UNIVERSITY OF SWAZILAND

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

MAIN EXAMINATION 2012

TITLE OF PAPER	:	INDIRECT TECHNIQUES OF DEMOGRAPHIC ESTIMATION
COURSE CODE	:	DEM 303
TIME ALLOWED	:	THREE (3) HOURS
INSTRUCTIONS	:	ANSWER QUESTION 1, 2, 3 AND EITHER QUESTION 4 OR 5 ALL FIVE (5) QUESTIONS ARE WORTH 25 MARKS. WHERE APPLICABLE ALL WORKINGS SHOULD BE SHOWN.
REQUIREMENTS	:	CALCULATOR GRAPH PAPER

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QUESTION 1 [Total=25 marks]

a. Compare and contrast direct and indirect techniques of demographic estimation. [9]

b. Explain what is meant by demographic models? [4]

c. Briefly explain how you would select a model life table to represent mortality conditions at a particular time and place. [4]

d. State two similarities between Coale and Demeny (Princeton) and United Nations model life tables. [4]

e. Identify the family of Princeton regional model life tables that best represents the following mortality patterns:

i. A high mortality during infancy and older ages (over 50 years); and, [2]

ii. Low mortality above age 50 years, and higher child mortality than infant mortality. [2]

Question 2 [Total=25 marks]

Consider the developing country A whose mortality experience is represented by the life table in Table E1.

Table E1: Mortality experience: Country A

Age x	Number surviving to age x out of 1000 births
0	1000
1	950
5	900
10	880
20	850
30	790
40	700
50	580
60	450
70	340
80	230

Using the data in Table E1

a. Find the parameters α and β of the Brass logit model life table, using the African Standard life table (in **APPENDIX**) as the standard. [10]

b. Explain the meaning of the Brass parameters obtained above. [4]

c. Fit the Brass logit model from the information above. [6]

d. Compare the fitted life table values with the observed ones. [3]

e. What is the purpose of a relational model life table? [2]

Question 3 **[Total=25 marks]**

Census data in Table E2 was obtained on children ever born and births in the last 12 months for women in country X in 2002. Based on these data, an attempt was made to estimate fertility using the Trussell variant of Brass P/F ratio method. The results are presented in Table E2 using standard symbols (in Manual X of United Nations). You may use in your calculations the relevant formulae and table coefficients in the appendix.

Table E2

i	Age group	W(i)	CEB(i)	B(i)	P(i)	f(i)	Φ(i)	F(i)	w(i)	f+(i)	P(i)/F(i)	f*(i)
1	15-19	3014706	1160919	320406	------	-------	0.5314	0.237	0.087	0.1262	-------	-------
2	20-24	2653155	4901382	609269	------	-------	-------	------	------	-------	------	-------
3	25-29	2607009	9085852	561494	------	-------	-------	------	------	-------	-------	-------
4	30-34	2015663	9910256	367833	------	-------	-------	3.323	------	-------	-------	-------
5	35-39	1771680	10384001	237297	------	-------	-------	4.094	0.205	0.1310	-------	-------
6	40-44	1479575	9164329	95357	------	-------	-------	4.579	0.167	0.0568	-------	-------
7	45-49	1135129	6905673	38125	------	-------	4.8288	4.790		0.0280	-------	-------

a) Calculate the values for columns P(i) to f+(i) in Table E2 as indicated by the blank spaces. [10]

b) Calculate P/F ratios for all age groups. [2]

c) Interpret the meaning of the P/F ratios you obtained above. [2]

d) Based on the values you obtained in (b), calculate the adjustment factor, k and give a reason on the method you have chosen. [2]

e) Calculate the adjusted fertility rate, f*(i). [2]

f) Using the results obtained above and data in Table E2, estimate the reported and adjusted total fertility rate for country X, and compare the results. [3]

g) State your assumptions for using the Brass P/F ratio method to estimate fertility. [4]

ANSWER EITHER

Question 4 **[Total=25 marks]**

a. Describe the rationale, data requirements, computational procedure and the meaning of the resulting estimates/parameters of the Coale's indices of marital and ex-nuptial fertility. [17]

a) Without any derivation used, provide formulae explaining the Coale-Trussell fertility schedule. In your answer explain the meaning of the parameters to be estimated. [8]

OR

Question 5 **[Total=25 marks]**

Describe in detail the Preston and Coale method for evaluating and adjusting data on deaths.

Note: Make sure to describe the purpose, assumptions, data requirements, computational procedure, resulting estimates and limitations. Include in your answer the appropriate formulae.

APPENDIX

Table A1: Brass General and African Standard life table l_x's and logits, $\lambda l^s(x)$

Age	General Standard		Age	African Standard	
x	l_x	$\lambda l^s(x)$	x	l_x	$\lambda l^s(x)$
0	1		0	1	
1	0.8499	-0.867	1	0.8802	-0.9972
2	0.807	-0.7153	2	0.8335	-0.8053
3	0.7876	-0.6553	3	0.8101	-0.7253
4	0.7762	-0.6218	4	0.7964	-0.682
5	0.7691	-0.6016	5	0.7863	-0.6514
10	0.7502	-0.5498	10	0.7502	-0.5498
15	0.7362	-0.5131	15	0.7362	-0.5131
20	0.713	-0.4551	20	0.713	-0.4551
25	0.6826	-0.3829	25	0.6826	-0.3829
30	0.6525	-0.315	30	0.6525	-0.315
35	0.6223	-0.2496	35	0.6223	-0.2496
40	0.5898	-0.1817	40	0.5898	-0.1817
45	0.5535	-0.1073	45	0.5535	-0.1073
50	0.5106	-0.0212	50	0.5106	-0.0212
55	0.4585	0.0832	55	0.4585	0.0832
60	0.3965	0.21	60	0.3965	0.21
65	0.321	0.3746	65	0.321	0.3746
70	0.238	0.5818	70	0.238	0.5818
75	0.1516	0.8611	75	0.1516	0.8611
80	0.0768	1.2433	80	0.0768	1.2433
85	0.0276	1.781	85	0.0276	1.781
90	0.0059	2.5634	90	0.0059	2.5634
95	0.0006	3.709	95	0.0006	3.709
100	0		100	0	

Source: Carrier and Hobcraft (1973)

Table A2: Table Coefficients for F(i) and f+(i)

Age group	a(i)	b(i)	c(i)	x(i)	y(i)	z(i)
15-19	2.531	-0.188	0.0024	0.031	2.287	0.114
20-24	3.321	-0.754	0.0161	0.068	0.999	-0.233
25-29	3.265	-0.627	0.0145	0.094	1.219	-0.977
30-34	3.442	-0.563	0.0029	0.12	1.139	-1.531
35-39	3.518	-0.763	0.0006	0.162	1.739	-0.3592
40-44	3.862	-0.2481	-0.0001	0.27	3.454	-21.497
45-49	3.828	0.016*	-0.0002			

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

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

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

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

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