, the total claim amount S payable during a specified period in respect of a block of policies is

$$S = X_1 + X_2 + \ldots + X_N,$$

where X_i is the claim amount payable during the period in respect of the i-th claim and N is the (random) number of claims during the period.

(i)   State the assumptions of the collective risk model. [1]

A general insurance company uses a collective risk model to determine the risk premium for a block of policies. It determines a distribution for X_i and N using the last five years of claims experience and then determines the risk premium using the following expression:

Risk premium = $E(S) + 2\sqrt{\text{Var}(S)}$.

(ii)   Comment on this choice of risk premium. [4]
[Total 5]

3   Describe:

(a)   two different types of self-retention group, and
(b)   the reasons for using each type.

[6]

4   A general insurance company writes crop insurance across the United States of America. One of the perils covered by the policy is loss caused by tornados. The insurance company purchases reinsurance for the tornado peril.

(i)   Explain why experience rating is unlikely to be used by a reinsurance company in determining the reinsurance premium for this peril. [2]

A reinsurance company providing a quote for the reinsurance has a tornado catastrophe model that it has previously used for commercial property business. The reinsurer intends to adapt this model in order to use it for crop insurance.

(ii)   Explain the changes that the reinsurance company will need to make to the inventory and vulnerability modules of the model. [4]
[Total 6]

5   The governing body of a developing insurance market has decided to create an industry-wide database. All general insurance companies in the market are required to supply quarterly data on business volumes and claims development at a specified level of granularity and using standardised data definitions. Data must be submitted within one month of each quarter end. All insurers will be able to read all of the data in the database.

Discuss the potential benefits of the database to the insurance market and problems that the insurers may experience as a result of this initiative.   [8]

6   A general insurance company writes breakdown cover as an optional extra to the car insurance product that it offers. It has at least five years of detailed claims and exposure data relating to the breakdown cover. The pricing department is undertaking a review of past experience in order to set the risk premium for the following year.

(i)   Explain, giving examples, what adjustments to the past experience may be required.   [6]

In order to boost sales of breakdown cover, the company has started negotiations with a car dealership that sells new and used cars. As an incentive to help car sales, the sales staff can give away this cover to car buyers.

(ii)   Suggest, with reasons, the further information required by the insurer to determine the appropriate risk premium for the free breakdown cover.   [4]
                                                                                              [Total 10]

7   A general insurance company currently writes household and private motor business only. It is planning to launch a product that provides a fixed benefit in the event of accident, sickness or unemployment.

(i)   Suggest reasons why the insurer may want to launch this product.   [2]

The insurer has no experience of underwriting the new product but wants to determine a schedule of premium rates in advance of the launch.

(ii)   Suggest different ways in which the company could acquire the information to enable it to determine the premiums to charge.   [3]

(iii)   Discuss the key indicators that the insurance company should monitor in the first few months following launch of the new product.   [8]
                                                                                              [Total 13]

8 (i) State the features of risk excess of loss reinsurance. [3]

A reinsurance company is pricing a risk excess of loss treaty that covers third party liability claims arising from mobility scooters on a large book of household insurance. The mobility scooters are single-occupant, electrically powered vehicles that are intended for people with impaired mobility to travel short distances outside the home, but are not classified as motor vehicles.

Mobility scooter cover is only provided under the contents section of the household insurance and policyholders are not required to disclose at the time of proposal how many mobility scooters they own, if any.

The reinsurance cover is $9m excess of $1m.

The reinsurance company decides to use exposure from the contents section only, i.e. "contents section years", as the measure of exposure for pricing the mobility scooter cover.

(ii) Comment on:

    (a) this choice of exposure measure, and
    (b) the advantages and disadvantages of other potential measures.
[3]

The cedant has provided the following data for the forthcoming treaty year.

Expected number of policies in force at start of year   288,280
Expected proportion of policies with a contents section   83%
Expected number of new policies written in year   19,000
Expected number of policies cancelling in year   9,000

The reinsurer estimates that the loss cost to the mobility scooter treaty per contents section year is 1.5% of the expected cost per vehicle year for a specific third party motor liability treaty. The reinsurer uses the following table of ILFs to adjust the motor liability treaty loss cost to the same layer of cover as the mobility scooter treaty.

Limit (£m)	ILF
1	1.000
2	1.463
3	1.703
4	1.843
5	1.931
10	2.096

The expected cost to the motor liability treaty per vehicle year is £6 for a layer £5m excess of £5m.

(iii) Calculate the total expected loss cost under the mobility scooter treaty, showing all workings and stating any other assumptions that you make. [6]

The reinsurer uses the following basis to calculate the reinsurance premium:

Commission	20% of reinsurance premium
Expenses	15% of expected loss cost
Capital required to be held	77% of reinsurance premium
Required return on capital	12% of capital
Minimum rate on line	3%

(iv) Calculate the reinsurance premium, showing all workings and stating any other assumptions that you make. [5]

[Total 17]

9 (i) Outline intrinsic and extrinsic aliasing in a generalised linear model. [5]

A general insurance company writes household insurance through three brokers, Maul, Sidious and Vader. Sidious has recently moved its business to a new policy administration system, but in the process has lost details of the number of bedrooms of the insured properties. There are no other known data problems. Sidious intends to update its records when it next makes contact with each policyholder, but has so far had little opportunity to do so.

The insurer uses Number of Bedrooms and Broker as two of the factors in its pricing model, and currently holds the following data for these factors.

Exposure (Policy Years)		Maul	Sidious	Vader
	0	6,270	0	5,277
	1	4,041	0	2,316
Number of Bedrooms	2	15,687	0	9,183
	3	21,042	0	13,974
	4	12,663	17	8,112
	5+	2,577	0	1,290
	Unknown	0	13,953	0

(ii) Explain:

(a) the problems that the insurer may encounter when building a generalised linear model that includes these two variables, and

(b) how it may choose to deal with these problems. [6]

[Total 11]

10 A fleet policy covering a variety of motor vehicles is soon to expire. The broker placing the business has provided the following data and information relating to the most recent five years of cover.

Policy year	Vehicle years	Number of claims	Total cost of claims
1	1692	127	£286,000
2	1931	142	£350,000
3	2262	168	£413,000
4	2566	180	£458,000
5	2954	210	£565,000

Claims numbers and claims costs have been projected to ultimate.

Changes were made to the cover for the policies written in years 4 and later. The effect of this change is believed to have reduced average claims frequency by 5%, but to have had no impact on average cost per claim.

Claims cost inflation has been 3% p.a. over the last five years.

The number of vehicle years for policy year 6 is predicted to be 3050.

(i) Calculate the risk premium for policy year 6, showing all workings and stating any further assumptions that you make. [8]

The following information is also available:

Expenses   40% of premium net of commission
Commission   10% of gross premium
Return on investments net of tax   8% p.a.
Profit margin net of tax   15% of premium net of commission
Insurance premium tax   Nil

(ii) Calculate the gross premium for policy year 6, showing all workings and stating any further assumptions that you make. [6]

(iii) Discuss why the premium calculated in part (ii) may not be an appropriate premium to charge. [6]

[Total 20]

END OF PAPER