INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

6 October 2016 (pm)

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 must not start writing your answers in the booklet until instructed to do so by the supervisor.

3.   You have 15 minutes of planning and reading time before the start of this examination. You may make separate notes or write on the exam paper but not in your answer booklet. Calculators are not to be used during the reading time. You will then have three hours to complete the paper.

4.   Mark allocations are shown in brackets.

5.   Attempt all 11 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.

> *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.*

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1   The organisers of a charity fun run are looking to arrange suitable public liability insurance cover for the event. All participants have to pay a set entry fee in advance.

Describe other types of general insurance cover that the organisers might wish to purchase for this event.   [5]

2   A general insurance company has decided to write motor fleet business for the first time. It has obtained the aggregated cost of claims and associated aggregated exposure information by calendar year for the last five years for a number of other fleets.

(i)   List rating factors that are typically used for motor fleet business.   [4]

(ii)   Explain whether a frequency/severity approach or burning cost approach is likely to be used to rate the motor fleet business.   [2]
[Total 6]

3   A pricing actuary is reviewing the rates charged by a general insurance company for multiple lines of business.

(i)   Explain the potential benefits of using industry-wide data as part of the review.   [2]

(ii)   State the limitations of using industry-wide data for the purpose of pricing.   [4]
[Total 6]

4   (i)   List the desirable qualities of the complement of credibility.   [2]

A large multinational insurance company sells household building and contents insurance policies through brokers. The company is considering introducing some form of experience rating in order to differentiate the company from the rest of the market.

(ii)   Outline the impact that the introduction of experience rating is likely to have on the insurance company and its policyholders.   [5]
[Total 7]

5   An actuary working for a large reinsurance company is responsible for pricing employers' liability reinsurance treaties.

The risk premium that he has derived this year for a particular treaty is different to the risk premium derived last year for that treaty.

Suggest possible reasons for this change.   [7]

6 A pricing actuary works for a general insurance company that sells commercial motor insurance.

The company has written €95m of premium (gross of reinsurance, net of commission) in the previous 12 months, and plans to write €100m in the next 12 months.

(i) Explain why the figure of €95m may not be a final figure, i.e. it may be subject to future adjustments. [3]

The actuary has estimated that the company will incur €10m from "large" losses from the business that it plans to write in the next 12 months for this portfolio. A large loss is defined as a loss above €1m.

The estimate of large losses is based only on the historical claims experience of the insurer.

(ii) Discuss the likely sources of uncertainty in the €10m estimate of the large losses. [7]

[Total 10]

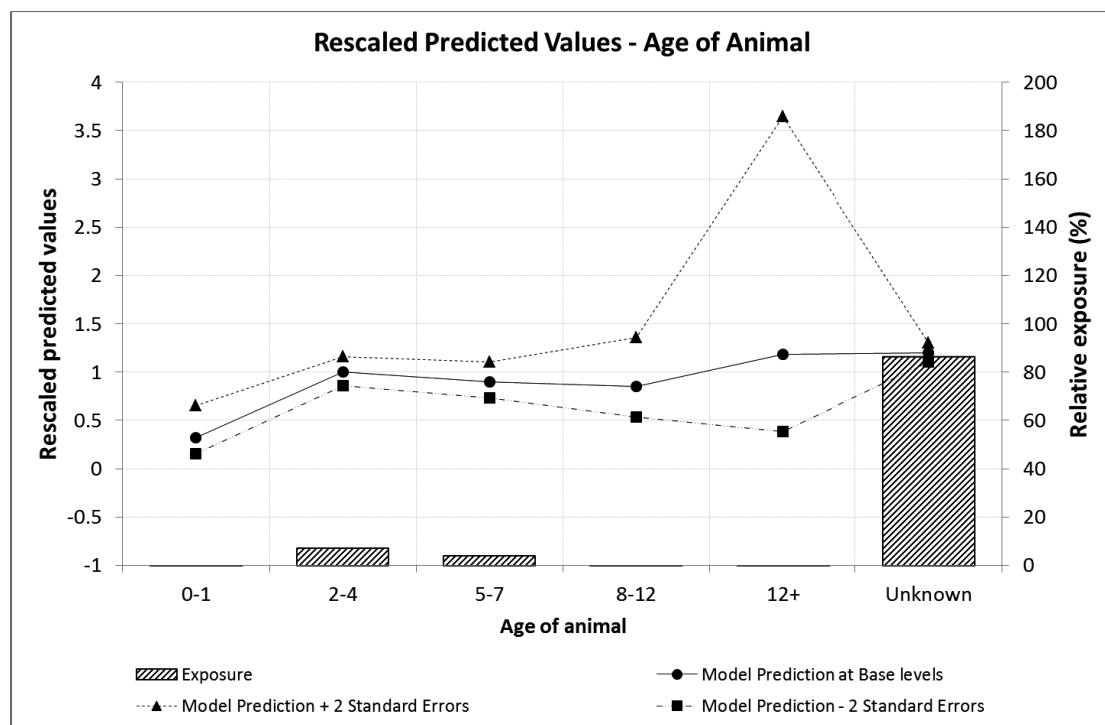**7** A general insurance company specialises in providing property damage cover for factories.

