EXAMINATION

29 September 2010 (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 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 five questions, beginning your answer to each question on a separate sheet.*

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

Graph paper is required for this paper

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 A large international reinsurance group writes a diverse portfolio of inwards reinsurance and retrocession business. Data are being prepared for a detailed reserve review.

(i) List the potential groupings within the claims and premium data that might be appropriate for projection purposes. [6]

(ii) Explain why it may not be practical to use all these subdivisions when using chain ladder based actuarial projection techniques. [3]

(iii) Suggest the steps that the company should take and the factors that it should consider when deciding the level at which to segment the data. [5]

[Total 14]

2 (i) Define diversification in the context of capital modelling. [2]

(ii) Discuss applications of capital modelling where diversification needs to be considered. [10]

(iii) List dependencies that should be considered in a typical capital model, giving an example of the drivers of dependency in each case. [6]

[Total 18]

3 A large general insurance company writes a small but growing commercial property insurance book. Its policyholders range from small retailers to large manufacturing companies. The property book is protected by a combination of risk excess of loss treaty reinsurance and quota share treaty reinsurance. This treaty reinsurance is purchased annually with effect from 1 January. The risk excess of loss reinsurance policy is purchased on a losses occurring (LOD) basis. The quota share policy is purchased on a risks attaching (RAD) basis. The quota share operates before the risk excess of loss.

(i) Define what is meant by "losses occurring policy" and "risks attaching policy". [1]

The quota share cession percentage depends on the treaty year, with each treaty running from 1 January to 31 December. The quota share cession is 50%, 30% and 20% on the 2008, 2009 and 2010 treaty years respectively. The table below sets out the key features of the risk excess of loss cover for each treaty year.

		Risk excess of loss			
Treaty year	*Layer*	*Limit*	*Excess Point*	*Aggregate Deductible*	*% Placed*
2008	1	£3m	£2m	–	100%
2008	2	£10m	£5m	–	100%
2008	3	£15m	£15m	–	100%
2009	1	£2.5m	£2.5m	£2.5m	100%
2009	2	£15m	£5m	–	80%
2010	1	£5m	£2.5m	£10m	100%
2010	2	£22.5m	£7.5m		100%

One of the property underwriters has asked you to calculate the total reinsurance recoveries he should expect the company to make on each of his two largest property losses:

- Smith Foods' fire claim, gross incurred loss of £8.5m. The Smith Foods' policy incepted on 1 December 2008 and the fire was notified on 11 November 2009.

- Yellow Plastics' flood claim, gross incurred loss of £12.0m. The Yellow Plastics' policy is renewed every year on 1 January and one of the Yellow Plastics' factories was flooded in February 2009.

The underwriter notes that losses are applied to an aggregate deductible in order of date of loss. The next largest gross claim to have impacted the account between 2008 and 2010 was £3.2m, relating to a fire event in January 2009.

(ii) Set out the reinsurance recovery calculations for each of Smith Foods and Yellow Plastics, explaining all the assumptions made. [8]

The managing director of the company has suggested that the company stops buying quota share treaty reinsurance from 2011. He is concerned that underwriting profit is being ceded unnecessarily.

(iii) Discuss the main advantages and disadvantages to the company of buying quota share reinsurance to protect its property book. [4]

(iv) (a) Suggest two alternative types of non-catastrophe reinsurance that could be used to protect the commercial property portfolio.

(b) Explain why each of these alternative types of reinsurance may be more appropriate for this company than quota share reinsurance. [5]

[Total 18]

4 A general insurance company writes public liability insurance. The company actuary has recently completed her review of the net of reinsurance outstanding claims and IBNR reserve requirements for this class of business as at 31 December 2009. Excerpts from the company actuary's working papers are shown below. Claims have been displayed grouped by underwriting year, which is the way in which the company usually looks at its business.

