



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ACTUARIAL SCIENCE)

SAC 306: LIFE ASSURANCE

DATE: 12/4/2023

TIME: 2:00 – 4:00 PM

INSTRUCTION:

ANSWER QUESTION ONE [COMPUSLSORY] AND TWO OTHER QUESTIONS

QUESTION ONE: (30 MARKS)

- a) Define the following terms:
 - i. Asset share (2 marks)
 - ii. Unitized contracts. (2 marks)
- b) Differentiate between financial and claim underwriting. (2 marks)
- c) Gross premium method is one of the methods used for effective reserve calculations .state four of its features. (4 marks)
- d) Mention five steps involved in asset liability modelling to determine an investment strategy. (5 marks)
- e) As an actuary assigned the task of pricing a new business contract for your insurance company .what are the five points that you will take into consideration? (5 marks)

- f) Outline five factors that contribute to onerousness of guarantees. (5 marks)
- g) State five ways that risk is managed based on the underwriting process. (5 marks)

QUESTION TWO (20 MARKS)

- a) A proprietary life insurance company has just brought in a new business idea that involves combining the two types of term assurance contracts. Explain ten principles it should follow when establishing the supervisory reserves. (10 marks)
- b) A with-profits whole of life policy for a sum assured of £30,000 is issued to a life aged 40. The insurance company uses an unadjusted net premium reserving method for its supervisory valuation, assuming:
- Benefits are paid at the end of the year of death.
 - interest: 4% pa
 - Mortality: AM92 Ultimate.

Calculate the amount of capital required (i.e. the new business strain) on day 1 of the policy, if the initial expenses are £350, and the office premium is £450.

(10 marks)

QUESTION THREE (20 MARKS)

- a) State with reasons whether you would use a deterministic or a stochastic model for the following purposes:
- Assessing the estimated loss to your portfolio of term assurance policies if there was an influenza epidemic as serious as that in 1918.
 - Estimating the expected value and variance of term assurance claims next year.
 - Estimating the cost of adding a minimum maturity value to a unit-linked product.

(6 marks)

- b) A life insurance company has successfully been selling a unit-linked single premium savings contract through independent intermediaries. The company is now considering introducing a new unit-linked regular premium savings contract in order to appeal to an even wider range of investors. The following design is being considered:
- Fund management charge: 1% per annum.
 - Minimum annual premium: £2,000.
 - Minimum term: 10 years.
 - Surrender penalty: $0.5 * (x + 10 - y) \%$ of the face value of the units at the date of surrender, in first ten years only (x = entry age, y = age at surrender).
 - All charges are guaranteed for the duration of the contract.
 - The face value of the units is payable on survival to the end of the term or on earlier death.
- i. Discuss briefly the considerations that the company would need to take into account before deciding on the product design. (10 marks)
- ii. Discuss two effects of fiscal regime in this business. (4 marks)

QUESTION FOUR (20 MARKS)

- a) Explain ten key steps in an actuarial modelling process. (10 marks)
- b) An insurance company have requested your expertise for a training on matters concerning re-insurance .what explanation would you give them on the importance of reinsurance? (10 marks)

QUESTION FIVE (20 MARKS)

- a) With the help of a flow chart illustrate how the underwriting process is done. (10 marks)
- b) A life insurance company writes a new business. Explain five sources of risk for the in-force business. (10 marks)