

## EXAMINATION

3 June 2024 (am)

### Subject F101 — *Health and Care* Fellowship Principles

**Time allowed:** Three hours and twenty minutes (which includes five minutes for downloading and uploading your answer document)

**Total marks:** 100

#### INSTRUCTIONS TO THE CANDIDATE

1. Ensure that you are logged in and authenticated through Examity before you attempt the examination.
2. The question paper is only available in the ASSA Exam Platform as a PDF download and may not be printed. Copy/paste of questions or parts thereof is allowed from the question paper to your Word answer document only.
3. Download the Word answer document template from the ASSA Exam Platform. Save this Word answer document on your desktop using your Candidate Number as filename. You are required to submit your answers in Word format ONLY using this document. No answers in any other format (e.g. handwritten) will be accepted. Save work regularly.
4. Ensure that your Candidate Number appears in the “header” of your Word answer document. [Double-click on the header at the top of the Word document, input your Candidate Number only in the header, then press “Esc” to close the header.] **Do not use your name or member number anywhere in your Word answer document.**
5. You may not access any file from your computer, use any other computer app (e.g., Email or Excel) or open any other browser during the examination. Nor may you use Grammarly, Grammarly Premium or similar add-ins. Microsoft Word spellcheck is allowed.
6. You may not use any other material (e.g., a Formulae and Tables book) during the examination. Any such information that may be required will be provided to you within the examination.
7. You are strongly encouraged to use the first 15 minutes as reading time only, however, you may start answering the paper whenever you are ready.
8. Mark allocations are shown in brackets.
9. Attempt all eight (8) questions, starting each on a new page (as provided for in the Word answer document).
10. Show calculations where appropriate. You may use blank paper to carry out rough work calculations. You may use a calculator from the ASSA-approved list only.
11. Upload your Word answer document only into the ASSA Exam Platform. Once you have uploaded your document, you must click on **Finish Attempt** to save your document. You will still be allowed to go back and make changes (**Review Attempt**) if you have time.
12. Once you are satisfied with your uploaded document, click **Finish Attempt** and **Finish all and Submit**. Once you have submitted you will not be able to make any changes.
13. **You must submit your Word answer document BEFORE the end of the allotted examination time.** You should stop writing and start uploading during the last five minutes. Take this into account when planning your review and submission. There will be no time announcements.

**Note: 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

A PMI insurer is analysing the relationship between the number of hospital visits (response variable) and various factors (predictor variables) for a particular group of policyholders. They use a Poisson regression model as part of their Generalized Linear Modelling (GLM) approach.

- i. Define the Poisson regression model, stating its key assumptions, and comment on its suitability for this purpose. [3]
- ii. List 4 predictor variables that can be included in the GLM and indicate how you expect them to influence the response variable. [4]

[Total 7]

## QUESTION 2

A developing country which has both Private and Public sector healthcare provision is considering the introduction of a Universal Healthcare Coverage scheme for its citizens.

- i. Define Universal Healthcare Coverage. [2]
- ii. Outline the advantages and disadvantages of Private Health Insurance systems. [4]
- iii. Outline the advantages and disadvantages of Universal Healthcare Coverage systems. [4]

[Total 10]

## QUESTION 3

You are an Actuarial Analyst at NurseInc, a large provider of Long-Term Care Insurance (LTCI). Your manager has asked for your help in determining the impact of the following economic events:

- a. The average increase in nurses' salaries this year is 6%, which is 2% higher than expected by NurseInc.
  - b. NurseInc banks with and holds shares in Blue Bank. Blue Bank has received a credit rating upgrade from BBB to A.
  - c. The State has announced a reduction in their subsidy for frail care and nursing homes. As a result, NurseInc has experienced new business growth of 10% (up from the prior year's figure of 8%). Furthermore, the new business sales team expects this trend to continue given the growing demand for frail care and nursing home care.
- i. Discuss the impact of these economic events on NurseInc's solvency ratio. [6]
  - ii. Describe how these economic events may affect NurseInc's investment decisions. [6]

[Total 12]

**PLEASE TURN OVER**

## QUESTION 4

An insurer plans to launch a new CI product into the market via tied agents. The indemnity commission of 600% of the first month's premium and the high underwriting costs at sales stage puts financial strain on the insurer each time a sale is made.

- i. Define indemnity commission.

[2]

The insurer has approached its reinsurer to assist with the financial strain using financial reinsurance.

The reinsurer has agreed on the following terms:

- 60% Quota share reinsurance on a risk premium basis
- A risk cost of 7.15 per R1000 reinsured per annum
- 15% loading for the reinsurer's expenses and profit margin
- New business financing multiple of 6 times the first month's premium (financial reinsurance)
- A loading of 30% is added to the reinsurance premium to account for the repayment of the new business financing.

