

M.Sc. Examination, 2019
Semester-IV
Statistics
Course : MSC-41
(Demography MSS-4)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Answer **any five** questions from the below

1. Under suitable assumptions (to be stated) derive the distribution of time to the n th child birth. Hence derive the average time to the first child birth. 6+2=8
 2. Derive Lotka's integral equation for birth function and hence explain a method of solution. 5+3=8
 3. Write down the probability generating function of Life table values $l_1, l_2, \dots, l_w$ given the cohort l_0 . Use this function to find correlation between two l_x values. 5+3=8
 4. (a) What are the coverage and content errors involved in demographic data? (b) What is a balancing equation? How one can use it to estimate the net migration (when it is unknown) on the basis of census and registration data? 3+5=8
 5. What is social mobility? How can one define the special situations of 'perfect mobility' and 'perfect immobility'? Describe the values of the following measures for these special situations: (i) $\cos \Delta = \sum_i \pi_i^{(t)} \pi_i^{(t+1)}$, (ii) $M = \sum_i (\pi_i^{(t)} - \pi_i^{(t+1)})^2$ and (iii) $T = \text{trace}(P)$, where P is the transition matrix and $\pi^{(t)}$ is the vector of proportions of persons in different categories in generation t . 2+3+3=8
 6. (a) Derive the Logistic curve for population projection and interpret the parameters involved. (b) Describe a method for fitting this curve to observed population data. 5+3=8
 7. Distinguish between the Gross Reproduction Rate (GRR) and the Net Reproduction Rate (NRR) and interpret the situations when for a society (i) $\text{GRR} = \text{NRR}$ and (ii) $\text{NRR} = 1$ and $\text{NRR} \neq 1$. 6+2=8
 8. Write short notes on **any two** of the following :
(i) Whipple's index, (ii) Use of Leslie matrix and (iii) Age dependency ratio. 4+4=8
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