EXAMINATIONS

September 1999

Subject 303 — General Insurance

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *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.*

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

3. *Write your surname in full, the initials of your other names and your Candidate's Number on the front of the answer booklet.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all 9 questions, beginning your answer to each question on a separate sheet.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet and this question paper.

In addition to this paper you should have available Actuarial Tables and an electronic calculator.

1 A general insurance company is constructing an asset-liability model to determine the likely future relationship between its assets and liabilities.

(i) State the particular factors that will need to be incorporated into the model if it is to be used to assess future solvency. [4]

(ii) List, with brief reasons for their interest, the parties who may be interested in the level of the solvency of the company. [3]

(iii) Discuss briefly whether it would be more effective to use a deterministic or a stochastic model. [3]

[Total 10]

2 State the reasons why a general insurer would analyse its claims data. [5]

3 You are the actuary to an insurance company that writes industrial property business with large deductibles. It is subject to large losses, which are usually reported quickly. Reserves are always set up in respect of these losses, but these are often found to be excessive or inadequate. You are concerned about the estimation of ultimate claims from this line of business, which has been carried out using the chain ladder method and has often been unstable in the past. It has been suggested that the use of Bornhuetter-Ferguson methods would provide an element of stability in reserve estimates.

Discuss this suggestion. [5]

4 List the guidance notes published by the Institute and Faculty of Actuaries which relate to general insurance business, and state what each relates to. [6]

5 List the portfolio movements that are normally monitored by a general insurance company, and state the reasons for monitoring them. [5]

6 Company A is a medium-sized general insurance company, writing a variety of property and liability risks. It expects a loss ratio of about 75% on its commercial property portfolio, which accounts for about 60% of the company's total premium. At the end of the company's past year it had capital of 28% of the premium written during the year. It has recently taken out a reinsurance treaty, from which the following information has been extracted.

Name of reinsured:	Company A
Subject business:	All business written by the reinsured in the class "commercial property" with an inception date during 1999.
Reinsurance premium:	41% of original premiums of the subject business, to be paid on 31 December 1999.
Commission:	A reinsurance commission of 9% of original premiums of subject business shall be paid to the reinsured. This is part of the 41% reinsurance premium.
Limits:	Losses shall be paid to the reinsured in excess of a total loss equal to 70% of original premiums of subject business, up to a maximum total loss of 111% of original premiums of subject business.
Termination:	This treaty shall be terminated with effect 31 December 2003, and all monies due as claims or profit share shall be paid to the reinsured immediately.
Profit share:	On termination of the contract a profit share shall be payable to the reinsured. This shall be calculated as 97½% of the profit. The profit shall be calculated as 41% of the original premiums of the subject business less any claim payments made to the reinsured under this contract.

Discuss this reinsurance treaty. You should consider the nature of the contract, the nature and amount of the protection and any other benefits it provides, the reasons for taking it out, and how it might meet those criteria.

[10]

7 Give examples of errors which might be made in entering data into a computer claims system, and suggest automatic proceedings which would reduce the probability of them occurring. [5]

8 You are the pricing actuary for a reinsurance company. You are being asked to quote for a quota share reinsurance of the cedant's book of liability business. The inception date of the policy is to be 1 January 2000. The broker has supplied you with the following information.

- Between 1990 and 1997 premium increases kept pace with increases in losses and the underwriting loss ratio was fairly stable at around 85%.

- Since 1997 the market has softened. Premium rates fell by 5% per annum in 1998 and 1999 while losses increased at 10% per annum over the same period. The company has cut back on its new writings as a result.

- Written premium in 1989 was 500.

The following statistics have also been provided, and you have made the calculations shown.

Underwriting year:	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Written premium:	500	600	700	800	900	1,000	1,100	1,200	600	300

Paid losses
Data evaluated as at 31 December each year
Last diagonal as at 30 June 1999

Accident Year	0	1	2	3	4	5	6	7	8	9
1990	26	48	65	89	208	257	298	319	339	351
1991	28	43	76	93	229	280	331	353	362	
1992	40	66	72	104	279	336	384	400		
1993	18	68	88	139	313	382	412			
1994	25	80	110	150	368	395				
1995	32	63	137	168	291					
1996	31	71	152	157						
1997	27	104	111							
1998	51	54								
1999	10									

Year-on-year development

Accident Year	0 – 1	1 – 2	2 – 3	3 – 4	4 – 5	5 – 6	6 – 7	7 – 8	8 – 9
1990	1.85	1.35	1.37	2.34	1.24	1.16	1.07	1.06	1.04
1991	1.54	1.77	1.22	2.46	1.22	1.18	1.07	1.03	
1992	1.65	1.09	1.44	2.68	1.20	1.14	1.04		
1993	3.78	1.29	1.58	2.25	1.22	1.08			
1994	3.20	1.38	1.36	2.45	1.07				
1995	1.97	2.17	1.23	1.73					
1996	2.29	2.14	1.03						
1997	3.85	1.07							
1998	1.06								

Average year-on-year development factors

All years:

