



MACHAKOS UNIVERSITY

SCHOOL OF PURE AND APPLIED STATISTICS.

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE.

BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

THIRD YEAR: FIRST SEMESTER: SAC 306: LIFE ASSURANCE

INSTRUCTION: ANSWER QUESTION ONE [COMPUSLSORY] AND TWO OTHER QUESTIONS

QUESTION ONE: (30 MARKS)

- a) Define the following terms:
- i. Embedded value. **(2 marks)**
 - ii. Conventional contracts. **(2 marks)**
- b) Differentiate between with profit and without profit life insurance contract. **(2 marks)**
- c) Give four effects of the distribution channels. **(4 marks)**
- d) Mention five steps involved in asset liability modelling to determine an investment strategy. **(5 marks)**
- e) A parent who has just died left a bond in their will that provides a single payment of £15,000 in 10 years' time. The payment of £15,000 will be shared equally between the local cats' home and such of the parent's two sons (currently aged 25 and 30 exact) who are then still alive. Calculate the expected present value of the share due to the cats' home. **(5 marks)**
- Basis:
- Mortality AM92 Ultimate
 - Interest 3% per annum
- f) List 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) Discuss five sources of the risk incurred by a life insurance office. (10 marks)
- b) Calculate the expected present value and variance of the present value of a term assurance of 1 payable immediately on death for a life aged 40 exact, if death occurs within 30 years. (10 marks)

Basis:

Interest 4% per annum

Mortality AM92 Select

Expenses: None

QUESTION THREE (20 MARKS)

- a) Explain ten key steps in a modelling process. (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 (ie 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 FOUR (20 MARKS)

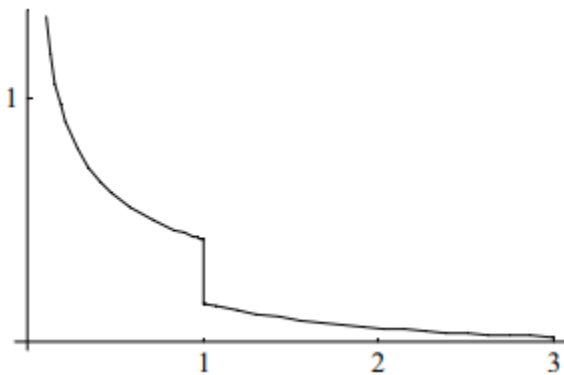
- a) With the help of a flow chart illustrate how the underwriting process is done. (10 marks)
- b) You have been consulted by an insurance company that would like to understand matters surrounding re-insurance .Explain to them the importance of reinsurance. (10 marks)

QUESTION FIVE (20 MARKS)

- a) Describe three methods that can be applied during distribution of policies to a policy holder. **(6 marks)**
- b) Find the constant k for which $h(x)$, pictured below, defines a valid PDF if:

$$h(x) = \begin{cases} kx^{-1/2} & \text{if } 0 \leq x \leq 1 \\ ke^{-x} & \text{if } 1 < x < \infty \\ 0 & \text{otherwise} \end{cases}$$

Hence describe how you would generate random values from this PDF using the inverse transform method and apply the method to generate three random values from this distribution, based on the random values 0.777, 0.203, 0.905 from the $U(0,1)$ distribution.



(14 marks)