

2021

STATISTICS — HONOURS

Paper : CC-6

(Demography and Vital Statistics)

Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer **any five** questions :

2×5

- (a) Write the formula of age-sex-adjusted (standardised) death rate for a region A. All the notations should be defined clearly.
- (b) Discuss the drawback of IMR.
- (c) How can you compute L_x value for the last age interval of a life table?
- (d) Suppose there are two persons of ages 12 and 15 years. Using life table notations, find the probability that both of them will survive for the next 5 years but the younger one will die within 3 years after the 5-year span.
- (e) Is it possible to compute ASDR of a region for age 10 in the year 2010 based on registration data only? Explain.
- (f) For a community, it is found that $GRR = 1.57$ and $NRR = 1.75$. Make your comment on the given statement with proper justification.
- (g) Show that

$${}_nL_x = n l_{x+n} + \int_0^n {}_t\mu_{x+t} l_{x+t} dt .$$

Notations have their usual meanings.

- (h) Define case fatality rate. Is it a probability rate? Explain.

2. Answer **any two** questions :

5×2

- (a) Write a short note on age dependency ratio. In 2001, it is found that the total dependency ratios of China and Italy are close to each other, but there are differences with respect to youth-dependency ratio and old-age dependency ratio as shown in the following table :

Country	Youth-DR	Old-Age-DR	Total-DR
China	32.9	10.0	42.9
Italy	20.6	26.5	47.1

What is your comment on the age structure of the two countries?

3+2

Please Turn Over

(b) What do you mean by population balancing equation? Discuss, in brief, its use to check the completeness of death statistics. 2+3

(c) Starting with a suitable form of l_x , derive the approximate formulae

$$(i) \quad L_x = \frac{1}{2}(l_x + l_{x+1}),$$

$$(ii) \quad L_x = -\frac{d_x}{\ln p_x}$$

Notations have their usual meanings.

2½+2½

3. Answer **any three** questions :

10×3

(a) Describe an indirect method of computing standardised death rate. Define two measures : crude prevalence rate and morbidity incidence rate. Suppose we are given morbidity statistics of West Bengal for the last week. In this case, which one of the above two measures is applicable and why? 4+4+2

(b) The most important column in a life table is the column of q_x values. Discuss how you estimate q_x values for $x = 1$ and $x = 10$. Define a measure of fertility which can be used to compare overall fertility level of two regions. Interpret the measure and also discuss its merits and demerits. 5+(2+1+2)

(c) Define GRR as a measure of population growth. Write its main drawback. Suggest a new measure of population growth by eliminating the above drawback. Is your new measure suitable for future population changes? 2+3+2+3

(d) Let P_t be the population at time t . Starting from the assumption of constant (positive) relative growth rate, derive the equation of the logistic curve. Write two important properties of logistic curve. Discuss the impact of migration on future population change of a country. 5+2½+2½

(e) Define neonatal and perinatal mortality rates. Give description of the functions that are used in the second form of abridge life table. If force of mortality increases in G.P., that is, $\mu_x = AB^x$ for some constants A and B , show that $l_x = Kg^{cx}$, where K , c and g are suitable constants. (2+2)+4+2