

Actuarial Society of South Africa

EXAMINATION

2 NOVEMBER 2020

Subject F101 – Actuarial Practice in Health

Fellowship Principles

Time allowed: Three hours and fifteen minutes

Total marks: 100

INSTRUCTIONS TO THE CANDIDATE

1. *Ensure that you are logged into your ProctorU account before attempting the examination.*
2. *Questions are only available in this ASSA Examination platform and may not be printed.*
3. *You are required to submit all of your answers in the ASSA Examination platform only. No uploads of answers (handwritten or otherwise) to the ASSA Examination platform will be accepted.*
4. *You may not use any other computer program (e.g. Email, MS Word or Excel), files or open any other browsers during the examination.*
5. *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.*
6. *Mark allocations are shown in brackets.*
7. *Attempt all seven (7) questions.*
8. *Show calculations where this is appropriate. You may use blank paper to carry out rough work calculations. You may use a calculator from the approved list only.*
9. *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.*
10. *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. There will be no time announcements.*

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

An insurer is targeting small to medium enterprises (SMEs) in an attempt to grow its book of group business. The group insurance cover pays out on an employee being diagnosed with any one of a pre-defined list of critical illnesses. The sum assured is equal to 3 times the employee's annual salary. The Free Cover Limit (FCL) is fixed at R1 million but if the SME has fewer than 5 people in employment at the time of application, the FCL is automatically set to zero.

- i. Define what is meant by a FCL in group insurance. [2]
- ii. Explain why the insurer has set the FCL to zero for SMEs with fewer than 5 employees. [2]
- iii. Define anti-selective risk for an insurer. [1]
- iv. List the measures the group insurer can take to reduce its anti-selective risk in the SME market. [3]

[Total 8]

QUESTION 2

You are the pricing actuary of a large health insurer selling pre-funded long-term care insurance (LTCI). Premiums are paid monthly until a claim is triggered for the insured life. The claims trigger is being unable to perform at least three Activities of Daily Living (ADLs). After a claim is triggered, a regular benefit is paid until the death of the insured life.

- i. Describe how a multi-state approach can be used to calculate reserve requirements for a LTCI policy. [2]
- ii. List four ADLs. [2]

Given the recent experience of your book of LTCI policies, you decide to adjust your long-term transition probabilities. The resultant valuation shows that your in-force LTCI policies are now expected to be loss-making.

- iii. Outline suggestions that could help improve the profitability of the product as a whole. [6]

[Total 10]

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QUESTION 3

The recently elected government of Actuarialia is in the process of implementing Universal Healthcare (UHC) provisions in Actuarialia for the first time – one of the promises it had made during its election campaign. Under the existing healthcare system, all services are entirely provided by privately owned healthcare providers. Medical costs are either funded by each citizen's private medical insurance or individual savings at the point of treatment. Under the proposed UHC system, healthcare services will be provided entirely by government-owned healthcare providers, funded by an increase in general taxation. The proposed UHC system will be designed to ensure that every citizen of Actuarialia will receive equitable healthcare irrespective of their social status, income, age, gender, race, pre-existing conditions or level of wealth.

Discuss the advantages and disadvantages of the proposed healthcare system relative to the current healthcare system in Actuarialia.

[Total 12]

QUESTION 4

- i. Explain why multivariate modelling is useful for modelling health insurance claims. [2]

Target Health is a large and well-established health insurer. Target Health is considering the acquisition of StarMed, a small health insurer. Both insurers offer PMI in various product options covering both in- and out-of-hospital.

- ii. Discuss how StarMed policyholders could be transferred into the product options offered by Target Health. [4]

- iii. Explain how you would use a Generalised Linear Model to estimate the claims experience of Target Health after the acquisition. [5]

- iv. Define each of the following:

- a. Sensitivity testing [1]
- b. Scenario testing [1]
- c. Stress testing [1]

[Total 14]

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QUESTION 5

You are an actuarial analyst working for KuhleHealth, a PMI insurer. IsifoCo is a managed care provider with whom KuhleHealth has a number of specific disease-management contracts. KuhleHealth has a high incidence of asthma in its policyholder base, and as such has a specific asthma management programme provided by IsifoCo in place. You have been tasked with evaluating this asthma management programme.

- i. Describe the risks that may be transferred from KuhleHealth to IsifoCo under this asthma management programme. [4]
- ii. Explain how you would assess if this arrangement is benefiting the policyholders of KuhleHealth, outlining the data you would require for this assessment. [8]
- iii. Suggest ways in which IsifoCo can manage the risks they have taken on as a result of offering this programme to KuhleHealth. [6]

[Total 18]

QUESTION 6

A large multinational health insurer (Health-E) is considering entering a new territory, Actuaria. Health-E currently sells only CI and PMI business and has no insurance business in Actuaria.

In Actuaria, there is a law that requires individuals to provide care to their parents should they require long-term care. This may be either the direct provisioning of care to their parents or in the form of financial assistance for their parents to acquire such care.

Health-E has identified a need for long-term care insurance (LTCI) in Actuaria and the CEO has proposed to the board of Health-E that they develop a LTCI product and expand into this territory.

- i. Describe the main risks Health-E faces when implementing the CEO's proposal. [6]
- ii. Describe ways in which Health-E may manage the risks associated with implementing the CEO's proposal. [6]
- iii. Discuss the possible sources of data that Health-E may use in pricing their new LTCI policy. [6]

[Total 18]

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QUESTION 7

- i. List 6 potential applications of risk adjustment. [3]

A PMI insurer is reviewing the risk-adjusted performance for heart-related care of two hospitals in two different cities, Hospital A and Hospital B, respectively. The insurer covers medical expenditure linked to five distinct Diagnosis Related Groups (DRG's) performed in each of these hospitals. Table 1 details the respective average cost per admission for each of these DRG's across the entire country (not just for Hospitals A and B).

Table 1

DRG	Average cost (R)
1 – Hypertension	5 000
2 – Angina syndrome	15 000
3 – Hypercholesterolemia	7 500
4 – Cardiac infarction (heart attack)	180 000
5 – Ischaemic heart disease	120 000
Overall	80 000

*The definitions and interpretation of these DRG's are not important to the questions that follow.

- ii. Calculate the respective case weights for these five DRG's. [2]

Table 2 details the number of admissions and average cost per admission for Hospitals A and B, respectively.

Table 2

DRG	Hospital A		Hospital B	
	# Admissions	Average cost (R)	# Admissions	Average cost (R)
1 - Hypertension	100	4 000	500	5 500
2 – Angina syndrome	20	18 000	150	15 000
3 - Hypercholesterolemia	150	7 000	300	7 500
4 – Cardiac Infarction (heart attack)	5	220 000	40	150 000
5 – Ischaemic heart disease	75	150 000	600	110 000

- iii. Calculate the case-mix adjustment factor for Hospital A and Hospital B, respectively. [4]
- iv. Calculate the admissions case-mix adjusted average cost per admission for Hospital A and Hospital B, respectively. [3]

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The demographic risk factor for the hospital population of City A is 1.2 and for City B is 0.89.

- v. Calculate the case-mix adjusted average cost per admission allowing for the demographic risk factor of each of Hospital A and Hospital B respectively, and comment on the results of the risk adjustment exercise. [8]

[Total 20]

[GRAND TOTAL 100]

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END OF EXAMINATION