KISII UNIVERSITY

UNIVERSITY EXAMINATIONS
SPECIAL EXAMINATION
FIRST YEAR EXAMINATION FOR THE AWARD OF
DEGREE IN BACHELOR OF ACTUARIAL SCIENCE
FIRST SEMESTER 2021/2022
(JULY, 2022)

BACS 100: INTRODUCTION TO ACRUARIAL SCIENCE

STREAM: Y1 S1   **TIME: 2 HOURS**

DAY: TUESDAY 3.00 PM – 5.00 PM   **DATE: 26/07/2022**

INSTRUCTIONS:

1. Do not write anything on this question paper.
2. Answer Question ONE (Compulsory) and any other TWO Questions.

QUESTION ONE (30 MARKS)

(a) Define the word actuarial science and actuary   (2marks)

(b) The force of interest, δ(t), is a function of time and at any time t, measured in years, is $a + bx$ where aand bare constants. An amount of £45 invested at time t = 0 accumulates to £55 at time t = 5 and £120 at timet = 10.

   i.   Calculate the values of a and b.   (5marks)
   ii. Calculate the constant force of interest per annum that would give rise to the same accumulation from time t= 0 to time t= 10.   (5marks)

(c) Describe the actuarial control cycle (5marks)

(d) The force of interest δ(t) is a function of time and at any time t, measured in years, is given by the formula

$$\delta(t) = \begin{cases} 0.04 + 0.02t & 0 \le t \ge 5 \\ 0.05 & 5 \le t \end{cases}$$

i. Derive and simplify as far as possible expressions for v (t), where for v (t) is the present value of a unit sum of money due at time t. (6marks)
ii. Calculate the present value of £1000 due at the end of 17 years. (4marks)
(e) Name and explain different types that actuaries can give to their stakeholders(3marks)

QUESTION TWO (20 MARKS)

(a) The force of interest, δ (t), is a function of time and at any time t, measured in years, is given by the formula

$$\delta(t) = \begin{cases} 0.05 + 0.001t & 0 \leq t \geq 20 \\ 0.05 & t > 20 \end{cases}$$

i. Derive and simplify as far as possible expressions for v (t), where v (t) is the present value of a unit sum of money due at time t. (6marks)
ii. Calculate the present value of £100 due at the end of 25 years. (4marks)
iii. Calculate the rate of discount per annum implied by the transaction in part (ii) (5marks)
(b) Use each of the above mitigation strategies to suggest how each of the following risks can be mitigated:
- the risk of poor investment performance to a life insurance company
- The risk of terrorist attacks on airplanes to an individual. (5marks)

QUESTION THREE (20 MARKS)

(a) Explain different types of investors depending on their preference to risk (3marks)
(b) Name and explain two types of risk(2marks)
(c) Define institutional investors and give roles played by investment banks (5marks)

(d) A loan of £16,000 is repayable by ten equal annual payments. The annual effective rate of interest is 4%. Calculate using loan schedule :
i. the interest element of the 4th payment
(4marks)
ii. the capital element of the 7th payment and 10th (6marks)

QUESTION FOUR (20 MARKS)

(a) Name and describe two risks affecting asset proceeds (2marks)
(b) Name and describe three risks affecting liability outgoes (3marks)
(c) Describe five types of cash flow scenarios (5marks)
(d) An investment of £1,000 made at time 0 is accumulated at the following rates: 8% per annum simple for two years, followed by a rate of discount of 6% per annum for two years. Calculate the accumulated amount of the investment after 4 years.
(6marks)
(e) A loan of £3,000 is repayable in 91 days at a simple discount rateof 4% per annum. Calculate the amount repayable in 91 days' time. (4marks)

QUESTION FIVE(20 MARKS)

(a) Define a real rate of interest and money rate of interest. (1marks)

(b) Explain different types of life insurance and different types of general insurance contacts (3marks)

(c) Define the word underwriting and give key features in general and life insurance contacts. (3marks)

(d) Calculate $_{10/5}q_{60}$ (3marks)

(e) The force of interest, $\delta(t)$, at time t is given by:

$$\delta(t) = \begin{cases} 0.04 + 0.003t^2 \\ 0.01 + 0.03t \\ 0.02 \end{cases} for \begin{cases} 0 < t \le 5 \\ 5 < t \le 8 \\ t > 8 \end{cases}$$

Calculate the present value (at time t= 0) of an investment of £1,000 due at time t= 10. (6marks)

(f) Define $_{12}p_{43}$ (2marks)

(g) Outline the codes that govern the professional conduct standards of an actuary (2marks)