

NEW

2017

Part II 3-Tier

STATISTICS

PAPER—II

(General)

Full Marks : 100

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

Answer any *one* question.

1×15

1. What do you mean by the term interpolation? Derive Lagrange's interpolation formula. Discuss the advantages of this formula over Newton's forward and backward formulae. 2+10+3

(Turn Over)

2. (a) Describe the method of false position for obtaining a real root of an equation.
- (b) Show that the r th order divided difference is a symmetric function of the argument.
- (c) Derive Simpson's 1/3rd rule to obtain an approximate value of a definite integral mentioning the underlying assumptions. 5+4+6

Group—B

Answer any *one* question. 1×10

3. What do you mean by statistical quality control? Explain the construction of control chart for mean in both cases when the standards are given and when the standards are not given. 2+4+4
4. What are rational subgroups? How are the rational subgroups formed? State the criteria under which a production process can be taken to show lack of control. 3+3+4

Group—CAnswer any *two* questions.

2×10

5. (a) Describe different columns of a life table. Discuss the use of a life table.
- (b) Show that, $q_x \approx 2m_x/(2+m_x)$,
 where m_x is the age-specific death rate without multiplying 1000 and other symbols have their usual meanings. 5+3+2
6. (a) Describe the direct method and the indirect method of standardization for constructing standardised death rate.
- (b) What are the different sources of vital statistics? 7+3
7. Write short notes on the following :
- (a) Net reproduction rate.
- (b) Crude rate of natural increase. 5+5

Group—D

Answer any *three* questions of which Q. No. 8 is compulsory.

8. Answer any *five* from the following questions : 5×3

- (a) Distinguish between Type I error and Type II error.
- (b) What do mean by point estimation ? How does it differ from interval estimation ?
- (c) Distinguish between a 'parameter' and a 'statistic'.
- (d) If two independent random variables X and Y follow normal distributions with means 6 and 5 and standard deviations 3 and 4 respectively, what are the distributions of (i) $2X + Y$ and (ii) $2X - 2Y$?
- (e) What is a critical region ?
- (f) What do you mean by power of a test ?
- (g) Distinguish between one-sided and two-sided tests.
- (h) Define a t-distribution with degrees of freedom 10. Is the distribution symmetric ?

9. (a) Distinguish between :

- (i) Large sample test and small sample test.
- (ii) Null hypothesis and alternative hypothesis.

(b) Suppose (x_1, x_2, \dots, x_n) is a random sample from a normal distribution with mean μ and standard deviation σ . How do you test the null hypothesis.

- (i) $H_0 : \mu = \mu_0$ against alternative $H_1 : \mu \neq \mu_0$
 - and (ii) $H_0 : \sigma = \sigma_0$ against alternative $H_1 : \sigma \neq \sigma_0$
- where both μ and σ are unknown ?

3+3+4+5

10. (a) Define Pearsonian χ^2 -statistic. How do you use this statistic to test

- (i) independence of two characters A and B each being classified into several categories.
- (ii) homogeneity of several similarly classified populations.

(b) Suppose $(x_{11}, x_{12}, \dots, x_{1n_1})$ and $(x_{21}, x_{22}, \dots, x_{2n_2})$ are two independent samples from two independent normal distributions with means μ_1, μ_2 and standard deviations σ_1, σ_2 respectively. Obtain a confidence interval for $(\mu_1 - \mu_2)$.

2+4+4+5

11. (a) Define minimum variance unbiased estimator.
- (b) Suppose X and Y are independently distributed Binomial random variables with parameters (m_1, p) and (m_2, p) respectively. Obtain the distribution of (i) $X + Y$ (ii) $X|X + Y$.
- (c) Suppose x_1, x_2, \dots, x_n are a random samples from a Bernoulli distribution with parameter p . Show that
(i) $T(T - 1)/n(n - 1)$ is an unbiased estimator of p^2
(ii) $T(n - T)/n(n - 1)$ is an unbiased estimator of

$p(1 - p)$, where $T = \sum_{i=1}^n x_i$. 1+6+8

Internal Assessment : 10
