

# EXAMINATION

*13 November 2017 (am)*

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

*Time allowed: Three hours*

### **INSTRUCTIONS TO THE CANDIDATE**

1. *Use the instructions and password provided at the examination center to log in.*
2. *Submit your answers in Word format only using the template provided. You MAY NOT use any other computer program (e.g. Excel) during the examination.*
3. *Save your work regularly throughout the examination on the supplied computer's hard drive.*
4. *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.*
5. *You must not start typing your answers until instructed to do so by the supervisor.*
6. *Mark allocations are shown in brackets on exam papers.*
7. *Attempt all seven (7) questions, beginning your answer to each question on a new page.*
8. *Candidates should show calculations where this is appropriate.*

**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.**

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

*Save your answers on the hard drive AND hand in 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

A life insurer sells death, lump sum disability and critical illness (CI) benefits through intermediaries. The CI benefit is an accelerated, non-tiered benefit to the death cover and covers 12 specified dread diseases. The insurer has asked you, a consulting actuary, to assist in increasing the sales of its CI benefit. Your market research reveals a market need for a stand-alone CI product.

- i. Discuss the considerations for the insurer in offering this standalone CI benefit. [5]
- ii. List some product changes that could make the existing product more marketable. [2]

[Total 7]

### QUESTION 2

- i. Explain why a Generalised Linear Model (GLM) may be preferable to a one-way analysis when estimating the impact certain explanatory variables have on the response variable. [3]
- ii. State the assumptions of a classic linear model. [2]
- iii. Outline the advantages of the GLM over the classic linear model. [4]

[Total 9]

### QUESTION 3

- i. Describe the features of cash as an investment vehicle and outline its suitability in each of the following cases: A health insurer selling...
  - a. ...indemnity cover for personal medical expenditure
  - b. ...pre-funded long-term care cover
  - c. ...immediate needs long-term care cover
  - d. ...critical illness cover [8]
- ii. Outline the restrictions that the regulatory framework can place on the investments of a health insurer. [4]

[Total 12]

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#### QUESTION 4

A health insurer is writing medical expense business in a market where risk rating is permitted. The marketing director has asked you to explain the difference in the approach that is used to underwrite group business of varying sizes and individual business.

- i. Set out the points that you would include in your response to the marketing director. [6]
  - ii. List the information that is likely to be collected to determine the rating for a medium-sized company applying for cover. [5]
  - iii. The insurer is adding certain preventative benefits to the cover. Discuss how you would structure and price for the following benefits:
    - a. Annual dental checkups
    - b. Mammograms
    - c. Blood glucose tests [8]
- [Total 19]

#### QUESTION 5

- i. List reasons why a health insurer would be monitoring their experience. [2]

Healthsure, a large health insurer servicing the group market, has experienced a 17.1% increase in hospital claims on a per life per month basis. The increase is based on a comparison of claims for the full 2016 year against the claims paid up until the end of May 2017 for the current benefit year. The benefit year runs from January to December each year.

The insurer offers cover for only hospital events, with limited cover for out-of-hospital events intended to cover post-discharge treatment. For the pricing of the 2017 product, the pricing actuary allowed for an 8.0% increase in hospital claims per life per month over the 2016 benefit year.

You are an actuarial analyst working for Healthsure and the chief actuary has asked you to investigate the experience and uncover the drivers of the increase in hospital claims.

- ii. Outline key items that need to be considered when conducting the claims experience analysis. [8]

The experience analysis reveals that the increase in claims is driven by a significant increase in the admission rate. An in-depth analysis of the admission rate indicates that doctors are admitting patients with minor ailments so that they can access in-hospital benefits given that the insurer does not pay for out of hospital treatment.

- iii. Outline how the health insurer can counteract this trend. [3]

[Total 13]

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## QUESTION 6

AirLife is an established long term insurance company writing pre-funded long-term care business. AirLife is about to calculate its supervisory reserves for pre-funded products using a gross premium valuation method.

Describe the key assumptions of the valuation basis and how they would be set.

[Total 12]

## QUESTION 7

The country of Actuarialia has a national health insurance (NHI) programme for low income earners. The NHI Fund is funded by tax revenue and a payroll levy for the participating employees. Membership is compulsory for all employees in the formal sector earning under a stipulated salary.

The NHI Fund contracts with public and private hospitals to provide hospital services on a fee for service basis.

You are a consulting actuary and you have been asked by the NHI Fund to assess the efficiency of the hospitals contracted by the Fund.

The currency of Actuarialia is Zuba denoted by Z.

- i. Describe the data requirements and process you would follow to determine hospital case mix and demographic risk adjustment factors for the NHI Fund. [9]

Your analysis has revealed the following case mix factors for the top 5 admission types (measured by total cost of admission):

Admission type	Case mix adjustment factor
A	0,5636
B	2,3795
C	0,3423
D	1,1062
E	0,7765

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- ii. Write a paragraph for the Board of the NHI Fund describing what these case mix factors mean and how they are used. [4]

You have the following data for four of the hospitals contracted to the NHI Fund and have determined the average demographic risk adjustment factor for the patients of each hospital over the prior year:

Admission type	Number of admissions			
	Hospital 1	Hospital 2	Hospital 3	Hospital 4
A	3500	1750	2000	0
B	1500	375	0	600
C	800	400	4000	0
D	2800	350	1000	1400
E	1400	350	0	0
Ave cost per admission	Z 25 700	Z 21 800	Z 12 100	Z 32 600
Demographic risk factor	0,987	1,025	0,93	1,086

- iii. Calculate the case mix adjusted cost per admission and the demographic risk adjusted cost per admission for each of the four hospitals and comment on the results. [9]
- iv. Describe three other reimbursement risks can be considered by the NHI Fund and the merits and drawbacks of each. [6]

[Total 28]

[Grand Total 100]

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**END OF EXAMINATION**