

UNIVERSITY OF ESWATINI

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

FINAL EXAMINATION 2018

TITLE OF PAPER : **INDIRECT TECHNIQUES OF DEMOGRAPHIC ESTIMATION I**

COURSE CODE : **DEM 313**

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

INSTRUCTIONS : **ANSWER ALL THREE QUESTIONS**
: **SHOW ALL YOUR FORMULAE AND WORKINGS**

REQUIREMENTS : **CALCULATOR**

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

Question 1

[20 Marks]

- a. State two major uses or applications of fertility models. [2]
- b. Briefly explain four desirable properties of models of fertility patterns. [8]
- c. The Coale and Trussell (1974) fertility model is given in the form:

$$r(a)/n(a) = M.e^{m.v(a)}$$

- i. Explain the meaning of the five parameters in the given model, namely $r(a)$, $n(a)$, M , m and $v(a)$. [10]

Question 2

[20 Marks]

A recent graduate in Census Statistical Office is given population Census data in Table Q2.1 obtained on children ever born and births in the last 12 months for women in country X in 2004. 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 Q2.1 using standard symbols (in Manual X of United Nations).

Table Q2.1: Application of Brass P/F ratio method to, Country X

K=1.499												
i	Age	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	0.385	0.1063	0.5314	0.237	0.087	0.1262	1.622	0.1892
2	20-24	2653155	4901382	609269	-----	-----	-----	-----	-----	-----	-----	-----
3	25-29	2607009	9085852	561494	3.485	0.2154	2.7565	2.338	0.111	0.2131	1.490	0.3194
4	30-34	2015663	9910256	367833	4.917	0.1825	3.6689	3.323	0.121	0.1783	1.479	0.2673
5	35-39	1771680	10384001	237297	5.861	0.1339	4.3386	4.094	0.205	0.1310	1.432	0.1964
6	40-44	1479575	9164329	95357	6.194	0.0644	4.6609	4.579	0.167	0.0568	1.353	0.0852
7	45-49	1135129	6905673	38125	6.084	0.0336	4.8288	4.790		0.0280	1.270	0.0420

You are provided with information in Tables Q2.1 and table coefficients of the P/F ratio method in the Appendix of this paper.

- a) With aid of formulae for the parameters P(i) to f*(i), fill in the blank spaces for age group 20-24 in Table Q2.1 [8]
- b) The value K=1.499 was chosen as an average of the age groups for index i=2, 3 and 4. Explain why this value was chosen in this manner? [1]
- c) Write down two assumptions of the Brass P/F ratio of estimating fertility? [2]
- d) State one advantage of using the Brass P/F ratio method. [1]
- e) List one disadvantage of this method. [1]

- f) After applying the P/F ratio method it was noticed that errors in the average number of children ever born per woman, by age of the woman affect the results. Then the demographer applied the El-Badry method before using the relational Gompertz method as an alternative method of estimation.
- Why was the El-Badry technique applied? [2]
 - State the assumption of the El-Badry method. [1]
 - State two advantages of applying the relational Gompertz model. [2]
 - Outline two assumptions for the relational Gompertz Model. [2]

Question 3

[20 marks]

- a. Explain the rationale of using the Coale's indices of marital and ex-nuptial fertility. [4]

Table Q3 gives the data needed to calculate Coale's indices for Country A in year 1974. The estimated total number of births in Country A in 1974 was 3,689,000 and there was a negligible amount of illegitimacy.

Table Q3 Data for calculating Coale's fertility indices for Country A, 1974

Age group	Hutterite standard	Estimated population (000s)	
		all females	married females
15-19	0.300	3777	2432
20-24	0.550	3101	2828
25-29	0.502	2636	2494
30-34	0.447	2161	2012
35-39	0.406	1793	1606
40-44	0.222	1484	1211
45-49	0.061	1222	892

Using the data provided in Table Q3:

- Calculate the expected number of births to i) all females and ii) married women. [4]
- State the denotation of the Coale's Indices symbols I_f , I_g , and I_m . [3]
- Calculate Coale's Indices: I_f , I_g , and I_m . [6]
- Comment on your answers in part d). [3]

APPENDIX

Table A1: 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			

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

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

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

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

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