

# EXAMINATION

29 May 2020 (am)

## Subject F103 — General Insurance Fellowship Principles

*Time allowed: Three hours and fifteen minutes*

### **INSTRUCTIONS TO THE CANDIDATE**

1. *Enter your candidate number as required in your examination answer.*
2. *Questions are only available in Moodle and may not be printed.*
3. *You are required to submit all of your answers in this Moodle learning platform only. You MAY NOT use any other computer program (e.g. MS Word or Excel) during the examination.*
4. *You are strongly encouraged to use the first 15 minutes as reading time only, however, you may commence answering the paper whenever you are ready.*
5. *Mark allocations are shown in brackets.*
6. *Attempt all eight (8) questions.*
7. *Show calculations where this is appropriate. You may use blank paper to carry out rough work calculations. You may use an electronic calculator from the approved list.*
8. *You may return to your answers to review and amend during the allotted examination time. Once you are happy with your answers you need to **Finish all and Submit** your work. Once you have submitted you will not be able to make any more changes to your answers.*
9. *It is the candidate's responsibility to ensure that all work is submitted **BEFORE** the end of the allotted examination time. Take this into account when planning your review and submission.*

**Note: Answers will be saved automatically during the examination. However, the Actuarial Society of South Africa will not be held responsible for loss of data where candidates have not followed instructions as set out above.**

**END OF INSTRUCTIONS**

## QUESTION 1

UGO is an insurance company which specialises in a particular type of insurance. It has a R50m XS R30m reinsurance treaty which operates for a one-year period. The initial premium was R10m. One reinstatement, at a rate of 150% of the original premium, is permitted. Reinstatements on the treaty operate on the basis of being pro-rata as to amount and time.

- i. Determine UGO's reinsurance recoveries and reinstatement premiums paid in respect of the following insurance claims, which occurred in the order given below:
  - a. R70m after 3 months;
  - b. R100m after 6 months; and
  - c. R70m after 9 months.

[4]

UGO is considering replacing the above treaty with the following reinsurance programme:

- Surplus, with a maximum retention limit of R100 million and 9 lines of cover; followed by
- Stop Loss, covering 80% of claims which fall between 125% and 175% of expected claims. For this purpose expected claims is defined to be equal to 75% of the premiums written (net of proportional reinsurance premiums) in the year.

UGO believes it will write premiums totalling R2000 million in the following year and, based on anticipated policy sizes, pay Surplus reinsurance premiums totalling R400 million.

- ii. Determine the Stop Loss recovery if UGO experiences gross claims totalling R2600 million and makes Surplus reinsurance recoveries totalling R600 million.
- iii. State, with reasons, the type of insurance you believe UGO sells.

[3]

[3]

[Total 10]

## QUESTION 2

Outline the criteria that are desirable for a risk to be insurable and explain why these criteria are desirable.

[8]

## QUESTION 3

As the actuary for a general insurance company you have been asked to analyse the policy experience of the insurer over the past year.

Outline briefly various elements of policy experience that should be monitored.

[9]

**PLEASE TURN OVER**

## QUESTION 4

- i. Outline the benefits offered by employers' liability insurance.

[2]

An unlisted local insurer writing employers' liability insurance, and not using reinsurance, is reviewing its investment strategy. The assets backing the liabilities for this class are money market instruments, mostly issued by the government.

- ii. Discuss the suitability of the current investment strategy for backing its employers' liability business.

[8]

The insurer is developing a stochastic asset-liability model (ALM) to help it evaluate and manage its risks better. In particular, it would like to explore the relationship between reinsurance purchased and investment strategy.

- iii. Explain how the insurer can use a stochastic ALM to find a more aggressive investment strategy that, together with reinsurance purchased, may lead to a higher expected future solvency position with a similar risk of insolvency.

[5]

[Total 15]

## QUESTION 5

An actuary working for a reinsurance company is pricing a 50% quota share treaty to cover an insurance company that writes commercial motor business. The cedant has provided some aggregated policy and claims data up until the end of 2019. The cedant expects to write 9100 policies in 2020, with total sums insured of R4500 million.

Year	Total No. of Policies	Total Sums Insured (R million)
2015	7 500	3 400
2016	8 000	3 750
2017	8 200	3 850
2018	8 500	4 000
2019	8 900	4 350
Total	41 100	19 350

The figures in the following table represent claims paid for each accident year, claim payments inflated to 2020 amounts, and the current IBNR held relating to each year, also inflated to 2020 amounts.

Year	Total Claims Paid (R million)	Claims inflated to 2020 (R million)	IBNR inflated to 2020 (R million)
2015	49	62	0
2016	42	51	5
2017	35	40	12
2018	26	29	25
2019	12	13	38
Total	164	195	80

**PLEASE TURN OVER**

i. Define and calculate the effective burning cost premium. [2]

ii. Define and calculate the indexed burning cost premium. [3]

The reinsurance company's book rate for commercial motor business is R16 500 per R1 million sum insured and based on the past 5 years of data for the insurance company the credibility factor is 0.8.

iii. Calculate the reinsurance premium that should be charged allowing for a 10% profit margin and 5% expense margin. [4]

iv. Discuss the factors that need to be considered before finalising the reinsurance premium relating to catastrophe and other large claims, and how these could be dealt with. [5]

[Total 14]

## QUESTION 6

All In Suppliers is a large supplier of chocolates globally. It has many offices and warehouses situated in over 100 countries and its staff travel frequently between these countries. Recently, a global pandemic with high infection and mortality rates has significantly hampered operations in many of the countries in which All In Suppliers operates. Many countries' Governments have declared a national pandemic, mandated non-essential suppliers and retailers (to which All In Suppliers supply chocolates) to be closed and have started cancelling flights to their countries.

i. Describe briefly 5 distinct risks faced by All In Suppliers as a result of this pandemic and suggest, for each, an appropriate insurance product (assuming pandemics are not excluded) that it could have purchased prior to the pandemic occurring to mitigate the risk. [7]

Insurer Inc. is a large multi-line insurer that is authorised to write all lines of business. It has a long-standing relationship with All In Suppliers and exclusively provides insurance coverage to All In Suppliers across all of the countries in which it operates. Pandemics have not been specifically excluded from this insurance.

