

# Actuarial Society of South Africa

## COMPUTER BASED EXAMINATION

22 MAY 2020

### Subject A213 — Contingencies

*Time allowed: 1 hour and 30 minutes plus 15 minutes reading time*

*(5 minutes will be added to your total exam time to allow for uploading your file)*

*Maximum: 50 marks*

#### **INSTRUCTIONS TO THE CANDIDATE**

1. *Ensure you have logged into your ProctorU account before attempting the exam. An ID verification process will only be done once you access the exam at the start time. This will NOT impact your allocated writing time.*
2. *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.*
3. *You are given this question paper and the Excel file. You will download the Excel file in the Exam. You may **not** use your own Excel file.*
4. *Mark allocations are shown in brackets. This exam has a total of 50 marks.*
5. *Attempt all questions. Each question is to be answered on a separate Excel sheet as per the provided template.*
6. *You MAY NOT use any other computer program during the examination.*
7. *Save your work throughout the exam. Save your file using your candidate number as file name. (DO NOT USE YOUR NAME)*
8. *Upload the Excel file with your solutions into the Moodle Learning Platform. You need to upload your file **BEFORE** the exam time expires.*
9. *Once you have added your file you MUST click on FINISH ATTEMPT to save your file. You will still be allowed to go back and make changes (Review Attempt) if you have time.*
10. *Once you are happy with your uploaded file click FINISH ATTEMPT and the FINISH ALL AND SUBMIT where after you will not be able to make more changes.*

*Graph paper is NOT required for this paper.*

***NO TIME ANNOUNCEMENT WILL BE MADE - MANAGE YOUR OWN TIME***

**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:**

*Check that you have saved your work as per instructions given to you.*

## QUESTION 1

A newly established life assurance company issues 20-year unit-linked endowment assurance policies to lives aged 35 exactly.

The policy provides a benefit of R1 000 000 or the bid value of units, whichever is higher, on maturity or earlier death of the policyholder. Death benefits are paid at the end of year of death.

Policyholders are given the option to surrender their policies at the end of any policy year. The surrender values are calculated at 95% of the current bid value of the unit fund, from which a surrender administration charge of R1 000 is deducted.

The policy has the following features:

- An annual premium of R38 000 is payable in advance.
  - The allocation percentage of the policy depends on the duration in force and is 90% during the first 10 years of the policy, 95% during the next 5 years and then 103% during the last 5 years of the policy.
  - A bid-offer spread of 6.5% applies.
  - An annual fund management charge of 2% of the bid value of units applies.
- i. Calculate the dependent rates of mortality and surrender for each year of the policy. [5]
- ii. Show that the bid value of units at the end of the 20<sup>th</sup> policy year is around R1.4m. [7]
- iii. Calculate the profit margin for the policy. You can assume that the company does not set up any non-unit reserves. [18]

Basis:

Mortality	AM92 Select
Surrender rates	5% of policies in force at the end of the year in each of the first 5 years and 3% thereafter
Expenses	R650 initial expense R132 per annum renewal expense at the start of the second and subsequent years R1 500 claims expense for all claim types
Unit fund growth rate	9% p.a. effective
Non-unit fund interest rate	6% p.a. effective
Risk discount rate	12% p.a. effective

[Total 30]

**REMEMBER TO SAVE**

**PLEASE TURN OVER**

## QUESTION 2

A large South African insurance company has recently partnered with a home loan origination business. The home loan origination business assists their clients to obtain home loans by negotiating with various banks on their clients' behalf. The insurance company has realised that these clients typically do not take out life insurance to settle the outstanding home loans on their death. This is mainly due to affordability concerns. As such, they have introduced a decreasing term assurance policy at a lower cost than the typical level benefit term assurance policies offered by competitors.

The policy has the following features:

- Policies have a term of 20 years, which is the length of a typical home loan.
- The initial benefit is R2 000 000 during the first policy year and decreases by R100 000 per year so that the benefit payable in the 20<sup>th</sup> policy year is R100 000. The death benefit is payable immediately on death.
- Level annual premiums of R4 000 are payable throughout the policy term, or until earlier death.

On 1 January 2020, 10 such policies were sold to 40-year-old males. The company is keen to understand the future reserving pattern of this book of policies and calculates the reserve at each integer policy duration (from 0 to 20, inclusive). The company holds gross premium prospective reserves using the following formula at each duration  $t$ , where  $0 \leq t \leq 20$  :

$${}_tV = 100\,000 \cdot \left[ (20 - t + 1) \cdot \bar{A}_{x+t:20-t}^1 - (IA)_{x+t:20-t}^1 \right] + EPV(\text{expenses}) - EPV(\text{premiums})$$

- Calculate the reserves for each policy duration for these policies and plot the results on a suitable graph showing the progression of reserves from time 0 to 20. [16]
- Given the reserving pattern above, discuss the main risk the company faces from this product. [4]

Basis:

Mortality	AM92 Ultimate
Interest rate	10% p.a. effective
Expense:	R1 000 initial expense
	R100 renewal expense at the start of the second and subsequent policy years
	R1 000 claims expense, incurred immediately on death

[Total 20]

[GRAND TOTAL 50]

**REMEMBER TO SAVE**

**END OF EXAMINATION**