

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

18 April 2011 (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 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 nine 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.

- 1** Explain the difference between the cover given under credit insurance and creditor insurance, giving examples where appropriate. [4]
- 2** You are talking to one of your friends and tell him that you are studying credibility theory. He is a trainee solicitor and is aware of basic insurance concepts but has never heard of credibility theory. He asks you to explain to him how credibility techniques could be used to set premium rates for his professional indemnity cover.
- Outline the points that you would make to him. [4]
- 3** Describe the five modules that typically make up a catastrophe model. [6]
- 4** State the possible regulatory restrictions that may be imposed on the actions of a general insurer. [7]
- 5** (i) List the adjustments that need to be made to a risk premium in order to calculate an office premium. [4]
- A general insurance company underwrites a household property insurance account that has an outwards quota share reinsurance contract.
- The account is expected to run at a loss ratio of 60% gross of reinsurance and 55% net of reinsurance. These loss ratios are calculated after the deduction of all commissions.
- (ii) Suggest why the expected net loss ratio is less than the expected gross loss ratio. [1]
- The quota share reinsurance has an event limit that allows the insurer to recover no more than a fixed amount per event. The reinsurer is proposing to increase this limit.
- (iii) Discuss how this might affect the expected net loss ratio. [5]
- The company also writes product liability insurance. A colleague suggests that the gross premium should be set for the household property account to achieve a higher target loss ratio than the product liability account.
- (iv) Discuss this statement. [7]
- [Total 17]

- 6 A reinsurance company is considering whether to write a property catastrophe reinsurance contract. When the contract exposures are run through a catastrophe model, the outputs in the tables below are obtained. The catastrophe model allows for all the losses that can occur under the contract. The mean loss of 1,090,000 is also an output from the model.

<i>OEP</i>	<i>Loss</i>	<i>AEP</i>	<i>Loss</i>
0.0001	12,639,194	0.0001	18,412,294
0.0002	11,845,886	0.0002	16,664,104
0.001	9,197,946	0.001	13,063,372
0.002	8,170,147	0.002	11,654,574
0.004	7,076,740	0.004	10,230,803
0.005	6,822,562	0.005	9,862,764
0.01	6,137,908	0.01	7,940,776
0.02	5,383,971	0.02	6,604,098
0.04	4,320,107	0.04	5,380,859
0.1	3,073,762	0.1	3,630,884
0.2	1,558,238	0.2	1,852,218
0.5	184,804	0.5	237,743

- (i) Define the terms OEP (occurrence exceedance probability) and AEP (aggregate exceedance probability). [2]

The following definitions are used:

- “gross premium” is the premium charged to the cedant;
- “net premium” is gross premium net of brokerage;
- “underwriting profit” is gross premium less brokerage, other expenses and ultimate claims.

Brokerage is 15% of gross premium and other expenses are 10% of net premium.

- (ii) Calculate the gross premium required to generate a 90% probability of making an underwriting profit in any given underwriting year. [2]

The contract is priced to achieve an expected gross loss ratio of 50%.

- (iii) Calculate, using linear interpolation, the probability that the combined ratio is greater than 100%. [3]

The reinsurance underwriter requests the purchase of some retrocession protection for this contract. Protection is required against all events occurring less frequently than 1 in 150 years.

- (iv) Define the terms retrocessionnaire and retrocedant. [1]

- (v) Estimate, using linear interpolation, the attachment point that the retrocession contract should have, in order to meet the underwriter’s requirements. [2]
[Total 10]

- 7** A general insurance company writes an annual travel insurance product for students travelling for long periods. The policy pays a fixed sum in the event of loss of luggage, hospital expenses and the cost of flying the student home, where necessary, as a result of an accident or illness.

Analysis of past data shows that claims emerge following a Poisson distribution with a parameter of 0.05. When a claim does occur, the claim cost has the following discrete probability distribution:

<i>Event</i>	<i>Loss of Luggage</i>	<i>Hospital Stay</i>	<i>Flight Home</i>
Fixed Benefit	£250	£750	£5000
Probability	0.80	0.19	0.01

- (i) Calculate the first three moments of the claim cost distribution arising from these policies. [3]
- (ii) Calculate the mean, variance, skewness and coefficient of skewness for the compound distribution. [2]
- (iii) Determine the parameters of the translated gamma distribution that would be used to approximate the compound distribution, giving your answers correct to 5 decimal places. [4]

There are currently 1,000 live policies.

- (iv) Calculate, using a Normal approximation to the compound distribution, the probability that the aggregate claims for these 1,000 policies exceeds £30,000 in a year. [3]
 - (v) State two advantages of using a Normal approximation to an aggregate claim distribution model rather than a recursive model. [1]
- [Total 13]

- 8 A general insurance company is pricing an employers' liability contract for a fishing business involving a large fleet of fishing vessels in the country Eeland. In this country, claims are frequent but their amounts are fixed. The contract will be denominated in the local currency, the Eero (E).

The company is calculating historical exposure for previous policy years using the payroll given in the following table. The 2011 figure is estimated.

<i>Fiscal Year</i>	<i>Fiscal Period</i>	<i>Annualised Payroll (Em)</i>
2007	1 May 2007–30 April 2008	55.0
2008	1 May 2008–30 April 2009	70.0
2009	1 May 2009–31 Dec 2009	71.0
2010	1 Jan 2010–31 Dec 2010	75.0
2011 (est.)	1 Jan 2011–31 Dec 2011	80.0

- (i) Project a payroll figure for the 2012 fiscal year, explaining your reasoning. [1]

The 2011 policy year runs from 1 July 2011 to 30 June 2012. All previous policy years ran from 1 July to 30 June.

- (ii) Estimate the exposure for each of the five policy years 2007-2011 so that it can be used for rating the 2011 policy. Use an assumed average rate of earnings inflation of 5% and state any further assumptions that you make. [7]

The following table contains historical aggregate claims under the policy, trended to current levels and projected to ultimate.

<i>Policy Year</i>	<i>Trended Ultimate Claims (Em)</i>
2007	2.30
2008	3.75
2009	3.55
2010	2.80

The underwriters think that the high claims in policy years 2008 and 2009 are due to the economic climate and they estimate the effect of this to be a 30% increase in total claim amounts in these years. They do not believe that there should be an increase in any other year, including 2011.

- (iii) Estimate the expected losses for the 2011 policy year by removing the effects of the economic climate, stating any assumptions that you make. [4]
- (iv) Discuss the issues involved in selecting the policy years to use as a basis for rating the 2011 policy. [3]

The underwriters suggest building a model to rate individual fishing vessels.

- (v) Suggest rating factors that may be used in this model. [3]
- [Total 18]

- 9** A large general insurance company is considering whether to start writing insurance for wind turbines. Wind turbines use wind energy to produce electricity, and the technological development of these turbines has been advancing rapidly in recent years. For the purposes of insurance, wind farms are treated as power plants. The insurance would cover the company that operates the turbines, rather than the manufacturer.

As the company has not written this type of insurance before, it will initially need to rely on external information.

- (i) List the perils that the insurance company might be asked to cover. [4]
- (ii) Suggest sources of external information that the company could use to help to price this business. [2]
- (iii) Discuss the potential problems with using external data for calculating premium rates for this class of business. [4]
- (iv) Discuss the information that the company would seek from a wind turbine operator in order to price a policy effectively. [11]

[Total 21]

END OF PAPER