

# EXAMINATION

*1 June 2016 (am)*

## **Subject F103 — *General Insurance* Fellowship Principles**

*Time allowed: 3 hours*

### **INSTRUCTIONS TO THE CANDIDATE**

1. *Enter all the candidate and examination details as requested on the front of EACH OF your answer booklets.*
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 (7) questions, beginning your answer to each question IN A SEPARATE BOOKLET.*
6. *Candidates should show calculations where this is appropriate.*

### **AT THE END OF THE EXAMINATION**

*Hand in your answer booklets, with any additional sheets firmly attached to the correct booklet, 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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## QUESTION 1

- i. In the context of reinsurance define what is meant by a “working layer” and outline briefly any type(s) of reinsurance commission which may be paid to a direct writer with such cover.

[3]

D&A is a general insurer which has reinsurance treaties which operate in the order given below:

- 25% Quota Share treaty with Reinsurer A.
- Surplus with Reinsurer B, which has the following conditions:
  - A maximum of 4 lines of cover.
  - A maximum retention limit of \$50m.
  - D&A must retain at least \$10m on each risk reinsured.
- Risk Excess of Loss with Reinsurer C, providing cover of \$5m in excess of \$2m.

You have been provided with the following extract of claim recoveries:

Policy	Sum Insured	Retention	Claim	Reinsurance Recoveries		
				Reins. A	Reins. B	Reins. C
1	\$100m	maximum permitted	\$12m	(a)	(b)	(c)
2	\$80m	minimum permitted	\$40m	amount not provided	(d)	(e)
3	(g)	maximum permitted	(f)	amount not provided	\$6m	\$1m

- ii. Determine the amounts (a) – (g) in the above table.

[8]

[Total 11]

## QUESTION 2

You are the actuary for a large established insurance company selling commercial comprehensive motor insurance policies covering property damage and third party liability. The company has a large database of its individual claims data, as well as relevant exposure measures, for the past 20 years.

You have been asked to investigate different excess of loss reinsurance structures on the book of business which must include a stability clause, aggregate deductible and a per occurrence limit.

- i. Define “stability clause”, “aggregate deductible” and “per-occurrence limit” and explain the effect that each will have on the expected cost of claims to an excess of loss layer.

[5]

- ii. Outline briefly how you could use a frequency-severity simulation model to estimate the next three years’ reinsurance risk premium under different reinsurance structures using the information from the company’s database.

[8]

[Total 13]

**PLEASE TURN OVER**

### QUESTION 3

A large corporate insurer provides an insurance licence to a number of underwriting managing agents in exchange for a management fee. Due to changes to the regulatory framework the insurance company now has to collect and store all of the details of the agents' individual policyholders as well as detailed claims information on a monthly basis. Previously only summary (bordereau) information was collected for financial reporting purposes.

- i. Describe the potential difficulties that the insurer faces in collecting the data on the new collections basis, given that each agent operates as a separate entity.

[6]

The insurer is setting up a reserving process for two of the agents, one providing detailed monthly transactional data and the other providing the latest monthly position of paid and outstanding amounts for all historic claims.

- ii. Describe the process the insurer will follow in processing the claims data from these two agents into an appropriate format for a reserving exercise to be carried out.
- iii. Outline briefly 4 potential challenges faced in comparing claims development patterns between two different agents writing the same class of business.

[4]

[2]

[Total 12]

### QUESTION 4

A Lloyds' syndicate that writes mostly employers' liability (EL) insurance is about to review its investment strategy. A stochastic asset-liability model (ALM), incorporating an economic scenario generator (ESG), is to be used in reviewing the investment strategy.

- i. Discuss the advantages and disadvantages of using a stochastic ALM relative to a deterministic approach for the purpose of setting investment strategy.
- ii. Explain the purpose of an ESG within an ALM exercise.
- iii. By referring to the characteristics of EL liabilities, outline suitable matching assets.

[4]

[2]

[4]

The syndicate has decided that it no longer wishes to retain exposure to liabilities relating to closed underwriting years (for existing business as well as for future new business).

- iv. Discuss the implications of this decision on the syndicate's matched investment position.

[5]

[Total 15]

**PLEASE TURN OVER**

## QUESTION 5

You are a reserving actuary working for a medium-sized general insurance company. You are busy setting the IBNR reserves for a liability class of business at 31 December 2015.

