CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

ACMT 201: ACTURIAL MATHEMATICS 1

STREAMS: **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 18/12/2024 **8.30 A.M – 10.30 A.M**

INSTRUCTIONS:

QUESTION ONE (30 MARKS)

A. Data is very important to Actuaries. What are the three factors considered where one gets the data from **(6 marks)**

B. The Register General of chuka calculates the mortality rates of a specific year and age group(eg 30 to 35 years) by dividing the number of deaths in this age group in the year given by ‘’mid year estimate of the population’’ show that the mortality rates so produced are crude central death rates. **(4 marks)**

C. Suppose that we are carrying out and investigation on 70 yrs. old between 1/1/2013 and 1/1/2014.Then an individual who was born 1/11/1942 joins our investigation on 1/3/2013 and dies on 1/9/2013.Deduce the three variables for persons year measure and their calculations. **(6 marks)**

D. Define the central Exposed to Risk **(3 marks)**

E. Estimate E^{c}_{55}based on the following data

Calendar years	population aged 55 last birthday on 1 Jan
2005	46,233
2006	42,399
2007	42,618
2008	42,020

(5 marks)

F. Explain three types of age definitions. **(6 marks)**

Question two (20 marks)

A. Define a rate interval. **(2 marks)**
B. Explain the three important reasons for graduation. **(6 marks)**
C. In a certain country, censuses are held on 30th June each year. The enumerated male population at 30th June 1993 was 306,421, in 1994 was 303,606 and in1995 was 307,412 for men aged 30.
   Estimate the central exposed to risk using:
   i) The reported mid-point rule. **(3 Marks)**
   ii) Formula used for E.L.T No. 14 **(3 Marks)**
D. List and explain conditions that should be met for data to be of good quality. **(6 marks)**

Question three (20 marks)

A. Suppose we are carrying out an investigation on 70 year olds between 01/01/2013 and 01/01/2014. We have an individual who was born 01/11/1942, joins our investigation on 01/03/2013 and dies on 01/09/2013 and another born on 01/10/1942 who joined the investigation when it started and was still alive when it ended. Calculate the total initial exposed to risk for those two.
   (5 marks)
B. The following data refers to a certain farmers and Doctors between exact ages 60 and 65.

Farmers		Doctors	
$E^c_{65.5}$	$\Theta_{65.5}$	$E^c_{65.5}$	$\Theta_{65.5}$
8453	83	25,858	345

Test at the 5% significance level, the hypothesis that the central death rates of the two occupations are equal. **(8 marks)**

C. Explain seven uses of data in Actuarial world. **(7 Marks)**

Question Four (20 marks)

A. Once data has been collected it is possible to determine if the data is indeed of good quality for analysis. What are the five checks done on data to see if it's of good quality? **(10 marks)**
B. Define i) Initial decrement rate.
   ii) Central decrement rate. **(4 marks)**
C. The following table refers to lives of a certain age, x, in the data for a whole life policies collected for the A 1924-29 mortality investigation.

	Deaths	Survivors
With profits	87	9728
Without profits	404	41040

Test the hypothesis that the true rate of mortality, q_x is the same for without profits and with profits policy holders, using a 1% significance level. **(6 marks)**

Question Five (20 marks)

A. List the advantages and disadvantages of the three methods of graduation. **(18 marks)**
B. Differentiate between qualitative and quantitative data. **(2 marks)**
