

**University of Colombo**  
**Faculty of Arts**  
**Bachelor of Arts Degree Examination (Special) - Fourth Year**  
**Semester End Examination- Semester I - 2018/2019**  
**DMG 4166: Advanced Demographic Analysis**

**Answer three (03) questions only**

**Calculators can be used**

**Time: Two (02) hours**

**This paper contains five (05) questions and five (05) pages**

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1. a) A change in life expectancy (at any age) does not necessarily mean that mortality rates change in the same magnitude or even in the same direction at all ages. Explain.

(06 Marks)

- b) Problems associated with erroneous life expectancy at old age can be solved by using temporary life expectancies. Explain.

(06 Marks)

- c) Use the data given in the following table and calculate life expectancies for exact ages and temporary life expectancies for each age group. Interpret your results.

(08 Marks)

Age	$l_x$	$T_x$
0-14	100,000	6,882,161
15-29	97,764	5,409,836
30-44	94,427	3,963,302
45-59	89,000	2,583,629
60-74	75,445	1,333,610
75+	44,279	411,241

2. a) It is important to understand mortality change in a country to decompose the difference in life expectancies into the change in mortality at each particular age group. Explain.

(05 Marks)

- b) Using the data given in the following table for Sri Lanka for the period 2000-02, calculate the contribution of Sex Differentials of Mortality at Each Age to the Total Sex Differential in Life Expectancy at Birth. Interpret your results.

(15 Marks)

Age	Males		Females	
	$l_x$	$T_x$	$l_x$	$T_x$
0-14	100,000	6,882,161	100,000	7,715,049
15-29	97,764	5,409,836	98,191	6,237,436
30-44	94,427	3,963,302	96,968	4,773,105
45-59	89,000	2,583,629	95,303	3,329,570
60-74	75,445	1,333,610	89,585	1,932,934
75+	44,279	411,241	66,930	724,252

Formulae for:

$$\text{Direct effect: } {}_iDE_x = l_x^t / l_a^t ({}_ie_x^{t+n} - {}_ie_x^t)$$

$$\text{Indirect Effect: } {}_iCS_x = l_x^t * (l_{x+i}^{t+n} / l_x^{t+n}) - l_{x+i}^t$$

$${}_iIE_x = ({}_iCS_x / l_a^t) e_{x+i}^t$$

$$\text{Interaction effect: } {}_iOE_x = ({}_iCS_x / l_a^t) e_{x+i}^{t+n}$$

$${}_iI_x = {}_iOE_x - {}_iIE_x$$

3. a) What is meant by endogenous and exogenous infant mortality?

(04 Marks)

- b) Out of 3,374 infant deaths relating to birth cohort 2001, 2,306 were recorded during the 1<sup>st</sup> month of life. Calculate exogenous and endogenous death rates with the use of Brougeois-Pichats' method.

(12 Marks)

$$\text{Formula: } d_n = \log_{10}^3 [30.5(n+1)+1] - \log_{10}^3 [(30.5(n+1)) / (\log_{10}^3 366 - \log_{10}^3 31.5)]$$

Year	Birth-Cohort	Age (Years)	Deaths	Births
2001	2001	0	2,893	142,471
2002	2001	0	481	-
2002	2002	0	2,603	138,214

- c) Using the data given in the above table, calculate the 'true' probability of dying between exact ages 0 and 1 for birth cohort 2001.

(04 Marks)

4. a) Explain why it is important to analyze birth intervals and duration of marriage when studying fertility.

(05 Marks)

- b) Following table gives a distribution of 418 births by duration of marriage in a non-contracepting population. Calculate monthly 'effective' fecundabilities.

(06 Marks)

Distribution of births by duration of marriage in a non-contracepting population		
Month of birth since marriage	Number of first births	Number of fecund women
9	138	544
10	86	406
11	58	320
12	42	262
13	32	220
14	25	188
15	20	163
16	17	143
	418	2,246

- c) Following table gives number of women wearing IUD after first insertion and on 'relevant closures' defined as including accidental pregnancies, expulsions, and removals for medical and personal reasons. Calculate contraceptive effectiveness with the use of Pearl Rate and interpret your results.

(09 Marks)

Month	Wearers at beginning of month	Relevant closures
0	250	12
1	214	4
2	199	6
3	176	5
4	154	1
5	139	1
6	127	2
7	108	3
8	98	3
9	78	1
10	65	0
11	50	1
12	36	
Total		39

R <sub>12</sub> (per 100 person-years)	1.5-2	3-4	6-8	12-21	Around 30
Contraceptive effectiveness	99.5	99	98	95	90

5. a) What is meant by intensity of migration?

(02 Marks)

b) What is meant by efficiency of migration?

(02 Marks)

c) Following table gives migration flows between three regions (A,B,C) in a country in 2012.

i. Calculate out-migration rates for each region

(02 Marks)

ii. Calculate interregional efficiency

(04 Marks)

iii. Calculate regional efficiency

(04 Marks)

iv. Calculate national efficiency

(03 Marks)

v. Interpret your results

(03 Marks)

From/To	A	B	C	Total number of out migration	Enumerated population
A	202,888	7,146	12,809	19,955	5,478,555
B	7,111	169,981	12,215	19,326	3,097,253
C	19,035	14,178	63,913	33,213	1,075,136
Total number of in-migration	26,146	21,324	25,024	72,494	9,650,944