UNIVERSITY OF SWAZILAND
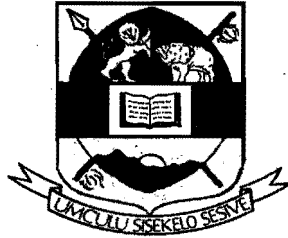
MAIN EXAMINATION PAPER 2014/2015

TITLE OF PAPER : POPULATION PROJECTIONS AND ESTIMATES

COURSE CODE : DEM 301

TIME ALLOWED : TWO (2) HOURS

INSTRUCTION : ANSWER ANY THREE QUESTIONS

REQUIREMENT : SCIENTIFIC CALCULATOR

Question 1

Use Table 1 to answer the subsequent questions:

Table 1: Estimated world population 1970-2000

Year	Mid-year population (millions)
1970	3696
1980	4432
1990	5321
2000	6067

a. What was the average annual numerical increase in the world's population in each decade?
   i. 1970-1980
   ii. 1980-1990
   iii. 1990-2000   3 marks

b. What was the average annual geometric growth rate percent in each decade?   6 marks

c. What was the annual exponential growth rate percent in each decade?   6 marks

d. How long would the world's population take to double if the annual geometric growth rate for 1990-2000 continued?   2 marks

e. Assuming a continuation of the 1990-2000 average geometric rate and using 2000.5 as the base date, when would the total world population reach 8000 million?   3 marks

[20 marks]

Question 2

a. Is a stationary population also a stable population? Explain your answer   2 marks

b. What are the assumptions of the stable population theory?   3 marks

c. What is the intrinsic growth rate of a population?   3 marks

d. At the start of the twenty-first century, China had an estimated R_0 of 0.81297 and an R_1 of 23. 52850. Calculate the population's intrinsic rate of natural increase   3 marks

e. Assuming an intrinsic rate of natural increase of 0.08 % and 1000 000 births in the year 1990 in the United States. Estimate the births for the years given below using the exponential growth model:
   i. 1903   3 marks
   ii. 1997   3 marks
   iii. 2015   3 marks

[20 marks]

Question 3

Use Table 2 to answer the questions below.

Table 2: Total population in four regions of Swaziland 1997-2007

	Population	Population
Region	**1997**	**2007**
Hhohho	255455	282734
Manzini	280972	319530
Shiselweni	198978	208454
Lubombo	194323	207731

a. Calculate the annual geometric growth rate of Swaziland in 1997-2007   4 marks

b. Calculate the annual average percentage change in each region   4 marks

c. Calculate the projected percentage change in 2017 in each region   4 marks

d. Calculate the projected populations in 2017 in each region   8 marks

[20 marks]

Question 4

Use Table 3 and answer the questions below.

Table 3: Incomplete Ghana closed female population projections, 2010-2015

Age group (x)	$_nN^F_x$ (thousands) [2010]	$_nL^F_x$	$_5F_x$ [2005, 2010]	$_nN^F_x$ (thousands) [2015]
0-4	1 673	407680		
5-9	1 539	339 241		1392
10-14	1 438	323 710		1469
15-19	1 298	310 893	0.05	
20-24	1 222	294 843	0.19	1231
25-29	1 106	271 251	0.28	
30-34	888	239 704	0.23	977
35-39	744	204 460	0.19	757
40-44	613	172 966	0.12	629
45-49	485	147 406	0.06	522
50-54	438	124 511		410
....	....	....	....	....
75-79	116	5 993		56
80+	192	640		
Total	**12 623**			**12 892**

NB: Births [2010, 2015]: **5 371**   Sex ratio: **1.05**

a. Project the female population in 2010 to 2015 for the age groups:
    i.   0-4 years   3 marks
    ii.   15-19 years   2 marks
    iii. 25-29 years   2 marks
    iv. 80 + years   3 marks

b. Project the births in 2010 to 2015 for women in the reproductive age groups:
    i.   15-19 years   3 marks
    ii.   25-29 years   3 marks

c. Project the female population from 2015 to 2020 for the age groups:
    i.   15-19 years   2 marks
    ii.   25-29 years   2 marks

[20 marks]

Question 5

a. Outline six of the guidelines for performing population estimations and projections developed by Shryock and Siegel (1973) and Morrison (1971).   6 marks

b. Population projections are revised due to a number of factors. Elaborate   8 marks

c. What are the flaws of the mathematical models of population projections   6 marks

[20 marks]