NEW

2018

Part II 3-Tier

STATISTICS

PAPER—II

(General)

Full Marks : 90

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. (a) Derive Newton's Backward Interpolation Formula. When and why would you consider it appropriate ? 6+3

(b) Explain the difference between $\left(\frac{\Delta}{E}\right)^2 u_x$ and $\frac{\Delta^2 u_x}{E^2 u_x}$ 6

(b) Explain the construction of control chart for Range when (i) the standards are not given and (ii) the standards are given. 4+6

Group—C

Answer any *two* questions. 2×10

5. Define crude death rate (CDR) and specific death rates (SDR), and discuss their merits and defects. (2+2)+(3+3)

6. (a) Define crude birth rate (CBR) and state its defects. 2+3

(b) Explain the concept of age specific fertility rate (ASFR) and total fertility rate (TFR). 2½+2½

7. (a) What is the relation between gross reproduction rate (GRR) and net reproduction rate (NRR) ? 3

(b) What is a life table ? Show that

$$L_x = \frac{l_x + l_{x+1}}{2}$$ 2+3

(c) What is standard population ? 2

Group—D

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

8. Answer any *five* questions : 5×3

(a) Write down the use of F-distribution.

(b) Distanguish between type–II error and power of a test.

(c) If x follows F–distribution with n_1 and n_2 d.f. write down the distribution of $1/x$ and give one use of this result.

(d) If (X, Y) follows $BN(\mu_x, \mu_y, \sigma_x^2, \sigma_y^2, \rho)$, write down the test statistic for $H_o : \sigma_x^2 = \sigma_y^2$.

(e) What is a test statistic ? Give example.

(f) Graphically explain the concept of critical region.

(g) Distinguish between Fishers' t and Students' t.

(h) Given an example of an estimator which is biased but consistent.

9. (a) Let P be the probability that a coin will fall head in a single toss. In order to test $H_0 : P = \frac{1}{2}$ against $H_1 : P = \frac{3}{4}$ the coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of type 1 error and power of the test.

(b) Suppose we have two univariate normal distributions with known means μ_1, μ_2 and unknown variances σ_1^2, σ_2^2. Describe a procedure for testing the equality of the variances on the basis of independent samples.

(c) For a $N(\mu, \sigma^2)$ distribution where both μ and σ^2 are unknown, two hypotheses are (i) $H_i : \mu = \mu_0$ (ii) $H_2 : \mu > \mu_0$. Identify each of H_1 and H_2 as simple or composite. 7+5+3

10. (a) Define Pearsonian χ^2-statistic. Is it parametric or non-parametric ? 2+2

(b) How do you use the χ^2-statistic for tesing the goodness of fit. 6

(c) What do you mean by large sample test : Write down the procedure for testing the population proportion (p) when the sample size is sufficienty large. 5

11. (a) What is Maximum likelihood estimate (MIE) ? Write down the properties of MLE. 4+4

(b) Derive the ML estimator of μ and σ^2 of a normal distribution. 7