You have been given the following information:

### Incurred Basic Chain Ladder Development Factors

Accident Year	<i>Development Year</i>			
	<i>1-2</i>	<i>2-3</i>	<i>3-4</i>	<i>4-5</i>
2011	2.21	2.10	1.22	1.04
2012	2.00	1.53	1.35	
2013	1.89	1.37		
2014	1.84			

### Paid Basic Chain Ladder Development Factors

Accident Year	<i>Development Year</i>			
	<i>1-2</i>	<i>2-3</i>	<i>3-4</i>	<i>4-5</i>
2011	3.53	1.69	2.30	1.19
2012	3.00	1.78	1.40	
2013	2.52	1.65		
2014	1.44			

(Amounts in R'000s)

<i>Accident Year</i>	<i>Written Premium</i>	<i>Paid claims to date</i>	<i>Incurred claims to date</i>	<i>Case Estimates</i>	<i>Prior Loss Ratio</i>
2011	182 591	133 291	151 810	18 518	65%
2012	191 720	118 849	146 843	27 994	65%
2013	201 306	106 950	136 039	29 089	60%
2014	211 371	39 762	87 611	47 849	57%
2015	221 940	19 466	60 252	40 786	55%

<i>Selected Factors</i>	<i>Development Year</i>				
	<i>1-ult</i>	<i>2-ult</i>	<i>3-ult</i>	<i>4-ult</i>	<i>Tail</i>
Paid	7.59	3.15	1.85	1.31	1.10
Incurred	2.93	1.63	1.20	1.09	1.05

You have also been given the following additional information:

- A case estimate of R20m is included in the incurred claims data with accident date 2015/07/21. No payments have been made to date for this claim.

**PLEASE TURN OVER**

- The claims triangles provided include claims for both corporate business and personal lines. The proportion of claims for personal lines was historically very low but has been increasing steadily over the last four years.
- During 2015 a case estimation clean up exercise was undertaken to release excessive margins in the case estimates.
- There are some material unexplained data reconciliation differences between the incurred claims and the financial statements.
- You have selected the following reserving methodology:

*Accident Year*

<i>2015</i>	<i>2014</i>	<i>2011 - 2013</i>
Loss Ratio Approach	Bornhuetter-Ferguson Method using incurred data	Basic Chain Ladder using incurred data

- i. Discuss the suitability of the incurred and paid claims data for use in chain ladder projections. You should consider potential issues that may arise and how these could be addressed. [7]
  - ii. Calculate the IBNR at 31 December 2015 using the proposed methodology. [3]
  - iii. Calculate the discounted mean term for the claims reserve run-off of the 2015 accident year at 31 December 2015 and comment on the effect of discounting based on a discount rate of 4% p.a. [5]
- [Total 15]

## QUESTION 6

A medium-sized insurer has historically managed its capital position by using a prescribed industry method. The insurer's Board of Directors has expressed its concern that the company may not be managing its capital optimally, and is less competitive as a result. You have been appointed as the actuary tasked with building an internal model to assess the appropriate level of capital the company should hold.

- i. Outline the two main types of required capital [2]
- ii. Outline how the calculation of the types of required capital may differ. [4]
- iii. Explain why the insurer might choose to hold additional capital above its solvency needs. [5]

It has been suggested as a starting point for the inputs to the model that you use the figures provided in the company's (optimistic) business plan.

- iv. Outline the adjustments which may need to be made to these figures to correctly parameterise gross underwriting risk in the internal capital model. [5]
- [Total 16]

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## QUESTION 7

You are the chief underwriting actuary for New Frontiers, a well-established general insurance company known for insuring large and unusual risks, through a vast network of expert brokers. It also sells standard personal lines business through its direct marketing channel.

A new manager has suggested that the use of brokers is undesirable and should be discontinued.

- i. Discuss the considerations which should be taken into account when deciding on whether or not New Frontiers should cease using brokers.

[4]

The government of a medium-sized, politically stable country, has approached New Frontiers to insure the construction and operation of the world's largest nuclear power station, which it believes will provide the most efficient form of energy to the country. The power station will have state of the art safety features. The government has decided to build the power station not far from the country's urban capital as this will save on distribution costs.

- ii. Outline the two largest perils faced by the government in this project for which it may require liability insurance.

[2]

- iii. Outline six potential considerations to be taken into account by New Frontiers when deciding on whether, and at what price, to offer this insurance cover.

[6]

- iv. Outline a potential approach to modelling the loss caused by a fire explosion at the nuclear plant, as part of the company's internal simulation model.

[6]

[Total 18]

**END OF PAPER**