INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

3 October 2011 (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.

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 gap motor insurance policy pays the difference between the price of the latest equivalent new model of the car written off and the amount received from the insured's own comprehensive motor policy when a car is written off within the terms of the comprehensive policy.

(i) Describe the risks associated with writing this business, and give suggestions how the policy could be modified to reduce the risks. [4]

(ii) Define UPR and AURR. [2]

The premium for a three-year gap motor policy has been calculated assuming that the amount payable by the comprehensive motor policy is based on 10% initial depreciation then 15% per annum depreciation thereafter and that the price of a new equivalent model increases by 5% per annum, with the simplifying assumptions that the probability that a car is written off is the same for each of the three years and occurs mid-year.

Subsequently it has emerged that initial depreciation should have been 15% with annual depreciation of 20%, new model increases were 10% per annum and the probability of a car being written off is 20% higher than predicted.

(iii) Calculate the UPR and AURR each as a percentage of the original premium two years after inception (ignoring DAC and differences between office and pure premiums). [4]

[Total 10]

2 (i) Explain the term "claim cohort". [2]

A general insurance company has arranged its paid claims data to 31 December 2010 into incremental triangles on an annual basis for claim cohort years 2006 to 2010 as shown below.

		Development year				
		Y1	Y2	Y3	Y4	Y5
Claim cohort year	2006	b_{11}	b_{12}	b_{13}	b_{14}	b_{15}
	2007	b_{21}	b_{22}	b_{23}	b_{24}	
	2008	b_{31}	b_{32}	b_{33}		
	2009	b_{41}	b_{42}			
	2010	b_{51}				

Additionally, an incremental paid claims triangle has been prepared on a quarterly basis for the most recent two claim cohort years.

Claim cohort quarter	**Development quarter** Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Q1 2009	a_{11}	a_{12}	a_{13}	a_{14}	a_{15}	a_{16}	a_{17}	a_{18}
Q2 2009	a_{21}	a_{22}	a_{23}	a_{24}	a_{25}	a_{26}	a_{27}	
Q3 2009	a_{31}	a_{32}	a_{33}	a_{34}	a_{35}	a_{36}		
Q4 2009	a_{41}	a_{42}	a_{43}	a_{44}	a_{45}			
Q1 2010	a_{51}	a_{52}	a_{53}	a_{54}				
Q2 2010	a_{61}	a_{62}	a_{63}					
Q3 2010	a_{71}	a_{72}						
Q4 2010	a_{81}							

Information about three particular claims has been provided below. Each date is expressed as DD/MM/YY.

Claimant	*Claim Ref*	*Policy inception date*	*Accident date*	*Notification date*	*Payment date*
Z Smith	M089124	05/05/08	21/11/08	02/01/09	07/04/09
T Matiza	M095689	01/01/09	30/06/09	02/07/09	01/02/10
P Shah	M082457	21/07/07	16/06/08	14/03/09	20/11/10

(ii) Identify the position within the annualised triangle, in the format b_{ij}, for the payment relating to each of the three given claims, assuming that the triangle was prepared on the following bases:

(a) Accident year
(b) Underwriting year
(c) Reporting year [4]

(iii) State the formulae for collating the quarterly triangle into an annual triangle for cohort years 2009 and 2010. [3]

(iv) Discuss the factors that you would consider when choosing whether to project quarterly triangles or annual triangles for reserving purposes. [5]

[Total 14]

3 (i) Describe the benefits provided by employers' liability insurance. [2]

A general insurance company has a portfolio of 5000 employers' liability policies written on a losses-occurring basis. Approximately half of these policies incept on 1 January each year, with the remainder spread throughout the year on the 1^{st} of each month.

(ii) Estimate the average date of accident for the company's policies incepting during 2010, stating all assumptions made. [4]

(iii) Explain, with examples, why the average date of notification of claims for the company's policies incepting in 2010 may be significantly later than your answer in (ii). [3]
[Total 9]

4 List and explain the purposes of the ways in which a supervisory authority can impose restrictions and requirements on a general insurance company in respect of:

(i) Investment policy [5]
(ii) Underwriting policy [12]
[Total 17]

5 A specialist general insurance company, Company A, is deriving reserve estimates for the engineering class of business for the purpose of the annual accounts. This book of business has been split between large and small contracts for reserving purposes. The large engineering class comprises three contracts which all incepted during 2009, paid by single premium without further adjustment.

Contract	**Bigtown Metro**	**Mega Power Plant**	**City Mall**
Written Premium	$50m	$100m	$30m
Project Duration	10 years	7 years	3 years
Inception date	30 June 2009	1 January 2009	30 September 2009
Expected loss ratio	65%	65%	65%
Risk Pattern	Level over the term	10% of risk for each of first six years, then 40% in final year	Doubling each policy year

(i) Calculate the unearned premium reserve (gross of DAC) as at both 31/12/09 and 31/12/10 for the large engineering class of business as a whole, stating any assumptions that you make. [6]

The following additional information has been provided on the financial performance of the business during 2010.

- No further large contracts were written during 2010. The company wrote premiums gross of reinsurance on small contracts of $50m in 2009 and $60m in 2010.

- Acquisition costs have been 25% of written premiums since 1 January 2009. General expenses are 10% of earned premium while unallocated claims handling expenses are 5% of incurred claims.

- For the small contracts, outstanding claims reserves are 75% of the written premiums in the previous 12 months and for all contracts claims paid are 40% of earned premiums.

- Investment income is 5% per annum on assets supporting both the technical reserves and the shareholders' funds. The company had shareholders' funds of $30m as at 31/12/09 and the total assets remained unchanged during the year.

- The company pays tax at 30% and has a long standing dividend policy of distributing 25% of pre-tax profits, subject to a maximum of $2m.

(ii) Construct the Profit and Loss Account for 2010 stating any further assumptions that you make. [14]

(iii) Calculate the following for 2010:

(a) Loss ratio
(b) Operating ratio

[2]

A broker has provided some benchmark ratios for a portfolio of engineering insurance business with another company, Company B.

	Loss Ratio	*Operating Ratio*	*Solvency Ratio*	*Return on Capital*
Company B	45%	72%	31%	5%

(iv) Discuss the possible limitations of carrying out a direct comparison of Companies A and B using these ratios [5]

[Total 27]

 PLEASE TURN OVER

6 The Board of a large London Market insurer is undertaking a review of the company's capital model.

(i) Comment on the appropriateness of the following suggestions, giving a brief description of the issues involved:

(a) The current methods of allowing for diversification should be replaced by the use of copulas.

(b) Time and money could be saved by including a fixed percentage allowance for operational risk rather than explicit modelling.

[6]

As part of the 2012 business planning process, the Board is also considering changes to the company's strategy.

(ii) Discuss how each of the following suggestions is likely to change the company's capital requirements, commenting on different risk types where appropriate:

(a) Writing a new line of business with a significant profit commission element.

(b) A reduction in reinsurance spending removing lower working layers of cover.

[6]

At its next meeting the Board is to consider outsourcing both the design and operation of the capital model to a third party provider.

(iii) Discuss the advantages and disadvantages of this proposal. [5]

[Total 17]

7 An actuary has been hired by a large insurance company writing many different lines of business to give advice on the construction of a new capital model. As part of the actuary's work, a gap analysis questionnaire has been compiled to identify some of the practical aspects to be considered.

Explain, with reasons, why the following questions have been included in the gap analysis questionnaire:

(a) What are the sizes of the premiums and reserves for each class of business?

(b) Are the data for each class available at a gross, reinsurance, and/or net level?

[6]

END OF PAPER