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 2023/2024 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

<u>**Instructions:**</u>

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 FOUR uses of population projection (4 Marks)

b) The data below is for a population of Siaya county for the years given below

1963 Census	1991 Census
1,443,568	5,685,781

   i. Find the constant rate of growth that follows a geometric model. (2 Marks)

   ii. Using (i) above estimate the population for 2005. (2 Marks)

c) Outline FOUR uses of demographic data (4 Marks)

d) In a certain population, there are a total of 132, 503 births with a sex ratio of 103 males to 100 females. Calculate the number of female and male births from the population

(4 Marks)

e) Outline FOUR assumptions used in the preparation of life tables (4 Marks)

f) In a given population, the number of people recorded at a census were 160, 000. The number of births and deaths recorded that year in the same population were 8, 000 and 3,200 respectively. Calculate the natural increase assuming that the census took place at midnight of 30th June or 1st July. (5 Marks)

g) Using the information below, compute the rate of growth of the population and the natural increase (5 Marks)

Item	Values
Population 1st Jan Year t	11,253
Births	556
Deaths	315
Immigration	40
Emigration	140

QUESTION TWO (20 MARKS)

a) Explain FOUR cohort measures of fertility. (8 Marks)

b) On the life table with $l_x = \dfrac{(300 - x)}{390}$ where $5 \le x \le 100$, work out

   i. The chance that a child who has reached age 5 will live 60. (2 Marks)

   ii. The chance that a man of age 30 lives to age 80. (2 Marks)

   iii. The probability of dying within five years for a man age 40. (2 Marks)

   iv. The average age at death of those dying between ages 40 and 45. (3 Marks)

   v. The chance that three men aged 30 at least one survives to age 80. (3 Marks)

QUESTION THREE (20 MARKS)

The following information is obtained from a given population

Age Group	Country A		Country B	
	No. of deaths	Population	No. of deaths	Population
0 – 29	7,000	6,000,000	6,300	1,500,000
30 – 59	20,000	5,500,000	3,000	550,000
60 and above	120,000	2,500,000	6,000	120,000

a) Compute crude mortality rates stratified by age and for the whole country for the two hypothetical populations. (8 Marks)

b) Compare the mortality rate of the two countries using direct standardization method applied to standard population below for each age group and for the overall population

Age – Group	Number of people in hypothetical standard population
0 - 29	100,000
30 – 59	65,000
60 and above	20,000

(12 Marks)

QUESTION FOUR (20 MARKS)

The following table is part of population in terms of thousands

Age group	1976		1993	
	Births	Female Population	Births	Female Population
	000's	000's	000's	000's
15 – 19	67.9	2809	55.1	2455
20 – 24	282.2	2672	252.0	2831
25 – 29	320.7	2855	336.0	3070
30 – 34	100.8	2593	271.1	2967
35 – 39	36.1	2379	68.8	2729
40 – 44	16.5	2300	20.5	2750

a) Compute the general fertility rate for the two years (8 Marks)

b) Calculate the Age specific fertility rate for the two years (4 Marks)

c) Standardize the general fertility rate for 1993 using 1976 as standard population. (8 Marks)

QUESTION FIVE (20 MARKS)

The following table is from part of a population

AGE	$_n^f P_x$	$_n B_x$	$_n i_x$
15-19	_____	1,208,361	198
20-24	198,732	_____	169.6
25-29	262,800	35,628.4	_____
30-34	245,362	15,770.87	_____
35-39	228,109	_____	198.6
40-44	206,211	_____	142.8
45-49	_____	2,466.13	26.9
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 $200/206$ of Total Fertility Rate. What will be its value   (3 Marks)