INSTITUTE AND FACULTY OF ACTUARIES

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EXAMINATION

24 April 2015 (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 new page.

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.

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1 Outline possible sources of uncertainty that a general insurance company should consider when analysing historical claims data for a pricing exercise. [5]

2 A general insurance company with a book of annual household business is reviewing its prices. The manager in charge of storing and providing data for risk pricing exercises is monitoring the amount of file space available. She has suggested that the pricing team will only need the following information for a risk pricing exercise:

- claims reported in the last six months, and
- exposure details for policies written in the last six months.

Discuss the problems with the manager's suggestion. [5]

3 (i) Explain the motivation for, and problems with, using a Tweedie distribution when building a generalised linear model of claims cost. [3]

(ii) Write down an example of the link function, error structure and prior weights that would typically be used when building a generalised linear model for each of the following:

    (a) claim frequency
    (b) average cost per claim
    (c) probability of renewing
[4]
[Total 7]

4 A reinsurance company is considering offering excess of loss cover for a fleet of seaplanes.

Outline the information about the fleet that it may request from the primary insurer, to determine the rate that should be charged. [8]

5 A general insurance company is reviewing its expense allocation.

(i) Describe, giving examples:

    (a) direct expenses
    (b) indirect expenses
[4]

The company writes new and renewing business through the internet and over the telephone.

(ii) Describe the information that the company is likely to need, in order to allocate expenses to the policies. [5]
[Total 9]

6 (i) Outline the operation of the underwriting cycle, starting from a point of generally high profitability. [3]

The regulatory body in a certain country is considering introducing legislation, whereby the amount of capital required to support a portfolio of general insurance policies increases in line with the premium income for that portfolio.

(ii) Discuss whether this new legislation may intensify or dampen the underwriting cycle. [3]

A new entrant to a line of business has decided to ignore the position of the underwriting cycle. The premium that it charges is the risk premium plus loadings for expenses and profit.

(iii) Explain, with reference to the underwriting cycle, how this pricing approach may affect the performance of this line of business for the new entrant. [4]
[Total 10]

7 The customer retention manager of a general insurance company that underwrites private motor insurance has been looking at the variation in renewal premiums from one year to the next. The manager has selected a customer at random, whose premium paid in the last five years is shown below:

New business	€468.32
1st renewal	€515.15
2nd renewal	€732.28
3rd renewal	€706.33
4th renewal	€847.89

The company does not currently offer a no claims discount (NCD).

(i) Suggest possible reasons for the above pattern of premiums. [4]

The company wants to implement an NCD.

(ii) Describe the method that the company would use to determine an appropriate NCD scale. [7]
[Total 11]

PLEASE TURN OVER

8   A general insurance company is quoting for property insurance on a large warehouse
complex, Borg. The company already provides insurance for three other smaller
warehousing sites: Klingon, Romulan and Vulcan. The company has obtained
detailed historical claims information for all four of the sites, and has used it to
estimate the expected losses for each site separately. The following table summarises
the information:

	Borg	Klingon	Romulan	Vulcan
Total warehouse capacity (m^3)	9,000	320	680	2,100
Number of warehouses on site	2	1	1	6
Distance from Borg (km)	0	0.1	20	350
Property sum insured (£m)	10	1	2	6
Business interruption cover limit (months)	3	12	0	3
Years of detailed claims information	5	7	10	1
Expected number of claims for the forthcoming year	11	3.2	4	38
Expected average amount per loss for the forthcoming year (£)	1,657	83,553	1,342	230

The expected number of claims and average amount per loss include all losses
reported by the insured from the ground up, developed to ultimate, and adjusted for
exposure and claims trends to a constant base for the forthcoming year.

An actuarial student suggests that the total expected loss costs for Borg for the
forthcoming year be estimated by calculating the average annual loss per unit sum
insured for each site, then taking the average and scaling up by the sum insured for
Borg. The calculations are as follows:

	Borg	Klingon	Romulan	Vulcan	Average
Loss per £m sum insured (£)	1,822.7	267,370	2,684.0	1,456.7	68,333
Estimated loss (£)	683,330				

Discuss the actuarial student's suggestion.   [11]

9 (i) State the advantages and disadvantages, to a primary insurer, of surplus reinsurance compared with quota share reinsurance. [5]

The following table relates to risks covered under a surplus reinsurance treaty with five lines and a maximum retention of $1m.

Risk	Estimated Maximum Loss ($)	Retention ($)	Lines of cover used	Original premium ($)	Ceded premium ($)
1	5,000,000	1,000,000	A	34,800	B
2	10,000,000	800,000	C	68,000	D

(ii) Calculate the figures A, B, C and D in the table above. [2]

Suppose that the following losses were to occur on the risks above.

Risk	Gross loss ($)
1	15,000
2	18,000

(iii) Calculate, for Risks 1 and 2 combined, the total gross loss ratio and ceded loss ratio. [2]

A reinsurance company is considering the level of profit commission that it should offer for renewal of the treaty. The reinsurance company requires a probability of at least 80% of making an underwriting profit of more than 5% of the capital required, after allowing for the outgoing profit commission and its own expenses.

(iv) Describe the method that the reinsurance company should use, and the matters that it should consider, in calculating the profit commission. [7]

[Total 16]

10 A general insurance company provides insurance to a holiday firm that hires out leisure boats to families for week-long trips. The insurance covers damage to the boat, and third party liability to indemnify the holiday firm and people hiring the boats.

(i) Suggest exclusions that may be placed on the cover provided. [4]

The insurance company is assessing the premium for the forthcoming policy year 5. The following information is available.

Policy year	Boats at start of policy year	Amount paid for claims arising from the policy year (€)
1	65	56,750
2	70	57,000
3	72	54,500
4	80	1,050,000
5	85	

- The number of boats at the end of policy year 5 is estimated to be 90.

- Claims inflation has historically been 2% per annum.

- In policy year 4, there was a liability claim that has been settled and closed at €1m. The insurance company's procedure for dealing with large claims is to assume that the number of such claims in a year has a negative binomial distribution type 2, with parameters $k = 2$ and $p = 0.99$, and is independent of the number of leisure boats. It is also assumed that the size of large claims will always be €1m, regardless of the policy year in which they occur.

- Non-large claims are not fully developed. Paid claims as a percentage of ultimate claims have the following development pattern:

Policy year in which claim reported	Percentage of ultimate
1	90%
2	85%
3	75%
4	60%

(ii) Determine the risk premium for policy year 5 using a burning cost approach, stating any further assumptions made, and showing all workings. [10]

(iii) List further adjustments that may be made to the premium calculated in part (ii) before providing a quote. [4]

[Total 18]

END OF PAPER