



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL
SCIENCE

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR
BACHELOR OF STATISTICS AND PROGRAMMING
SST 400: DEMOGRAPHY

DATE: 25/7/2019

TIME: 8:30 – 10:30 AM

INSTRUCTION: Answer Question One and any other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Consider the following table of values of e_x .

Age, x	75	76	77
e_x	10.5	10.0	9.5

Calculate the probability that a life aged 75 will die by age 78. (5 marks)

- b) Given that the complete expectation of life at ages 30 and 31 for a particular group of lives are respectively 21.39 and 20.91 years and that the number living at age 30 is

41,176.

Calculate

- i) the number that attains age 31. (4 marks)
ii) the number that will die without attaining the age 31. (4 marks)

- c) Show that $q_x = \frac{m_x}{1 + \frac{m_x}{2}}$ (5 marks)

- d) Suppose from mortality table $\ell_{20} = 693,435$, $T_{20} = 35,081,126$ and $\ell_{21} = 690,673$
 Calculate (i) L_{20} (ii). e_{20}^0 (6 marks)
- e) Define the following terms
 i) Crude Death Rate. (C.D.R.)
 ii) Total Fertility Rate. (T.F.R.)
 iii) Standardized Death Rate. (S. D. R.) (6 marks)

QUESTION TWO (20 MARKS)

Consider the following data on fertility of some female population

Age group of

Child bearing females	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Number of women (×1000)	16.0	16.4	15.8	15.2	14.8	15.0	14.5
Total births	260	2244	1894	1320	916	280	145

Assuming that the population of female births is 46.2%, compute

- a) the General Fertility Rate (G.F.R.) (6 marks)
 b) The Total Fertility Rate (T.F.R.) (6 marks)
 c) The age Specific Fertility Rates (S.F.R.) (8 marks)

QUESTION THREE (20 MARKS)

- a) Consider the following table of values of e_x .

Age, x	75	76	77
e_x	10.5	10.0	9.5

Calculate the probability that a life aged 75 will die by age 78. (8 marks)

- b) Given that the complete expectation of life at ages 30 and 31 for a particular group of lives are respectively 21.39 and 20.91 years and that the number living at age 30 is

41,176.

Calculate

- (i). the number that attains age 31. (6 marks)
 (ii). the number that will die without attaining the age 31. (6 marks)

QUESTION FOUR (20 MARKS)

Calculate the general fertility rate and the total fertility rate from the data given in the table below, assuming that for every 100 girls 106 boys are born.

Age of women	Number of women	Age-specific rate
15-19	212,619	98.0
20-24	198,732	169.6
25-29	162,800	158.2
30-34	145,362	39.7
35-39	128,109	98.6
40-44	106,211	42.8
45-59	86,753	16.9

(20 marks)

QUESTION FIVE (20 MARKS)

- a). Define, for a given population,
- (i). the gross reproduction rate (3 marks)
 - (ii). The net reproduction rate. (3 marks)

- (b). Consider the following data on age specific fertility and survival rates.

Age (Years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Fertility rate	0.0108	0.0662	0.0675	0.0413	0.0216	0.0063	0.0004
Survival Rate	0.963	0.967	0.963	0.958	0.952	0.942	0.928

Compute

- (i). the gross reproductive rates (7 marks)
- (ii). the net reproduction rates. (7 marks)