

2018

STATISTICS-HONOURS

Fourth Paper

Group - A

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.*

Section – I

Answer *any two* from *question nos. 1–4* and *any one* from *question nos. 5 and 6*.

1. Briefly describe the functions of Central Statistical Organisation (CSO). 5
2. Distinguish between GDP and GNP. 5
3. Mention the names of official publications (besides Statistical Abstract) containing information on (i) foreign trade, (ii) area under principal crops, (iii) wholesale price index number. 5
4. If the distribution of income follows a log Normal distribution with p.d.f. 5

$$f(x) = \frac{1}{\delta x \sqrt{2\pi}} e^{-\frac{(\ln x - \ln \mu)^2}{2\sigma^2}} \quad -\infty < x < \infty,$$
 derive the expression for Gini's coefficient.
5. (a) What is a cost of living index number? 3
 - (b) How can one construct the cost of living index number for middle class families in Kolkata? 6
 - (c) Compare the performance of Laspeyre's and Paasche's formula for estimating the true cost of living index number. 6
6. (a) Describe the nature of official statistics relating to industrial production. 5
 - (b) Discuss the matter considered in (a) in respect of the unorganised sector. 4
 - (c) Explain the construction of index number of industrial production. 6

Please Turn Over

Section – II

Answer *any two* from *question nos. 7–10* and *any one* from *question nos. 11 and 12*.

7. What is control chart for fraction defectives? Why is it better than the np chart when the sample size varies? 5
 8. While preparing a control chart for process mean, how can one estimate the process standard deviation if it is unknown? State whether the estimate is valid when the underlying distribution is not normal. 5
 9. A 3σ control chart for mean is required to be set-up given that the quality characteristic is normally distributed with mean μ and known variance σ^2 . Suppose the target mean is specified as μ_0 . Find an expression for the probability that out of 5 subsequent subsamples 4 will not be in the desired state of control when the variance of the process increases four-fold. 5
 10. The lifetime of an electronic component is known to follow a normal distribution with standard deviation 10 hours. The component is said to be acceptable if it functions for at least 200 hrs. Discuss how you will set up a sampling inspection plan. 5
 11. Two companies X and Y, producing electric bulbs, have two different goals for their products. Company X wants to ensure that the average life of their bulbs is 200 hours while company Y wants that 80% of their bulbs work for at least 200 hours. Describe in detail how the two companies can ensure that their respective goals are met. State clearly the assumptions that you make. 15
 12. (a) Define acceptance-rectification type sampling plan. 2
(b) What are Average Outgoing Quality Limit (AOQL) and Average Total Inspection (ATI)? How are the two used in selecting a sampling plan? 6
(c) A producer claims that his products have no more than 1% defectives. A single item from each of his lots of N items is inspected and the lot is accepted or rectified according as the selected item is non-defective or defective. For the inspection plan find 7
 - (i) the ATI
 - (ii) an expression of the average outgoing quality (AOQ) and hence the AOQL.
-