

UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION 2010

TITLE OF PAPER: INDIRECT TECHNIQUES FOR DEMOGRAPHIC ESTIMATION

CORSE NUMBER: DEM 303

TIME ALLOWED: 3 HOURS

INSTRUCTIONS: ANSWER ANY FOUR QUESTIONS. ALL QUESTIONS ARE WORTH 20 MARKS EACH.

REQUIREMENTS: CALCULATOR

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

Question 1

- Describe briefly the characteristics of each region (family) of the Coale and Demeny regional model life tables. (12)
- Outline two uses of stable populations. (4)
- Give any two data requirements for estimating fertility using the P/P^* ratio method by Coale and Trussel? (4)

Question 2

- Describe the Heligman-Pollard model for mortality (i.e. explain the 3 components for the model as well as the meanings of the parameters for each component). (20)

Question 3

- The data below shows the average parities of women at two surveys 5 years apart $P(i, 1)$ and $P(i, 2)$. Using the data calculate, the inter-survey age-specific fertility rates $f(1, s)$, $f(2, s)$, $f(3, s)$ and $f(4, s)$. (20)

Age	i	$P(i, 1)$	$P(i, 2)$
15-19	1	0.131	0.127
20-24	2	0.994	0.884
25-29	3	2.409	2.126
30-34	4	3.819	3.481
35-39	5	5.082	4.660
40-44	6	5.921	5.677

You may find the following formula useful:

$$\Phi(i, s) = 0.9283 P(i, s) + 0.4547 P(i+1, s) - 0.0585 P(i+2, s) - 0.3245 \Phi(i-1, s);$$

$$\text{Where } P(i, s) = P(i-1, s) + P(i, 2) - P(i-1, 1) \text{ or } P(i, s) = \sum \Delta P(j)$$

Question 4

- Find the value of l_1 corresponding to level 14.6 in the female South model. (4)
- Find the value of l_5 corresponding to level 13.7 in the female North model. (4)

- c) Assuming that the CD South female model is applicable in a certain population, estimate the decline in child mortality when the level changes from 10 to 12. (6)
- d) What is the probability of a male surviving to age 5 in a population whose probability of surviving to age 1 is 0.84? Assume that the pattern of mortality in the given population resembles the CD South model. (6)

Question 5

The Brass Relational Gompertz model is given as:

$$Y(x) = \alpha + \beta Y^*(x)$$

Where $Y(x)$ is a Gompit function defined as: $-\ln [-\ln(F(x))]$ and $Y^*(x)$ is the standard gompits.

- a) Explain the meanings of α and β . (4)
- b) Use the least squares method to fit the Gompertz model to the following data. (16)

Age group	ASFR	$Y^*(x)$
15-19	0.2004	-0.69130
20-24	0.3373	-0.02564
25-29	0.3109	-0.70000
30-34	0.2615	1.47872
35-39	0.1970	2.62602
40-44	0.0954	4.80970
45-49	0.0135	-----

Question 6

- a) Compare and contrast the P/F ratio method and the P_1/F_1 method for first births. (10)
- b) What are the assumptions of the Widowhood method? (4)
- c) What data are required to make use of the widowhood method? (4)
- d) Give any two typical errors associated with data on Children Ever Born. (2)

TABLE XIV (Continued). Values of l_x by single years of age from 1 to 5 for regional model life tables ($l_0 = 100,000$) at mortality levels 1 to 24

