JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL PHYSICAL MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL

2ND YEAR 2ND SEMESTER 2022/2023 ACADEMIC YEAR

REGULAR (MAIN)

COURSE CODE: WAB 2212

COURSE TITLE: DEMOGRAPHY AND SOCIAL STATISTICS

EXAM VENUE: **STREAM: (B.s.c ACTUARIAL SCIENCE)**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS)

a) Outline SIX features of census (6 Marks)

b) Using the table below

Age	l_x	d_x	$1000q_x$
0	1,000,000	1,580	_____
1	998,420	680	_____
2	997,740	485	_____
3	997,255	435	_____

i. Complete the table above. (4 Marks)

ii. Find the probability that a newborn will live to age 3. (2 Marks)

iii. Find the probability that a newborn will die between age 1 and age 3 (3 Marks)

c) Outline FIVE contents of demography (4 Marks)

d) 30% of those who die between ages 25 and 75 die before age 50. The probability that a person aged 25 dying before age 50 is 20%. Find ${}_{25}p_{50}$ (6 Marks)

e) Outline FIVE components of crude death rate (5 Marks)

QUESTION TWO (20 MARKS)

a) Identify and explain FIVE different sources of demographic data (10 Marks)

b) Doubling time is given by $\ln 2 \big/ \ln(1+r) = 0.693 \big/ \ln(1+r)$, if r is the rate of increase compounded annually, show

i. that $0.70 \big/ r$ is on the whole a better approximation than $0.693 \big/ r$ for values $r = 0.01, 0.02, 0.03, 0.04$

ii. that for those r values the error in $0.70 \big/ r$ is never in the excess of 1%.

(10 Marks)

QUESTION THREE (20 MARKS)

Given that $l_x = 1000\left(1 - x \big/ 105\right)$ determine each of the following

a) l_0 (2 Marks)

b) l_{35} (2 Marks)

c) q_{20} (3 Marks)

d) ${}_{15}p_{35}$ (3 Marks)

e) ${}_{15}q_{25}$ (3 Marks)

f) The probability that a 30 year old dies between ages 55 and 60. (4 Marks)

g) The probability that a 30 year old dies after 70 years. (3 Marks)

QUESTION FOUR (20 MARKS)

a) Explain FIVE cohort measures of mortality. (10 Marks)

b) For the following small cohort life – table, find d_x, the probabilities for all values of T, both unconditionally and conditionally for lives age 2. (10 Marks)

x	0	1	2	3	4	5
l_x	100	80	65	55	40	0

QUESTION FIVE (20 MARKS)

The following table is from part of a population

AGE	${}^{f}_{n}P_x$	${}_{n}B_x$	${}_{n}i_x$
15-19	_____	2,208,361	298
20-24	398,732	_____	269.6
25-29	462,800	55,628.4	_____
30-34	445,362	25,770.87	_____
35-39	428,109	_____	298.6
40-44	406,211	_____	242.8
45-49	_____	4,466.13	36.9
TOTAL	_____	_____	_____

a) Complete the table above (10 Marks)

b) Use the information to calculate the General Fertility Rate and Total Fertility Rate (7 Marks)

c) Given that Gross Reproduction Rate is approximated as $300/306$ of Total Fertility Rate. What will be its value (3 Marks)