2.15	1.49	1.29	2.27	1.18	1.14	1.06	1.04	1.04

All years excluding last diagonal:

2.39	1.59	1.36	2.43	1.22	1.16	1.07	1.06

Last three years:

2.10	1.68	1.19	2.13	1.16	1.13	1.06	1.04	1.04

Last three years excluding last diagonal:

2.64	1.86	1.36	2.44	1.22	1.16	1.07	1.06

Incurred losses
Data evaluated as at 31 December each year
Last diagonal as at 30 June 1999

Accident Year	0	1	2	3	4	5	6	7	8	9
1990	123	511	384	404	416	421	425	425	425	425
1991	135	561	420	445	458	463	468	468	468	
1992	169	661	496	524	542	547	553	553		
1993	201	763	572	606	625	631	634			
1994	220	869	651	685	708	712				
1995	242	970	726	766	779					
1996	267	1,073	805	824						
1997	295	1,174	1,026							
1998	372	930								
1999	202									

Accident Year	0 – 1	1 – 2	2 – 3	3 – 4	4 – 5	5 – 6	6 – 7	7 – 8	8 – 9
1990	4.15	0.75	1.05	1.03	1.01	1.01	1.00	1.00	1.00
1991	4.16	0.75	1.06	1.03	1.01	1.01	1.00	1.00	
1992	3.91	0.75	1.06	1.03	1.01	1.01	1.00		
1993	3.80	0.75	1.06	1.03	1.01	1.00			
1994	3.95	0.75	1.05	1.03	1.01				
1995	4.01	0.75	1.06	1.02					
1996	4.02	0.75	1.02						
1997	3.98	0.87							
1998	2.50								

Average year-on-year development factors

All years:									
	3.71	0.77	1.05	1.03	1.01	1.01	1.00	1.00	1.00
All years excluding last diagonal:									
	3.98	0.75	1.06	1.03	1.01	1.01	1.00	1.00	
Last three years:									
	3.40	0.79	1.04	1.03	1.01	1.01	1.00	1.00	1.00
Last three years excluding last diagonal:									
	4.00	0.75	1.06	1.03	1.01	1.01	1.00	1.00	

(i) Describe in detail how you would use the Paid and Incurred Bornheutter-Ferguson methods to estimate ultimate losses for this business for each accident year. You should explain all choices and assumptions you would use. You are not required actually to calculate the estimated ultimate losses [16]

(ii) Estimate the ratio of discounted ultimate claims to undiscounted ultimate claims as at the start of an accident year. Use a 10% p.a. interest rate.

[5]

(iii) Assuming brokerage of 2½%, commission of 5%, premiums paid evenly throughout the year and a required profit load of 10% of undiscounted premiums calculate the required ceding commission for this treaty. State any assumptions made. [5]

[Total 26]

9 In a particular country, all insurance business is accounted for on a one-year basis, but may be accounted for on an accident year basis or an underwriting year basis.

Company A and Company B operate in this country. Company A uses an accident year basis and company B uses an underwriting year basis. Their balance sheets as at 31 December 1998 are given below. Both companies have had stable levels of premium income for a number of years.

Company A — balance sheet as at 31 December 1998

Cash on hand	3,000	Unearned premium	4,000
Other investments	11,000	less DACs	800
			3,200
		Claim reserves	6,000
		Share capital	500
		Share premium account	1,500
		Retained profits	2,800
Total assets	**14,000**	**Total liabilities**	**14,000**

Company B — balance sheet as at 31 December 1998

Investments	14,000	Claim reserves	12,000
		Share capital	500
		Retained profits	1,500
Total assets	**14,000**	**Total liabilities**	**14,000**

(i) Discuss how these two bases would differ in the context of one-year accounting, and the consequences for the recognition of profits. [5]

Company A has agreed to acquire all the shares of Company B as at 31 December 1998 for 2,500. At that date, Company B's balance sheet will be restated in accordance with Company A's, and the two companies will be merged. In accordance with the laws of this country, any goodwill arising from the transaction will be written off immediately. Company A's own loss ratio in underwriting year 1998 is expected to be 60%. In the course of Company A's due diligence exercise, the following facts have emerged about Company B.

- The premium written in 1998 was 3,200.

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- No premium will be received in respect of the 1998 underwriting year after the end of the year.
- The expected loss ratio on underwriting year 1998 was 88%. This is the conclusion of the due diligence exercise, rather than Company B's management's opinion.
- Average commission on underwriting year 1998 was 25%.
- Business is renewed predominantly on 1 January and 1 April, to the extent that the average inception date of all policies was 1 April. (Which may be considered to be exactly 25% through the year.)
- All claim reserves need to be increased by 10% to conform to the standards of Company A.

(ii) Prepare the balance sheet of Company B at 31 December 1998 on an accident year basis to Company A's reserving standards. [5]

(iii) Prepare the balance sheet of Company A at 31 December 1998 after the takeover has been completed. [4]

(iv) Comment on the differences between Company A and Company B that may be inferred from the balance sheets and other information, and the effect of the takeover on Company A's financial position. You may assume that all assets yield income of 7½% per year. [14]

[Total 28]