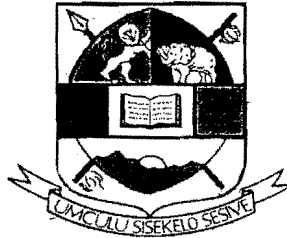


UNIVERSITY OF SWAZILAND



MAIN EXAMINATION PAPER 2017

TITLE OF PAPER : POPULATION ESTIMATES AND PROJECTIONS

COURSE CODE : DEM 301 / DEM 311

TIME ALLOWED : TWO (2) HOURS

INSTRUCTIONS : 1. ANSWER QUESTION 1 AND ANY TWO QUESTIONS.
2. ALL QUESTIONS ARE WORTH 20 MARKS EACH

REQUIREMENT : SCIENTIFIC CALCULATOR

Question 1 [Compulsory]

Study the data in Table 1 and answer the questions below.

Table 1: Abridged Sub-Saharan Africa (SSA) closed female population projections (thousands), 2015-2025

Age group (x)	${}_nN_x^F$ [2015]	${}_nL_x^F$	${}_5F_x$ [2010, 2015]	${}_nN_x^F$ [2020]	${}_5B_x$ [2015, 2020]	${}_nN_x^F$ [2025]
0-4	68 226	346557		.....		268831
5-9	59 452	241 364		47517		182927
10-14	51 906	221 041		54446		.....
15-19	45 707	205 419	24 982	48238	.....	50598
20-24	40 135	187 883	43 242	.....	220707	44120
25-29	33 996	162 650	38 526	34745	194754	36191
30-34	27 890	130 341	26 209	27243	.....	27843
35-39	22 087	97 786	14 113	20924	68708	20439
40-44	17 707	71 819	5 561	16222	26638	15368
45-49	14 830	53 779	1 718	.....	8136	12147
50-54	12 559	40 909		11281		10086
55-59	10 414	30 132		9250		8309
60-64	8 259	19 908		6881		6112
65-69	6 274	10 611		4402		.....
70-74	4 339	3 889		2299		1613
75+	6 414	724		.....		626
Total	430 195		154 351	602 851	776 835	732392

NB: l_0 : 100, 000

Sex ratio: 1.05

- a. Project the female population from 2015 to 2020 for the age groups:
- 0-4 years [3]
 - 20-24 years [2]
 - 45-49 years [2]
 - 75+ years [3]
- b. Project the births from 2015 to 2020 for women in the reproductive age groups:
- 15-19 years [3]
 - 30-34 years [3]
- c. Project the female population from 2020 to 2025 for the age groups:
- 10-14 years [2]
 - 65-69 years [2]
- [20 marks]**

Question 2

- a. Distinguish between the stable and stationery model populations [4]
- b. Assuming a sex ratio at birth of 1.03, calculate the intrinsic rate of natural increase for a Western Africa country using the information in Table 2. [12]

Table 2: Female population, births and females reaching specific age-group in a Western Africa country in 2015

Age	Mid-year female population	Births (Both sexes)	l_x (female)
15-19	309000	41400	0.97518
20-24	188600	49300	0.97258
25-29	148000	34100	0.96916
30-34	131500	27700	0.96524
35-39	139400	19400	0.96006
40-44	143500	7500	0.95209
45-49	117900	1000	0.94091
50-54	111900		0.92435

- c. Given the total number of female births the Western Africa country experienced in 2015, use the intrinsic rate of natural increase obtained in question b. above and apply the exponential growth model to estimate the female births in the following years:
- 1988 [2]
 - 2025 [2]

[20 marks]

Question 3

- a. What are the middle-range projections and under which circumstances are they used? [2]
- b. State **three** primary factors that necessitate the revision of population projections [3]
- c. The student population at Northern Arizona University (NAU) can be modelled by the logistic growth model below, with the initial population taken in the mid-1960. Using the 25th August 1965 as the initial population date, what will be NAU's population on 10th December 2017? [3]

$$P(t) = \frac{30,000}{1 + 5e^{-0.06t}}$$

- d. Briefly discuss how the demographic variables will influence future population trends in both developed and developing countries. [12]

[20 marks]

Question 4

Table 3: South Africa's mid-year population estimates by province, 2010-2017

Province	Population: 2010	Population: 2017
Eastern cape	6 743 800	6 498 700
Free State	2 824 500	2 866 700
Gauteng	11 191 700	14 278 700
KwaZulu-Natal	10 645 400	11 074 800
Limpopo	5 439 600	5 778 400
Mpumalanga	3 617 600	4 444 200
Northern Cape	1 103 900	1 214 000
North West	3 200 900	3 856 200
Western Cape	5 223 900	6 510 300

Use the data in Table 3 above to answer the following questions:

- a. Calculate the annual average percentage change in each province [10]
- b. Project the percentage distributions of the following provinces in 2032:
- i. Eastern Cape [2]
 - ii. Gauteng [2]
- c. Calculate the projected population using the geometric growth model in each province in question b. above in 2032 [6]

[20 marks]