UNIVERSITY OF SWAZILAND

SUPPLEMENTARY 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

a. The population of Swaziland was estimated at 929 718 on 30th June 1997 and increased to 1, 018 449 on 30th June 2007. What was the population on 18th October 2005? 3 marks

b. The population of South Africa in mid-2011 is estimated at 50.6 million. Assuming a constant growth rate of 0.5 % and using the exponential growth model:
   i. What will be the population size in 2016? 3 marks
   ii. When is the population expected to reach the 60 million mark? 3 marks
   iii. What is the doubling time for the South African population? 2 marks

c. Assuming a -0.2 % growth rate of Germany estimated for 2010-2015 will remain constant, how long will it take for Germany to lose 25 % of its population using the exponential growth model? 3 marks

d. In a hypothetical scenario, an initial population of 20 000 had 950 births and 150 deaths observed in 12 months.
   i. Assuming the population is growing geometrically, what will be the population in three years? 3 marks
   ii. Assuming the same growth rate in i., calculate the population size after eight years 3 marks

[20 marks]

Question 2

a. What is R_0 and why is it important in stable population theory? 4 marks

b. Assuming a sex ratio at birth of 1.05, calculate the intrinsic rate of natural increase for Population X using the information in Table 1. 10 marks

Table 1: Female population, births and females reaching specific age-group in Population X in 2010

Age	Mid-year female population	Births (Both sexes)	l_x (female)
15-19	234000	3986	0.97518
20-24	185700	23798	0.97258
25-29	112500	27433	0.96916
30-34	86700	12065	0.96524
35-39	107000	7642	0.96006
40-44	122000	2771	0.95209
45-49	112600	354	0.94091
50-54			0.92435

c. If Population X experienced 78 049 births in 2010.Use the intrinsic rate of natural increase obtained in b. and apply the geometric progression to estimate the births in the following years:

i. 1991 — 2 marks
ii. 2009 — 2 marks
iii. 2015 — 2 marks

[20 marks]

Questions 3

Compare and contrast the ratio method and multiregional projection model **[20 marks]**

Question 4

a. Explain the difference between female and male closed population projections 10 marks

b. Use the information in the Table 2 to answer the questions that follow.

Table 2: Ghana male population in 2010 and person years lived in each interval

Age group (x)	${}_nN^M_x$ [2010]	${}_nL^M_x$
0-4	1810	402852
5-9	1 596	331658
10-14	1 415	315578
15-19	1 312	300318
20-24	1 175	281525
25-29	1 026	258162
30-34	874	231042
35-39	729	200674
40-44	605	169442
45-49	489	139749
50-54	385	112330
55-59	294	84782
60-64	254	57375
65-69	187	32938
70-74	128	13718
75-79	77	3116
80+	54	139
Total	**12 410**	

NB: Male births [2010, 2015] = **9 813**, Male births [2015, 2020] = **10 246**

i. Project the 0-4 years age group from 2010 to 2015 and 2020 — 6 marks
ii. Project the 80+ years age group from 2010 to 2015 — 4 marks

[20 marks]

Question 5

Distinguish between the following terms:

a.	Projections and estimates	4 marks
b.	Intrinsic rate of natural increase and growth rate	4 marks
c.	Exponential progression and geometric progression	4 marks
d.	Aggregation and disaggregation	4 marks
e.	Gross reproduction rate and net reproduction rate	4 marks

[20 marks]