

UNIVERSITY OF SWAZILAND

MAIN EXAMINATION 2018

TITLE OF PAPER: DEMOGRAPHIC METHODS II

COURSE NUMBER: DEM 212

TIME ALLOWED: 2 HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY TWO QUESTIONS. ALL
QUESTIONS ARE WORTH 30 MARKS EACH.

REQUIREMENTS: CALCULATOR

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

Question 1 (COMPULSORY)

- a) What are the two important pieces of information in survival analysis? (2)
- b) Define precisely the following terminologies in survival analysis::
- Survival function (2)
 - Probability density function (2)
 - Hazard function (2)
- c) What are the advantages of survival analysis over the traditional life table? (6)
- d) 50 patients with skin melanoma were treated in one hospital during the time period October 1952-June 1967. Patients were followed annually and the study was closed to patient follow up on December 31,1969. 20 deaths occurred and 30 observations were censored due to withdrawal or lack of follow-up. The information is summarised in the table below. Using the information given, construct a clinical life table. (16)

| Interval in years | # alive at beginning of interval | # of deaths during interval |
|-------------------|----------------------------------|-----------------------------|
| 0-1 | 50 | 9 |
| 1-2 | 41 | 6 |
| 2-3 | 34 | 2 |
| 3-4 | 28 | 1 |
| 4-5 | 22 | 2 |
| 5-6 | 17 | 0 |

Question 2

- a) Differentiate between the following terms:
- Return migration and lifetime migration (4)
 - Gross migration and net migration (4)
- b) Describe the sources of data for migration analysis.(5)
- c) What is the major limitation of the vital statistics method for estimating internal migration? (2)
- d) Using the vital statistics method, calculate the intercensal net migration to or from the following places: (4)

| | 1996 census | 2001 census | Births | Deaths |
|------------|-------------|-------------|--------|--------|
| Greenlane | 22400 | 22100 | 1872 | 1018 |
| Kensington | 44150 | 48700 | 4131 | 1448 |

- e) Using forward survival, calculate age-specific net migrants and rates for the age groups 10-14 and 20-24 in 1986. (6)

| Age in 1976 | Age for survival ratio | ${}_5S_x$ | Population 1976 | Population in 1986 |
|-------------|------------------------|-----------|-----------------|--------------------|
| 0-4 | 10-14 | 1.0612 | 17286 | 17297 |
| 5-9 | 15-19 | 0.8879 | 17129 | 12013 |
| 10-14 | 20-24 | 0.8036 | 13889 | 7689 |
| 15-19 | 25-29 | 0.9344 | 9084 | 6087 |
| 20-24 | 30-34 | 0.9823 | 5693 | 4613 |
| 25-29 | 35-39 | 0.9369 | 5615 | 4834 |

- f) Specify one disadvantage of migration expectancy as a measure of the occurrence of migration? (2)
- g) What is the main benefit of the migration effectiveness ratio? (3)

Question 3

- a) What is the major purpose of a multiple decrement table ? (2)
- b) Outline the steps for constructing a multiple decrement table that pertains to causes of death. Make sure to include the relevant formula for each step. (10)
- c) What is the difference between a gross and net nuptiality table? (3)
- d) Using the data in the table below, construct a gross nuptiality table. (15)

Female Population by age and number of first marriages

| Age | Number of women (thousands) | No of first marriages (thousands) |
|-------|-----------------------------|-----------------------------------|
| 15-19 | 311.1 | 19.6 |
| 20-24 | 228.0 | 18.1 |
| 25-29 | 155.0 | 4.5 |
| 30-34 | 140.4 | 1.4 |
| 35-39 | 138.7 | 0.7 |
| 40-44 | 130.4 | 0.4 |
| 45-49 | 109.8 | 0.3 |
| 50-54 | 98.7 | 0.1 |

Question 4

- a) What is meant by a stable population? (2)
- b) Using the data in the table below, calculate the intrinsic rate of natural increase. (6)

ASFRs and survival probabilities for country X

| Age group | Female ASFRs | Survival Probabilities |
|-----------|--------------|------------------------|
| 15-19 | 0.01289 | 0.98615 |
| 20-24 | 0.05007 | 0.98376 |
| 25-29 | 0.07120 | 0.98134 |
| 30-34 | 0.03947 | 0.97877 |
| 35-39 | 0.01205 | 0.97530 |
| 40-44 | 0.00215 | 0.96960 |
| 45-49 | 0.00012 | 0.96003 |

- c) Distinguish between generation and abridged life tables. (4)
- d) Use the period life table below to answer the following questions:
- (i) Fill in the gaps numbered (i) to (iv). For each gap you fill in give the notation and formula, where applicable. (8)
 - (ii) What is the probability of dying between exact age 15 and 35 when given survival to age 15? (2)
 - (iii) What is the life expectancy at age 25? In addition, give a verbal interpretation. (4)
- e) Now, conceive of the life table as a stationary population. Answer the following questions:
- (i) What is the total size of the population? (2)
 - (ii) What is the crude birth rate? (2)

Abridged life table for England and Wales females, 1985

| Age | nq_x | l_x | nd_x | nL_x | T_x | e_x |
|-------|----------|--------|--------|--------|---------|-------|
| 0-1 | 0.008252 | 100000 | 825 | 99258 | 7756261 | 77.56 |
| 1-4 | 0.001630 | 99175 | 162 | 396311 | 7657003 | 77.21 |
| 5-9 | 0.000905 | 99013 | 89 | 494842 | 7260692 | 73.33 |
| 10-14 | 0.000935 | (i) | 93 | 494388 | 6765850 | (iv) |
| 15-19 | 0.001409 | | (ii) | | 6271462 | 63.46 |
| 20-24 | 0.001534 | 98692 | 152 | 493080 | 5777654 | 58.54 |
| 25-29 | 0.001818 | 98540 | 179 | 492253 | 5284574 | 53.63 |
| 30-34 | 0.002826 | 98361 | 278 | 491110 | 4792321 | 48.72 |
| 35-39 | 0.004410 | 98083 | 432 | (iii) | 4301211 | 43.85 |
| 40-44 | 0.007199 | 97651 | 693 | 486523 | 3811876 | 39.04 |
| 45-49 | 0.012348 | 96958 | 1197 | 481798 | 3325353 | 34.30 |
| 50-54 | 0.020831 | 95761 | 2005 | 473793 | 2843555 | 29.69 |
| 55-59 | 0.035455 | 93756 | 3324 | 460470 | 2369762 | 25.28 |
| 60-64 | 0.058507 | 90432 | 5291 | 438933 | 1909292 | 21.11 |
| 65-69 | 0.087310 | 85141 | 7434 | 407120 | 1470359 | 17.27 |
| 70-74 | 0.139189 | 77707 | 10816 | 361495 | 1063239 | 13.68 |
| 75-79 | 0.220993 | 66891 | 14782 | 297500 | 701744 | 10.49 |
| 80-84 | 0.352367 | 52109 | 18362 | 214640 | 404244 | 7.76 |
| 85+ | 1.000000 | 33747 | 33747 | 189604 | 189604 | 5.62 |