LEVEL	M O D E L					E A S T				
	Females					Males				
	l_1	l_2	l_3	l_4	l_5	l_1	l_2	l_3	l_4	l_5
1	57180	49795	46656	44596	43167	49453	42922	40206	38482	37222
2	60636	53494	50458	48466	47084	53511	47063	44382	42680	41436
3	63788	56935	54022	52111	50784	57211	50920	48305	46644	45431
4	66680	60150	57375	55554	54290	60606	54530	52003	50399	49227
5	69350	63168	60540	58815	57619	63741	57920	55500	53963	52840
6	71827	66009	63536	61913	60786	66649	61115	58814	57353	56286
7	74135	68692	66378	64860	63806	69588	64135	61963	60584	59577
8	76292	71232	69081	67670	66690	71891	66997	64962	63670	62725
9	78317	73643	71657	70353	69448	74268	69715	67822	66620	65742
10	80221	75936	74115	72920	72090	76504	72302	70555	69445	68635
11	82003	78166	76535	75464	74722	78599	74819	73247	72249	71520
12	83663	80270	78828	77881	77225	80519	77144	75741	74850	74199
13	85260	82285	81020	80191	79615	82373	79387	78145	77357	76781
14	86794	84213	83117	82397	81897	84161	81547	80461	79770	79266
15	88267	86659	85120	84504	84077	85882	83626	82688	82092	81657
16	89677	87823	87035	86518	86159	87536	85624	84829	84324	83956
17	91028	89531	88885	88455	88151	89123	87544	86887	86470	86166
18	92318	91160	90650	90305	90055	90643	89406	88879	88539	88288
19	93548	92706	92328	92069	91877	92095	91200	90797	90529	90325
20	94721	94176	93927	93753	93622	93480	92897	92620	92429	92282
21	95904	95546	95380	95262	95171	94852	94462	94266	94127	94018
22	96939	96718	96614	96539	96481	96111	95868	95741	95648	95574
23	97861	97739	97681	97638	97605	97245	97110	97035	96980	96935
24	98640	98583	98555	98518	98518	98219	98154	98116	98088	98065
25	99245	99223	99212	99204	99198	98989	98963	98948	98936	98926

LEVEL	M O D E L					S O U T H				
	Females					Males				
	l_1	l_2	l_3	l_4	l_5	l_1	l_2	l_3	l_4	l_5
1	69279	55503	49161	45812	43909	66423	53927	48164	45074	43368
2	71532	58606	52655	49512	47727	68857	57056	51612	48694	47083
3	73567	61479	55913	52974	51304	71056	59951	54829	52083	50567
4	75420	64152	58964	56225	54668	73058	62645	57842	55267	53846
5	77119	66651	61832	59287	57842	74894	65163	60675	58269	56941
6	78685	68997	64537	62181	60843	76586	67526	63347	61107	59870
7	80136	71206	67094	64923	63689	78154	69750	65874	63796	62649
8	81487	73291	69518	67525	66394	79613	71850	68270	66351	65291
9	82748	75265	71820	70001	68968	80975	73838	70546	68781	67607
10	83916	77145	74028	72382	71447	82229	75650	72616	70990	70092
11	84937	78890	76106	74636	73801	83337	77434	74711	73252	72446
12	85933	80569	78099	76795	76054	84419	79153	76724	75422	74702
13	86903	82184	80011	78863	78211	85474	80809	78657	77504	76867
14	87848	83738	81845	80846	80278	86501	82405	80515	79502	78943
15	88764	85232	83606	82748	82260	87498	83941	82300	81420	80935
16	89651	86670	85297	84573	84161	88463	85419	84015	83262	82846
17	90509	88068	86936	86334	85986	89397	86841	85663	85031	84682
18	91342	89424	88523	88038	87751	90303	88235	87270	86789	86457
19	92266	90774	90064	89676	89440	91361	89859	89132	88727	88493
20	93180	92044	91496	91193	91004	92369	91237	90668	90344	90150
21	94089	93256	92849	92620	92475	93372	92551	92123	91872	91718
22	94988	94405	94116	93952	93846	94361	93799	93491	93306	93190
23	95868	95484	95292	95181	95108	95343	94973	94765	94637	94555
24	96716	96483	96365	96296	96249	96287	96064	95934	95853	95799
25	97514	97386	97321	97282	97255	97178	97057	96984	96937	96906

