

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

16 April 2012 (pm)

Subject ST7 – General Insurance: Reserving and Capital Modelling 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 at 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 seven 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.

<p><i>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.</i></p>
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- 1**
- (i) Define a copula function and suggest the rationale for its actuarial use in general insurance. [2]
 - (ii) Derive copula expressions for variables X and Y when these are not statistically independent. [3]
 - (iii) State the copula expression used most commonly in insurance applications and summarise its characteristics. [2]
- [Total 7]

- 2**
- (i) Outline quantitative indicators of an increase in fraudulent claims in a motor insurance portfolio. [3]
 - (ii) Describe how an insurer could attempt to reduce the number of fraudulent claims. [5]
- [Total 8]

- 3** Describe the main constraints a general insurer faces in setting its investment policy. [10]

- 4** Two general insurance companies A and B operate in the same country. Each company writes primarily personal lines motor and property business. The following information relates to the year ending 31 December 2011.

	<i>A</i>	<i>B</i>
Gross Written Premium	152	1,112
Additional Unexpired Risk Reserve c/fwd	47	0
Gross Outstanding Claims Reserve b/fwd	61	3,203
Gross Claims Paid	111	647
Gross Outstanding Claims Reserve c/fwd	94	3,076
Non Acquisition Expenses	17	129
Investment Income	10	68
Current Assets at 31/12/2011	17	133
Current Liabilities at 31/12/2011	35	171
Investments at 31/12/2011	386	4,372
Share Capital at 31/12/2011	46	541
Acquisition Costs as a % of Gross Written Premium	38%	23%

- (i) Construct the balance sheet for each of the two companies as at 31 December 2011, stating any assumptions made. [4]
 - (ii) Derive underwriting, solvency and return on capital employed ratios for each company, ignoring taxation, stating any assumptions made. [5]
 - (iii) Comment on the results in part (ii). [4]
- [Total 13]

5 The following claims information for a large insurer has been provided:

<i>Under-writing Year</i>	<i>Premium</i>	<i>Outstanding Case Reserves</i>	<i>Paid Claims</i>	<i>Selected Incurred Development</i>	<i>Selected Ultimate Cost</i>	<i>Loss Ratio</i>
2005	109,900	2,700	19,700	100.0%	22,400	20.4%
2006	103,000	6,300	19,300	102.3%	25,027	24.3%
2007	78,300	9,000	12,100	109.4%	19,285	24.6%
2008	78,700	10,100	9,300	104.6%	18,548	23.6%
2009	80,200	13,300	5,400	84.2%	22,207	27.7%
2010	82,100	8,000	1,000	21.9%		

Premium Rate Increases

2005	–6%
2006	–8%
2007	–6%
2008	0%
2009	6%
2010	5%

*Claims Inflation
Assumption*

5%

- (i) Discuss the advantages and disadvantages of the following approaches for deriving an estimated loss ratio for use within the Incurred Bornhuetter-Ferguson method:
 - (a) Using the underwriter’s view of the priced loss ratio.
 - (b) Using market loss ratios derived from industry benchmark information.
 - (c) Using an average of the last three years selected ultimate loss ratios adjusted for premium rate increases and claims inflation.

[5]
- (ii) Using method (c) above, estimate the ultimate loss ratio for underwriting year 2010.

[3]
- (iii) Comment on the ultimate loss ratio estimates by underwriting year and any alternative projection methods that may be appropriate.

[2]

[Total 10]

6 A small but expanding general insurance company has over the last three years written a packaged product for small businesses. The product includes property, employers' and public liability and business interruption covers. The basis for the outstanding claims reserve for the product is being reviewed.

- (i) Compare the relative merits of case estimates and statistical methods when calculating a reserve for outstanding claims for this product. [8]
- (ii) For each of the property, liability and business interruption covers, outline the characteristics of the claims expected under this product [7]

When grouping the data for the purpose of statistical reserving for outstanding claims, the company currently combines all property and business interruption claims but treats liability claims separately.

- (iii) Discuss the advantages and disadvantages of this approach. [6]
 - (iv) Explain the circumstances in which an exposure-based method would be appropriate for estimating the reserve and how it would be applied. [3]
 - (v) Describe how the business environment might impact the basis and method for estimating the reserve. [3]
- [Total 27]

7 An insurer writes only public and employers' liability business. The company actuary has been asked by the managing director to consider ways to improve the internal planning process by including output from the capital model.

- (i) Discuss how the actuary could use the capital model to inform the planning process and which parts of the business may benefit from this. [7]

The managing director is particularly interested in including information from the insurance risk element of the model as the company is planning to start writing commercial motor business.

- (ii) Discuss how you could parameterise the insurance risk elements of this capital model for this new class of business, considering any practical issues faced. [12]
 - (iii) Discuss the potential impact on the company of the use of inappropriate model parameters. [6]
- [Total 25]

END OF PAPER