Summary net of reinsurance:

Cumulative notified incurred claim amounts (£000)

	Development month							
UW Year	*12*	*24*	*36*	*48*	*60*	*72*	*84*	*96*
2002	5,206	29,299	35,539	32,039	31,161	31,351	31,508	31,508
2003	5,690	35,988	43,077	39,894	37,584	37,637	37,768	
2004	4,791	25,482	33,432	29,962	29,249	29,307		
2005	7,280	31,231	36,290	34,512	34,312			
2006	10,642	39,207	47,519	42,111				
2007	10,090	43,476	57,649					
2008	11,950	49,761						
2009	12,983							

Cumulative notified incurred claim development factors

	Development months							
UW Year	*12–24*	*24–36*	*36–48*	*48–60*	*60–72*	*72–84*	*84–96*	
2002	5.6278	1.2130	0.9015	0.9726	1.0061	1.0050	1.0000	
2003	6.3251	1.1970	0.9261	0.9421	1.0014	1.0035		
2004	5.3190	1.3120	0.8962	0.9762	1.0020			
2005	4.2901	1.1620	0.9510	0.9942				
2006	3.6840	1.2120	0.8862					
2007	4.3087	1.3260						
2008	4.1642							
*Selected idf**	4.8170	1.2370	0.9122	0.9713	1.0032	1.0043	1.0000	1.0100
*Selected cdf***	5.3723	1.1153	0.9016	0.9884	1.0176	1.0143	1.0100	1.0100

* idf = incremental development factor
** cdf = cumulative development factor

(i) Sketch the selected incurred claims development pattern, with the development year along the *x*-axis and the cumulative incurred claims as a percentage of the ultimate claims along the *y*-axis. [3]

(ii) Comment on the incurred claim development patterns shown in the data, including reference to the claims characteristics of public liability business. [7]

The company actuary's selected ultimate claims figures have been based on:

- her incurred chain ladder projections for the 2008 and prior underwriting years

- the application of the underwriter's planned ultimate loss ratio to the ultimate premium estimate for the 2009 underwriting year

(iii) Discuss the appropriateness of the actuary's reserving methodology for this class of business. [7]

The company actuary wants to develop a method for quantifying the levels of uncertainty around her estimate of reserves. This is the first time that she has attempted this. She has been considering the following two methods:

- the Mack method
- bootstrapping the overdispersed Poisson.

(iv) List the benefits of quantifying uncertainty in reserve estimates. [3]

(v) Describe each of the two methods being considered by the actuary, indicating the key assumptions underlying each method. [7]

(vi) Recommend which of the two methods is preferable, giving your reasons. [3]

[Total 30]

5 (i) Define the following terms as they apply to a general insurance company:

(a) Economic capital
(b) Available capital
(c) Excess capital [2]

A general insurance company wishes to undertake an investigation of its exposures to market risks as at 31 December 2009.

(ii) Describe potential sources of market risk. [5]

The information given below is a simplified summary of the company's balance sheet as at 31 December 2009:

Liabilities (Undiscounted)	*£m*
Claims Reserve	150
Unearned Premium Reserve	50
Total Reserve	200

Assets (Market value as at 31 December 2009)	*£m*
Cash	50
Gilts	100
Corporate Bond (A-rated)	50
Equities	75
Total	275

It should be assumed that:

- the corporate bond is a single asset
- the duration of each of the gilts and the corporate bond is 3 years
- the duration of the assets matches the duration of the liabilities
- the risk-free interest rate is 5%
- the corporate bond spread is 2% above the risk-free rate

(iii) Calculate the insurance company's available capital as at 31 December 2009. [1]

(iv) Estimate the change in the insurance company's available capital under each of the following scenarios, showing your reasoning and stating any further assumptions that you make:

(a) a fall in equity markets of 20%
(b) an increase in the risk-free interest rate from 5% to 10%
(c) a decrease in the corporate bond spread from 2% to 0%
(d) a default on the corporate bond

[9]

(v) Discuss any changes to the calculations in part (iv) if the insurance company were to discount its liabilities. [3]

[Total 20]

END OF PAPER