2020

(Held in 2021)

STATISTICS

(Major)

Paper : 5.3

(Applied Statistics—I)

Full Marks : 42

Time : 2 hours

The figures in the margin indicate full marks for the questions

GROUP—A

(*Marks* : 21)

1. Answer the following as directed : 1×2=2

(a) Write the relationship between purchasing power of money and cost of living index number.

(b) If $_p$ 1 where $_p$ is the price elasticity of demand, then demand is inversely proportional to price.

(State True or False)

2. Answer the following questions : 2×2=4

(a) Which component of time series is mainly applicable in the following cases?

(i) Decrease in employment of sugar factory during the off-season

(ii) Fall in death rate over the years due to improvement in health care

(b) After some period, cost of living index (CLI) was increased from 110 to 200. By the same period, the wage of a worker also increased from ₹ 330 to ₹ 500. Was there any gain of that worker? If so, find by how much.

3. Answer any *three* questions from the following : 5×3=15

(a) Show that under normal economic conditions, Laspeyres' price index is greater than Paasche's price index.

(b) Describe the method of principles of least squares (starting with the normal equations) of fitting trend to the following curves : 2½×2=5

(i) $U_t \quad ab^t$

(ii) $U_t \quad ab^t c^{t^2}$

(c) For application of principle of least squares in the linear regression model, what would happen in the following situations? 1+2+2+=5

(i) If the explanatory variables are perfectly linearly correlated

(ii) If the disturbances are auto-correlated

(iii) If there is heteroscedastic disturbance term

(d) Let the demand law is given by x 10 p where x is the quantity demanded and p is the price. Obtain the price elasticity of demand at p 6. If the price increases by 5%, determine the per cent decrease in demand. 4+1=5

(e) Write a short note on any *one* of the following (within *200* words) :

(i) Pareto's law of income distribution

(ii) Autocorrelation

GROUP—B

(*Marks* : 21)

4. Answer any *three* questions from the following : 7×3=21

(a) A company estimates its sales for a particular year to be ₹ 12 lakhs. The seasonal indices for sales for the four quarters are as follows :

Quarter	1st	2nd	3rd	4th
Seasonal Index	98	89	82	130

Estimate the quarterly sales for the company assuming that there is no trend.

(b) An enquiry into the budgets of the middle-class families of a certain city revealed the following data of percentage expenses on the different groups and the group index numbers for the current year as compared with a fixed base period :

Groups	*Food*	*Rent*	*Clothing*	*Fuel and Light*	*Miscellaneous*
Group Index	400	200	300	200	300
% Expenses	40	15	10	15	20

Mr. *X* was earning ₹ 1,000 in the base period and ₹ 2,000 in the current year.

Find how much he should receive as dearness allowance to maintain his former standard of living.

(c) Show that the OLS estimator ($\hat{}_0$) of the model Y_t $\hat{}_0$ U_t (t 1, 2, ..., n) is given by the mean value of Y, that is, $\hat{}_0$ $\overline{Y}$. Also prove that, if U satisfies the standard assumptions, then

(i) $E(\hat{}_0)$ $_0$

(ii) var($\hat{}_0$) $\frac{1}{n}$ ^2_U, where ^2_U $E[U^2]$

2+2+3=7

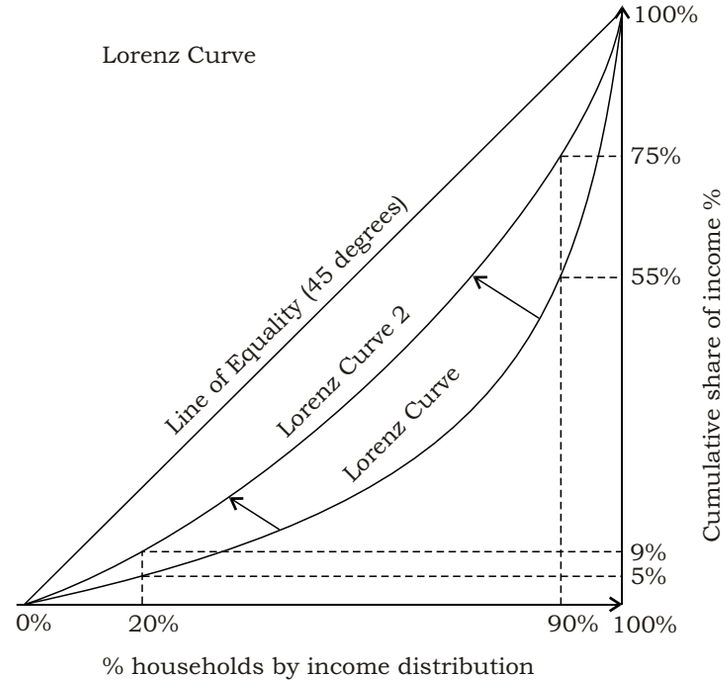
(d) The price elasticity of demand ($_p$) of a certain demand function is given by

$$_p \quad \frac{4 \quad 5x^2}{10x^2}$$

Determine the demand function. What will happen to the market turnover for the commodity, if x $\frac{2}{\sqrt{15}}$? 4+3=7

(e) The diagram given below shows an upward shift in the Lorenz curve of a particular nation at two different points of time. From the diagram, compare *(i)* the share of total income of the poorest 20% of the population and *(ii)* the share of total income of the richest 10% of the population.

If G_1 and G_2 are the Gini coefficients corresponding to the Lorenz curves at the 1st and the 2nd time point respectively, then state whether G_1 G_2 or G_1 G_2 or G_1 G_2. 2+4+1=7



★ ★ ★