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University Examinations 2014/2015

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE STATISTICS

STA 2490: DEMOGRAPHIC TECHNIQUES

DATE: APRIL 2015

TIME: 2 HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE (30 MARKS)

- Define infant mortality rate as a measure of mortality and hence explain the reasons why high levels of infant mortality is a problem which requires special attention (6 Marks)
- State and explain the types of infant mortality (4 Marks)
- Define the term “parity progression ratio”. What does it measure? (4 Marks)
- State and explain briefly the various factors affecting mortality (8 Marks)
- Life table for males USA 1978

Age x	Number of survivors l_x	Expected number of years lived after x (e_x^0)
0	100,000	73.30
20	97,051	51.43
40	93,045	33.19
60	78,213	17.10
80+	46,183	6.38

Source: US Bureau of Census

Stating any assumptions made, calculate the:

- i) Male crude death rate (2 Marks)
- ii) Expected number of males who will die aged 60-80 out of 5000 males now aged 40-60 (4 Marks)
- iii) Expectation of a life of a male reaching his 80th birthday (2 Marks)

QUESTION TWO (20 MARKS)

- a) Distinguish between a stable and stationary population (4 Marks)
- b) Prove the following inequality

$$\frac{M_x}{1 + M_x} \leq q_x \leq M_x \leq \frac{q_x}{1 - q_x}$$

Where q_x and m_x have their usual meaning (6 Marks)

- c) What is a life table (2 Marks)
- d) what are the components of population (6 Marks)
- e) What is demography (2 Marks)

QUESTION THREE (20 MARKS)

- a) Explain four sources of demographic data (8 Marks)
- b) Calculate the population growth rate of a country with enumerated population in 1971 to that in 1961 being $p_n | p_0 = 1.2457$ (4 Marks)
- c) What is the dependency ratio (2 Marks)
- d) In a closed population, there were 112 persons aged exactly 18 years on 1st January 1972. On 1st January 1973 only 100 of the cohort had survived
 - i) Calculate the probability of dying q_x for the 112 persons (2 Marks)
 - ii) Calculate the age specific death rate for the above cohort assuming uniform death rate (4 Marks)

QUESTION FOUR (20 MARKS)

- a) Fill in the remaining gaps in the following life table (11 Marks)

Age (x)	l_x	d_x	p_x	q_x
30	94726	-	-	0.00157
31	-	-	0.99838	0.00161
32	94425	164	-	0.00167
33	-	-	-	0.00174
34	-	-	-	0.00183
35	93931	182	0.99806	0.00194

- b) Using the constructed table in (a) above. What is the proportion of men aged 31 expected to live to age 35 (3 Marks)
- c) Using the Australian life tables for males and females given find:
- The probability that a male aged 15 will die between 40-50 (3 Marks)
 - a couple both aged 25 have male twins. What is the probability that one parent or both will die before either of the sons in the next ten years (3 Marks)

QUESTION FIVE (20 MARKS)

- a) Using the Australia life table A^{mbi} and A^{fb1}
- What is the proportion of men aged 31 expected to live to age 35 (3 Marks)
 - What proportion of males now aged 32 will die while aged 34 last birthday (3 Marks)
 - What is the average number of males who might be expected to die between age 31 and 35 out of 3000 males now aged 30 (3 Marks)
 - What is the chance that a female aged 31 and a male aged 33 both will die within 20 years (3 Marks)
- b) What factors affect fertility (5 Marks)
- c) Distinguish between population morbidity and population mortality (3 Marks)