Insurer Inc. has identified the following key risks relating to the pandemic to which it is exposed:

- a. Higher claims than expected;
- b. Falling equity markets, given its significant exposure to equity; and
- c. Interruption to business as usual, from its staff being forced to work from home.

ii. Discuss, for each of the above risks, appropriate mitigating actions that could be taken by Insurer Inc. to limit financial losses now that the pandemic is a reality. [8]

[Total 15]

**PLEASE TURN OVER**

## QUESTION 7

You are carrying out the year-end claims reserving exercise as at 31 December 2019 for a general insurance company that was established on 1 January 2015. This consists of an adequacy check on the published claims reserves and a calculation of reserve risk for your company's internal solvency model.

You have been provided with earned premiums for 2019, as well as aggregated information for the last 5 accident years i.e. accident years 2015 to 2019:

<b>Class of business</b>	<b>Earned Premium for 2019 (R million)</b>	<b>Claims Paid to date (R million)</b>	<b>Case Estimates (R million)</b>	<b>Ultimate Claims (R million)</b>
Household Contents	130	490	8	504
Motor	250	440	180	654

- The claims paid to date above shows the sum of all claims paid until 31 December 2019 for the last 5 accident years.
  - The case estimates are the sum of all outstanding reported claims as at 31 December 2019 and are shown at the 75<sup>th</sup> percentile.
  - The ultimate claims represent the sum of all claims paid for the last 5 accident years plus estimates of future claim payments. These have been calculated using bootstrapping techniques and are shown at the 75<sup>th</sup> percentile.
  - The finance department calculates the IBNR for published reporting purposes as a percentage of the premiums earned in the year immediately preceding the reporting date. The percentages used for IBNR at 31 December 2019 are 10% and 15% for Household Contents and Motor respectively and are based on the previous year's actuarial reserving exercise.
  - Your company's reserving policy requires that published claims reserves are held at least at the 75<sup>th</sup> percentile for each class of business separately, and does not allow for third party recoveries on motor claims.
- i. Calculate the adequacy of the published claims reserves (relative to the claims reserves at the 75<sup>th</sup> percentile) separately for the Household Contents and Motor classes based on the IBNR calculated by your finance team as at 31 December 2019. [5]
- ii. In your last risk committee meeting your auditors claimed that your company's reserving policy may result in excessively prudent reserves. Explain 2 reasons why this may be the case. [2]
- iii. Discuss 3 key challenges you may face when performing stochastic reserving and explain how each may be overcome. [6]
- iv. State 4 reasons why the claims experience for the Household Contents and Motor classes may be correlated. [2]

[Total 15]

**PLEASE TURN OVER**

## QUESTION 8

You are the Chief Risk Officer of RIAV Insurance, an insurer that sells only motor and property policies. Expected premium volumes are split 25% motor and 75% property. RIAV has Total Assets of R800 million and expects to have Net Written Premium (NWP) of R1 billion the following year.

### Regulatory Capital Requirement

The regulator requires an insurance company to hold solvency capital at a level such that it can withstand a 1-in-100 year loss event.

$$SCR = \sqrt{(IRC)^2 + (MRC)^2} + ORR$$

$$IRC = (NWP_1 \times f_1) + (NWP_2 \times f_2)$$

Class	$f_i$
1. Motor	7%
2. Property	15%

$$MRC = Total\ Assets \times 5\%$$

$$ORR = Expected\ Premium \times 1\%$$

Where:

- SCR = Solvency Capital Requirement
- IRC = Insurance Risk Requirement
- MRC = Market Risk Requirement
- ORR = Operational Risk Requirement
- NWP = Expected Net Written Premium

### Economic Capital Requirement

The insurer's Board of Directors has decided that it wants to hold capital at such a level that the insurer can at least withstand a 1-in-100 year event.

The insurer assumes that its capital requirement for non-operational risks follows a normal distribution with a mean of R50m and standard deviation of R60m.

The operational risk capital charge will be set at R3m. This has been determined as the average operational losses incurred over the past 3 years.

The total economic capital requirement will be taken as the sum of the capital requirement for non-operational risks plus the capital charge for operational risk.

**PLEASE TURN OVER**

- i. Define “available capital” and “required capital”. [3]
  - ii. Define “operational risk”. [1]
  - iii. Suggest one reason why the operational risk capital charge in both cases is a simple add-on in the overall capital requirement. [1]
  - iv. Describe the major short-coming in allowing for operational risk as it has been in the Economic Capital Requirement calculation. [1]
  - v. Calculate, using the information provided, and Standard Normal Distribution 1<sup>st</sup> percentile of -2.3263, the Regulatory Capital Requirement and Economic Capital Requirement. [5]
  - vi. Explain why using the normal distribution to describe the loss distribution may not be appropriate, and suggest how the modelling could be improved in future. [3]
- [Total 14]

**END OF PAPER**