(i) List ten items of data the insurer is likely to record on its policy system. [5]

(ii) List ten items of data the insurer is likely to record on its claims system. [5]

[Total 10]

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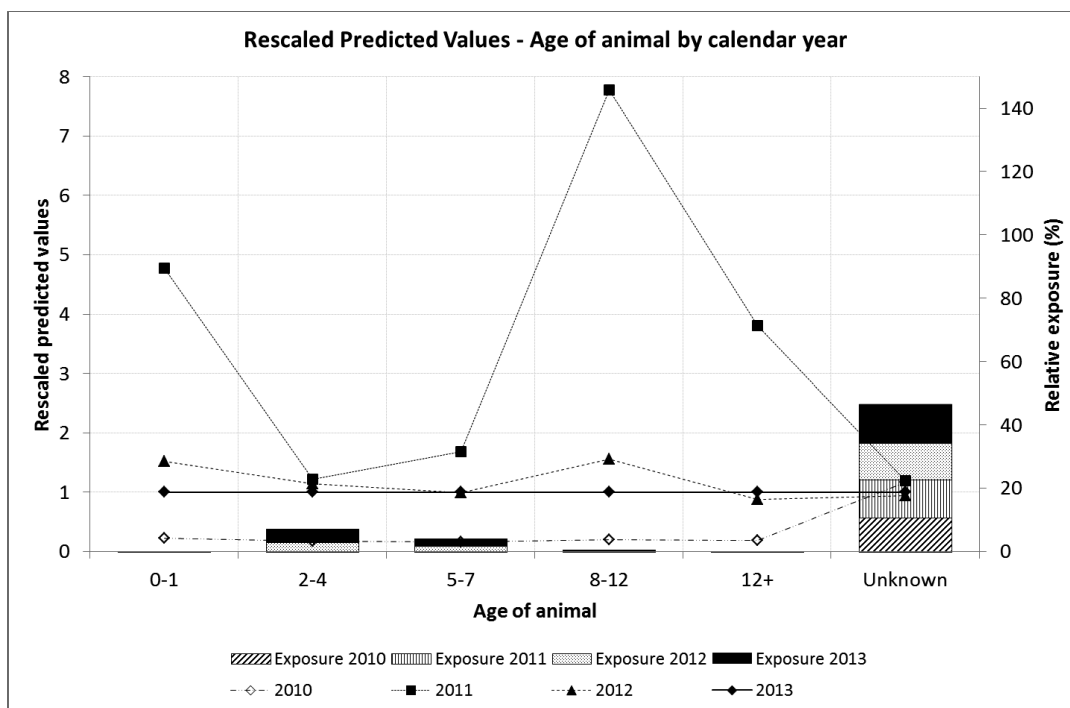**8** (i) Describe the likely claim characteristics of pet insurance. [3]

A trainee actuary working for a pet insurance company is assessing whether a new factor (*age of animal*) should be used for rating. The age of animal is banded into the six levels shown in the plots below before the factor is fitted to the model.

She has fitted two models (Model A and Model B) of the claim frequency for the pet insurance cover that the insurance company writes. Model A has the same factors as Model B, except that Model A includes the factor *age of animal* and Model B does not.

The insurance company has only started capturing data on *age of animal* in the last few years. Some of the output from the trainee's analysis is shown below.

Model	*A*	*B*
Scaled deviance	41,332	41,348
Akaike Information Criterion (AIC)	43,667	43,672

Rescaled Predicted Values - Age of Animal

Rescaled Predicted Values - Age of animal by calendar year

(ii)   Recommend, giving reasons, whether the factor *age of animal* should be used
        as a rating factor.   [8]
                                                                          [Total 11]

9   The recent edition of a popular magazine includes a letter in which the writer asks
        why general insurance companies would want to continue writing business given that
        the insurance industry has been stuck in a soft market for almost a decade.

        (i)   Discuss why an insurance company would continue to stay in business during
                soft market conditions.   [9]

        (ii)   Suggest some shortcomings of staying in business during soft market
                conditions.   [2]
                                                                          [Total 11]

10   An actuary has obtained the following claims data for a block of 25,000 general insurance policies:

Number of claims per policy	Number of policies
0	18,797
1	5,270
2	831
3	91
4	10
5	1

(i)   Calculate the mean number of claims per policy.   [1]

The actuary fits a Poisson distribution to the number of claims per policy using the mean from part (i) as the mean of the Poisson distribution.

The test statistic for a chi-squared goodness of fit test is given by:

$$\sum_i \frac{(O_i - E_i)^2}{E_i}.$$

(ii)   Show that the test statistic is equal to 15.41 (do not group the policies with 4 and 5 claims).   [6]

(iii)   Determine whether the Poisson distribution is a good fit to the claims data.   [2]

A reinsurance company has been asked to provide a quote to cover a block of 1,000 policies. The reinsurance treaty will have the following structure:

- The excess on each claim is $1,000.
- The upper limit on each claim is $1,000,000.
- The total amount of cover available is $10,000,000.

A gamma distribution has been fitted to the ground-up losses. The number of claims is assumed to follow the Poisson distribution fitted above.

(iv)   Describe how simulation could be used to estimate the risk premium and to estimate a measure of the variability in this risk premium.   [3]

[Total 12]

11 (i) Outline the five modules of a catastrophe model. [8]

The country of Tectonia is prone to earthquakes. Its government periodically publishes maps, which classify different areas of Tectonia by intensity of earthquake risk. In the most recent publication, the government revised its classifications as follows:

	Previous classification system	*New classification system*
Areas covered	Out of the fifteen counties, only eight counties are covered.	The remaining seven counties have been added to the maps.
	The rest of the country is not mapped.	Now the whole country is mapped.
Number of classification levels of intensity of risk	Three levels of intensity – no risk, low risk or high risk	The number of levels of intensity have been increased from three to five.
		As a result, some areas have a higher numerical intensity level than under the previous classification system, but no area has a lower numerical intensity level.

A general insurance company operating in Tectonia has been maintaining a catastrophe model for a number of years.

(ii) Assess how the revised information published by the government would affect the insurance company's model. [3]

(iii) Outline the approaches the insurance company would use to update its model. [4]
[Total 15]

END OF PAPER