

2019
Part-II
Statistics
(General)
Paper-II
Full Marks-90
Time - 3 Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

Group - A (15 marks)

1. Answer *any one* question : 10×1=10
- (a) Derive Lagrange's interpolation formula. Hence show that Lagrange's formula is a weighted average of the entries where the weights are some functions of the arguments. 5+5
- (b) Describe the Newton's-Raphson's method and interaction method of solving a numerical equation with one unknown. 5+5
2. Answer *any one* question : 5×1=5
- (a) What do you mean by numerical integration? Discuss briefly any one of the formulae used for numerical integration? 2+3
- (b) Explain the two operators A and E used in numerical analysis. Obtain the relation between *the two operators*. 3+2

Group – B (10 marks)

3. Answer *any one* question : 10×1=10
- (a) Explain the theoretical basis of control charts. How does a control chart indicate that the process is out of control? 5+5
- (b) What are rational sub-groups? Explain how you would construct control chart for number of defects. 5+5

Group – C (20 marks)

4. Answer *any one* question : 10×1=10
- (a) What is meant by a complete life table? Briefly describe the different mortality functions enlisted in a complete life table. 2+8
- (b) Define CBR, GFR and ASFR and indicate why each is considered an improvement on the proceeding measure of fertility. 6+4
5. Answer *any two* questions : 5×2=10
- (a) Define Infant Mortality Rate. Why is it considered inspite of the availability of Age Specific Death Rate at zero I.b.d? 2+3
- (b) Define Standardised Death Rate (STDR). How should the standard population be chosen for calculation of STDR? 2+3
- (c) The NRR of a community is 0.9 and its sex ratio at birth is 6:5 in favour of males. Comment on the growth of the population in the community. 5
- (d) Explain why the mortality situation of two communities cannot be compared on the basis of Crude Death Rate (CDR). 5

Group – D (45 marks)

6. Answer *any two* questions : 10×2=20
- (a) Define χ^2 distribution. Derive the moment generating function of χ^2 distribution and hence find its mean and variance. 2+4+2+2
- (b) Describe the exact test procedure for testing the significance of difference of means of two independent normal populations against all possible alternatives. 10
- (c) Describe the large sample test procedure for testing the significance of a single Binomial Proportion. Also obtain the $100(1-\alpha)\%$ confidence interval for the Binomial Proportion. 8+2
- (d) Define Minimum Variance Unbiased Estimator (MVUE). Show that, MVUE, if it exists is unique. 2+8
7. Answer *any five* questions : 5×5=25
- (a) Distinguish between point estimation and interval estimation. 5
- (b) Describe the use of Pearsonian χ^2 statistic to test the goodness of fit of a distribution. 5
- (c) What are the two types of errors that arise in testing of hypothesis? Discuss their relations with size and power of test? 3+2
- (d) Let x_1, x_2, \dots, x_n be a random sample of size n drawn from $N(\mu, \sigma^2)$ where μ and σ^2 are both unknown. Find maximum likelihood estimators of μ and σ^2 . 5

- (e) Define Unbiased Estimator. Let x be a random variable that follows Bin (n, p) . Find unbiased estimator of p^2 . (Assume that n is known)

2+3

- (f) Define consistency of a test. When it is said to be unbiased?

2½+2½

- (g) Let x_1, x_2, \dots, x_n be a random sample of size n from $N(\mu, \sigma^2)$.

Derive the sampling distribution of the sample

mean

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n x_i$$

5

- (h) Let x_1, x_2, \dots, x_n be a random sample of size n from $N(\mu, 1)$.

Show that X^2 is a consistent estimator of μ^2

where

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n x_i$$

5

- (i) Define F distribution. Derive the mean and variance of F distribution.

1+4

- (j) Distinguish between a parameter and a statistics. State the law to derive the large sample standard error of a function of a statistic.

2+3