

Seat No. : _____

NN-101
December-2015
B.Sc., Sem.-III
CC-202 : Statistics

Time : 3 Hours]

[Max. Marks : 70

Instruction : All questions carry equal marks.

1. (a) Define index number. Distinguish between fixed base and chain base method for construction of index number and discuss their relative merits.

OR

State Laspeye's, Paasche's and Marshall-Edgeworth index numbers. Justify or refuse the statement : "The above three index numbers satisfy the time reversal test but not satisfy the factor reversal test."

- (b) What is cost of living index number ? Discuss the problems encountered in construction of the cost of living index number of a certain defined group of people.

OR

Discuss the problem of the construction of index number of wholesale price with special reference to (i) selection of base period and (ii) selection of commodities and markets. State its application.

2. (a) Explain crude and standardized death rates. In what way is standardized death rate superior to crude death rate ? Give briefly the direct and indirect method of finding standardized death rates.

OR

Define the term 'Vital Statistics'. Describe their nature and methods of collection of vital statistics.

- (b) Define and compare the various measures of fertility.

OR

Define 'reproduction rates' and explain how far they may be looked upon as indices of population growth.

3. (a) Define the terms: ${}_n p_x$, ${}_n q_x$, Survival function $S(x)$, force of mortality $\mu(x)$. In usual notations show that

$$(i) \quad S(x) = \exp\left[-\int_0^x \mu(y)dy\right]$$

$$(ii) \quad {}_n p_x = \exp\left[-\int_0^n \mu(x+y)dy\right]$$

OR

Suppose that the force of mortality $\mu(y)$ is specified for exact ages y ranging from 5 to 55 as

$$\mu(y) = 10^{-4}(20 - 0.5|30-y|).$$

Find (i) Analytical expression for the survival probabilities $s(y)$ for exact ages y in the ranges 5 to 30 years given that $s(5) = 0.97$. Hence find $S(30)$.

(ii) An expression for one year death rate q_x for $x = 5, 6, \dots, 29$. Hence find the probability that a person of exact age 25 will die within one year following the attainment of that age.

- (b) What is life table ? Discuss the terms : (i) Average size of the cohort between ages x and $x+1$. (ii) Total number of years lived by the cohort l_0 after attaining the age x . (iii) The curate expectation of life. (iv) The complete expectation of life.

OR

Suppose that the death rate q_x for integer age x in a cohort life table follows the functional form $q_x = 4 \times 10^{-4}$ for $5 \leq X \leq 30$. Find analytical expressions for

(i) l_x (ii) d_x (iii) S_9x) at these ages if $l_0 = 10^5$ and $S(5) = P(X \geq 5) = 0.96$.

4. (a) Discuss Gini's coefficient. State its advantages and disadvantages as a measure of inequality.

OR

What is Lorenz curve ? How do you construct it ? Construct Lorenz curve from the following data and make comment on it. The following table shows the population quintile shares of income received in the yellow Springs economy;

Population Quintile :	Poorest	Second	Third	Fourth	Richest
% of total income received :	12	16	20	24	28

(b) Write note on Pareto law : an income distribution function.

OR

Write note on lognormal distribution : an income distribution function.

5. Answer the following :

- (1) Comment: Laspeye's index number is always greater than Paasche's index number.
- (2) State the expression for percentage price relatives based on geometric mean.
- (3) What is link relative?
- (4) Define factor reversal test.
- (5) Define infant mortality rate.
- (6) State the general limit within which CBR (per thousand) lies.
- (7) Give interpretation of "NRR – 1".
- (8) State Gompertz - Makeham force of mortality.
- (9) Mr. XYZ yield ₹ 50,000 by his insurance if he survive at the time of maturity of the insurance, otherwise he gets ₹ 1,00,000. The chance of his death during insurance period is 20%. If his utility function is $u = w^{0.5}$, w = his wealth. Find his expected utility.
- (10) Define central mortality rate.
- (11) If $l_{10} = 79348$, $l_{11} = 79109$, find L_{10} .
- (12) State the interpretation of 'Gini's coefficient = 1'.
- (13) What do you mean by joint lives ?
- (14) In the year 2010, suppose the Gini's coefficient for a country A was 0.30. In the year 2015, it rises to 0.35. What will be your conclusion ?