- ii. Calculate the monthly reinsurance premium on a CI policy with a sum assured of R500 000, both with and without the proposed financing arrangement.

[3]

- iii. Discuss the main considerations for the reinsurer in determining the size of the loading for the financing repayment (determined to be 30% in this case).

[7]

[Total 12]

**PLEASE TURN OVER**

## QUESTION 5

ABC Health offers a stand-alone hospital cash plan. The pricing basis is given as the following:

- a. The expected distribution of admissions by length of stay:

| <b>Length of stay<br/>(completed days)</b> | <b>Proportion of<br/>admissions</b> |
|--------------------------------------------|-------------------------------------|
| 0 (same day)                               | 0,18                                |
| 1                                          | 0,24                                |
| 2                                          | 0,18                                |
| 3                                          | 0,12                                |
| 4                                          | 0,09                                |
| 5                                          | 0,08                                |
| 6 or more days<br>(average is 8.2)         | 0,11                                |

- b. The percentage of the population with at least one admission per year: 18%
- c. Average number of admissions per admitted person: 1.2
- d. Expense loadings:
- Administration costs: R25 per policy per month plus 5% of gross premium
  - Loadings for profit and cost of capital: 7.5% of gross premium
  - Commission: 20% of gross premium
- i. Calculate the monthly premium for the cost of cover for a hospital cash plan that pays R1000 per day in hospital with a minimum length of stay of 3 days. [4]
- ii. Calculate the monthly premium for the policy in (i) with the benefit per day increased to R2000 per day. [2]
- iii. Comment on the ratio of the expected claim cost to the gross premium for the policies in (i) and (ii). [2]
- The marketing manager has reported that the premiums are not competitive.
- iv. Describe the risk management measures, other than design changes, that ABC Health could include to reduce the cost of claims. [4]

[Total 12]

**PLEASE TURN OVER**

## QUESTION 6

You are an actuary employed by Infinity Health Hospital Group and you have been tasked to design and price a new product suite of 'Prepaid Global Fees' to give patients certainty and transparency when planning for a surgery or medical procedure.

Infinity Health Hospital Group intends to target cash-paying individuals who do not have PMI cover who require certain medical procedures or surgeries. Individuals will pay upfront for this product and get peace of mind that the costs related to the surgery or procedure are covered. This product promises that there are no hidden fees, nor any out-of-pocket expenditure following the procedure.

The price of this new product offered by the Infinity Health Hospital Group must include the costs related to the procedure – including the specialist and hospital costs, any prescribed medication and post-operative follow-up, if required. In the event of any related complications, those costs are also covered by the Prepaid Global Fee.

- i. Discuss 6 features of the product's benefit design and how these might support demand for such a product. [6]
- ii. Briefly outline the features of the surgeries or medical procedures that would make them suitable for cover under such a prepaid product. [4]
- iii. Explain how you would determine a price for such a product that would satisfy the benefit design features as discussed in Part (i). [5]

[Total 15]

## QUESTION 7

A new drug to treat obesity, "Slimbo", has recently come to the market. The drug has performed exceptionally well in clinical trials, with obese persons taking the drug losing around 15% of their body weight, on average, over a 12-month period. A one-month prescription for the drug costs around R3000 per person.

You are an actuarial consultant specialising in healthcare funding and are presenting to the Board of a large PMI insurer about "Slimbo". The insurer is considering whether or not to cover the cost of "Slimbo" for their policyholders.

- i. Describe the advantages of the insurer covering "Slimbo". [4]
- ii. Discuss the key risks faced by the insurer of covering "Slimbo". [7]
- iii. Describe risk mitigation measures the insurer can take to reduce the risks associated with covering "Slimbo". [4]

[Total 15]

**PLEASE TURN OVER**

## QUESTION 8

A large health insurer sells a wide array of individual PMI products ranging from basic hospital plans to more comprehensive PMI options. The insurer operates in a community-rated environment as dictated by prevailing legislation. For its entry level hospital plan, premiums are differentiated by income band, which is permitted by legislation.

- i. Describe the rationale for using income bands to differentiate premiums on a PMI plan. [3]
- ii. Outline the difficulties associated with using income bands as a rating factor on these plans. [3]

Historically, this entry level hospital plan has run at a loss but the past year has shown a more severe loss than expected. Other plans have not seen experience out of the ordinary. You are an actuarial analyst in the product design team tasked with investigating the cause(s) of these unexpected losses.

- iii. Describe possible reasons for the higher than expected loss experienced on the entry level hospital plan. [4]

Your manager has suggested that you do a modelling exercise whereby you change the income bands on the entry level hospital plan in order to reduce the level of losses expected on the plan in future years.

- iv. Discuss how changing the income bands could impact the experience on the entry level hospital plan. [3]
- v. Outline the commercial and operational factors you would need to consider when recommending any changes to the income bands. [4]

[Total 17]

**END OF PAPER**