UNIVERSITY OF SWAZILAND

SUPLLEMENTARY EXAMINATION 2018

TITLE OF PAPER: INDIRECT TECHNIQUES OF DEMOGRAPHIC ESTIMATION

COURSE CODE: DEM 303

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY THREE (3) QUESTIONS. ALLQUESTIONS ARE WORTH 25 MARKS.

REQUIREMENTS: CALCULATOR

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SECTION A: COMPULSORY QUESTION

Question 1 [25]

a. Explain the importance of indirect estimation in demography.

b. Explain the meaning and purpose of model life tables? State any two limitations of model life tables.

c. What are the general features of a stable population? Explain the difference between a stable population and a stationary population.

d. Briefly explain Coale and Demeny (Princeton) regional model life tables.

e. Why do we use the El-Badry method?

f. What are the data requirements for the El-Badry correction?

g. State the assumption for the method to be applied.

SECTION B: Answer any THREE (3) questions

Question 2 [25]

a. Describe the rationale of Relational Gompertz Model of fertility schedule.

b. What are the data requirements for this method?

c. State the assumptions of the method.

d. Show the computational procedure required for this procedure.

e. Explain the meaning of the parameters α and β in this relational fertility model.

f. State two limitations of this technique.

Question 3 [25]

a. What is meant by a relational system of model life table?

Table 1 shows the life table computed directly from data obtained in the 1976 Swaziland census.

Table 1: observed life table: Swaziland 1976 Census

Age x	observed l_x
...	
2	0.8102
3	0.8060
...	
5	0.7885
...	
45	0.6843
50	0.6484
55	0.5952
60	0.5363
65	0.4773
...	

b. Using the African Standard in **Annex**, Fit the Brass logit model life table for this data and determine alpha, α, and beta, β.

c. What is the meaning of α and β parameters obtained above?

Question 4 **[25]**

Discuss the rationale, data requirements, assumptions and limitations of **ANY TWO** of the following indirect estimation methods.

a. Brass growth balanced method

b. Preston and Coale method

c. Bennet and Horiuchu method

d. Preston and Hill method

Question 5 [25]

You are given the following age specific marital fertility rates for USA for 1984 in Table 2. The total number of births in the USA in 1984 was 3659176, and the total number of legitimate births was 2897896.

Table 2: Marital Age-specific fertility rates: USA, 1984

Age group	legitimate births	Married women	Total females	MASFRs
15-19	208578	608000	9189000	343.1
20-24	862386	4576000	10620000	188.5
25-29	1028755	7855000	10603000	131.0
30-34	599235	8403000	9694000	71.3
35-39	174839	7838000	8477000	22.3
40-44	23148	6496000	6868000	3.6
45-49	955	5559000	5829000	0.2

Using the data for United States 1984 in Table 2 and data in the annex:

i) Calculate Coale's Indices and comment on your answers.

ii) Use the Coale-Trussell fertility schedule to estimate the M and m scale factors, Give an interpretation of these parameters.

Question 6 [25]

The following information for Zimbabwe, 2002 census is given in Table 3 which is used to estimate fertility using the Brass P/F ratio method in Table 4.

Table 3: 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**

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

b) Define the parameters P(i) to f*(i) in table 4.

c) State the advantage of using the Brass P/F ratio method

d) List two disadvantages of the method.

e) Fill in the blank spaces in table 4. You may use the formulae and table coefficients in annex.

Table 4: Application of Brass P/F ratio method to results of 2002 Zimbabwe census

							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						

f) How is the value K chosen, and why do you think this value was chosen this way.

g) Using the data above, calculate the following adjusted rates:

   i) Total fertility rate and comment on this value;

   ii) Crude birth rate; and,

   iii) General fertility rate.

ANNEX

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

Age	General Standard		Age	African Standard	
x	l_x	Ys(x)	x	l_x	Ys(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: Hutterite marital ASFRs, 1921-30

Age group	Hutterite Standard
15-19	0.300
20-24	0.550
25-29	0.502
30-34	0.447
35-39	0.406
40-44	0.222
45-49	0.061

Table A3: Five year n(a) and v(a) for Coale-Trussell fertility model

Age group (a)	n(a)	v(a)
15-19	0.411	0.000
20-24	0.460	0.000
25-29	0.431	-0.279
30-34	0.395	-0.667
35-39	0.322	-1.042
40-44	0.167	-1.414
45-49	0.024	-1.671

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

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

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

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

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

Table A4: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 A5: 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