UNIVERSITY OF SWAZILAND

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

SUPPLEMENTARY EXAMINATION 2017

TITLE OF PAPER :INDIRECT TECHNIQUES OF DEMOGRAPHIC ESTIMATION

COURSE CODE :DEM 303

TIME ALLOWED :THREE (3) HOURS

INSTRUCTIONS

a) ANSWER ALL FOUR QUESTIONS
b) SHOW ALL YOUR WORKING AND FORMULAE WHERE APPLICABLE
c) EXPRESS YOUR ESSAY ANSWERS IN BULLET POINTS

REQUIREMENTS : CALCULATOR

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

Question 1 **[25 Marks]**

a. Discuss the importance of indirect techniques of estimation in demography. Elaborate your answer with aid of examples. [5]
b. Briefly describe the characteristics of each region of the Coale and Demeny regional model life tables. [16]
c. Explain how you would select a model life table from the Coale and Demeny regional model life tables to use in a specific demographic estimation. [4]

Question 2 **[25 Marks]**

Consider the developing country A whose mortality experience is represented by the life table in Table 2.1.

Table 2.1: Mortality experience: Country A

Age x	Number surviving to age x out of 100,000 births
15	96457
20	95800
25	94912
30	94042
35	93044
40	91645
45	89537
50	86259

Using the data in Table 2.1, and the General Standard life table in **APPENDIX**:

a. What is meant by a relational system of model life tables?. [3]
b. Determine the parameters alpha (α) and beta (β) in a Brass logit model life table fitted to all ages or the data provided above. [12]
c. Interpret the values of the Brass parameters obtained in part b); [4]
d. Derive a fitted life table using the parameters derived in part b) and the General standard; [6]

Question 3 [25 Marks]

A census for Country C was conducted in year 2012 and the information in Table 3.1 was observed which is used by a population analyst to estimate fertility using the Brass P/F ratio method as shown in Table 3.2.

Table 3.1: Number of women, W(i), children ever born, CEB, and births in the last 12 months B(i)

Age group	i	W(i)	CEB(i)	B(i)
15-19	1	766882	136575	56223
20-24	2	658857	689022	120600
25-29	3	513783	1065311	85742
30-34	4	360277	1088263	48182
35-39	5	268789	1101057	25718
40-44	6	239716	1215454	12168
45-49	7	191154	1088320	3002
Total		**2999458**	**6384002**	**351635**

Table 3.2: Application of Brass P/F ratio method to results of 2002 census, Country C

							K=	1.1536
Age group	P(i)	f(i)	Ø(i)	F(i)	P/F	w(i)	f+(i)	f*(i)
15-19	-------	--------	--------	--------	--------	--------	--------	0.1022
20-24	-------	--------	1.2818	0.9065	--------	0.108	0.1858	0.2143
25-29	-------	--------	2.1162	1.7949	1.1552	-------	--------	--------
30-34	-------	--------	--------	--------	--------	0.1216	--------	--------
35-39	-------	--------	3.2633	3.0849	--------	0.1576	0.092	--------
40-44	-------	--------	3.5171	3.42	1.4826	--------	0.0463	-------
45-49	5.6934	0.0157	--------	--------	1.5915		0.0122	0.014
TFR		3.6						

NB: You are provided with information in Tables 3.1 and 3.2 and formulae in the **Appendix** of this paper.

a) What are the assumptions for Brass P/F ratio of estimating fertility? [2]

b) State one advantage of using the Brass P/F ratio method [1]

c) List one disadvantage of this method. [1]

d) Defining the parameters P(i) to f*(i), fill in the blank spaces in Table 3.2. You may use the formulae and table coefficients in the appendix. [17]

e) How was the value K chosen, and why do you think this value was chosen this way. [2]

f) Using the data above, calculate the adjusted Total Fertility Rate : [2]

Question 4 **[25 Marks]**

a) What is the purpose of the widowhood method; [2]
b) State the assumptions of the widowhood method; [5]
c) What are the advantages of the widowhood method over the orphanhood method? [8]
d) Using the data on the proportion of ever married respondents classified by age given in Table 4.1 and coefficients in Table 4.2, calculate the male probability of survival from age 20 to age 35 and from age 20 to 40. [10]

Table 4.1: Proportion of ever married women

Age	$NW_f(n)$	$NW_f(n-5)$
30	0.9514	0.9729
35	0.9170	0.9514
40	0.8735	0.9170

You may find the following information useful:

Table 4.2: Coefficients on Widowhood method

n	a(n)	b(n)	c(n)	d(n)
30	-0.0284	-0.00465	-0.00157	1.0822
35	-0.0159	-0.00638	0.00253	1.0831
40	-0.0041	-0.00784	0.00395	1.0596

Assume that SMAM(m)=25.3 years and SMAM(f)=23.2 years.

APPENDIX

Table A1: Brass General and African Standard life table l_x's values

Age, x	General Standard, l_x	Age, x	African Standard, l_x
0	1	0	1
1	0.8499	1	0.8802
2	0.807	2	0.8335
3	0.7876	3	0.8101
4	0.7762	4	0.7964
5	0.7691	5	0.7863
10	0.7502	10	0.7502
15	0.7362	15	0.7362
20	0.713	20	0.713
25	0.6826	25	0.6826
30	0.6525	30	0.6525
35	0.6223	35	0.6223
40	0.5898	40	0.5898
45	0.5535	45	0.5535
50	0.5106	50	0.5106
55	0.4585	55	0.4585
60	0.3965	60	0.3965
65	0.321	65	0.321
70	0.238	70	0.238
75	0.1516	75	0.1516
80	0.0768	80	0.0768
85	0.0276	85	0.0276
90	0.0059	90	0.0059
95	0.0006	95	0.0006
100	0	100	0

Source: Carrier and Hobcraft (1973)

$$F(7) = \phi(6) + a(7)f(7) + b(7)f(6) + c(7)\phi(7)$$

$$f^+(i) = (1 - w(i-1))f(i) + w(i)f(i+1)$$

$$w(i) = x(i) + y(i)\frac{f(i)}{\phi(7)} + z(i)\frac{f(i+1)}{\phi(7)}$$

$$F(i) = \phi(i-1) + a(i)f(i) + b(i)f(i+1) + c(i)\phi(7)$$

$$f^+(7) = (1 - w(6))f(7)$$

Table A2:Table Coefficients for F(i)

Age group	a(i)	b(i)	c(i)
15-19	2.531	-0.188	0.0024
20-24	3.321	-0.754	0.0161
25-29	3.265	-0.627	0.0145
30-34	3.442	-0.563	0.0029
35-39	3.518	-0.763	0.0006
40-44	3.862	-2.481	-0.0001
45-49	3.828	0.016*	-0.0002

Table A3: Table Coefficients for $f^{+}(i)$

Age group	x(i)	y(i)	z(i)
15-19	0.031	2.287	0.114
20-24	0.068	0.999	-0.233
25-29	0.094	1.219	-0.977
30-34	0.12	1.139	-1.531
35-39	0.162	1.739	-3.592
40-44	0.27	3.454	-21.497