# UNIVERSITY OF ESWATINI


**RE-SIT EXAMINATION PAPER 2018/2019**

**TITLE OF PAPER :** **POPULATION ESTIMATES AND PROJECTIONS**

**COURSE CODE :** **DEM 311**

**TIME ALLOWED :** **TWO (2) HOURS**

**INSTRUCTION :** **ANSWER ALL QUESTIONS**

**REQUIREMENT :** **SCIENTIFIC CALCULATOR**

## Question 1

a. A country in the central part of Europe had an intrinsic rate of natural increase of 0.1% and 119,000 births recorded in the year 2010. Estimate the births for the years given below using the geometric growth model:

i. 1998 [5 marks]
ii. 2016 [5 marks]

b. If a population grows at a rate of approximately 5 % per year, how many years are required for the population to double? Apply the exponential model. [5 marks]

c. The current global human population is about 7.4 billion and is growing at an annual rate of 1.13 % . If the world population were to grow at this rate for the next year, approximately how many people would be added? [5 marks]

d. Given the global human growth rate in question c. above, when will the global population reach 15 billion? Apply the exponential model [5 marks]

e. The population of the United States of America was 320, 611,133 on 1st January 2015 and 323, 025, 335 on 1st January 2016. Estimate the population on 28th October 2015. [5 marks]

f. In your research on population dynamics, you estimate that the population size of a particular country is 60,000. Over the course of a month, you record 400 births and 150 deaths in the population. Estimate $r$ and calculate what the population size is predicted to be in 6 months. Apply the geometric model [10 marks]

**[40 marks]**

## Question 2

a. The population of Kansas in 2012 was 2,885,398 with data on the components of population change for the 2012–2013 period shown below:

**Births** = 39,624
**Net domestic migration** = -12,557
**Net international migration** = +5,105
**Deaths** = 23,701

i. Assuming a sex ratio of 1.03, how many of the Kansas births were female? [5 marks]
ii. Estimate the population in 2013? [5 marks]
iii. Given the 2013 estimate, calculate the geometric growth rate between 2012 and 2013? [5 marks]
iv. Based on the 2013 estimate and growth rate obtained in iii., when will the population of Kansas reach 6 million? [5 marks]
v. When will the population of Kansas double in size [5 marks]

**[25 marks]**

## Question 3

*Table 1:* Data on female population (thousands), number of person years lived in each interval, fertility rates and number of migrants for a Health and Demographic Surveillance Site in South Africa, Agincourt, 2010.

| Age Groups (x) | n | ${}_nN^F_x$ (2010.0) | ${}_nL^F_x$ | ${}_5F_x$ | ${}_5I_x$ [2005.0,2010.0] |
|---|---|---|---|---|---|
| [1] | [2] | [3] | [4] | [5] | [6] |
| 0-4 | 5 | 3,262 | 466,558 | | 116 |
| 5-9 | 5 | 3, 611 | 458,199 | | 59 |
| 10-14 | 5 | 3, 875 | 457,587 | | 54 |
| 15-19 | 5 | 3, 335 | 456,607 | 0.2201 | 44 |
| 20-24 | 5 | 2, 268 | 451,444 | 0.3536 | 90 |
| 25-29 | 5 | 1, 733 | 433, 823 | 0.3635 | 120 |
| 30-34 | 5 | 1, 456 | 402,703 | 0.3125 | 108 |
| 35-39 | 5 | 1, 282 | 366,841 | 0.2418 | 82 |
| 40-44 | 5 | 1, 135 | 332,828 | 0.1251 | 67 |
| 45-49 | 5 | 941 | 298,462 | 0.0308 | 68 |
| 50-54 | 5 | 824 | 259,736 | | 61 |
| 55-59 | 5 | 650 | 220,582 | | 64 |
| 60-64 | 5 | 592 | 185,470 | | 61 |
| 65-69 | 5 | 558 | 151,997 | | 30 |
| 70+ | ∞ | 1, 364 | 268,762 | | 0 |
| **All** | | **26, 886** | | | |

***NB*: Sex ratio at birth** = 1.05 $l_0$ = 100,000 **Births** [2010.0, 2015.0] = 17.8
**${}_5I_x$ = Net Migration**

**Use the data presented in Table 2 to answer the questions below:**

a. What is the total fertility rate (TFR)? [5 marks]

b. What will be the projected number of births in the year 2010 to 2015 for women in the reproductive age groups:
   i. 20-24 years [5 marks]
   ii. 45-49 years [5 marks]

c. What will be the projected female population in the year 2010 to 2015 for the age groups:
   i. 0-4 years [5 marks]
   ii. 5-9 years [5 marks]
   iii. 15-19 years [5 marks]
   iv. 70 + years [5 marks]

**[35 marks]**