OLD

2017

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. Describe the Newton Raphson method for numerical solution of equation involving a single unknown. Discuss briefly about the (i) Geometrical significance of the method and (ii) Convergence of the method. 7+4+4

(Turn Over)

2. (a) Show that

$$\sum_{x=0}^{\infty} u_{2x} = \frac{1}{2}\sum_{x=0}^{\infty} u_x + \frac{1}{4}\left(1 - \frac{\Delta}{2} + \frac{\Delta^2}{4} - \cdots\right) u_0 .$$

(b) Derive Tropezoidal rule and Simpson's $\frac{1}{3}$rd rule to obtain an approximate value of a definite integral mentioning the underlying assemptions. 6+4+5

Group—B

Answer any *one* question. 1×10

3. What do you mean by attribute control chart ? Discuss the construction of control chart for (i) number of defectives and (ii) traction defective when standards are not given. 2+4+4

4. (a) Explain clearly the terms "Assignable Cause" of variation and "Chance Cause" of variation in context of statistical quality control.

(b) Explain the construction of control chart for range when (i) the standards are given and (ii) the standards are not given. 4+(3+3)

Group—C

Answer any *two* questions. 2×10

5. Write short notes on the following :

(a) Net reproduction rate.

(b) Different sources of vital statistics. 5+5

6. (a) What is crude birth rate ? Discuss some merits and demerits of crude birth rate.

(b) What is general fortility rate ? Discuss some advantages and disadvantages of this fertility rate.

5+5

7. Discuss the assumptions, description and uses of a complete life table. 2+6+2

Group—D

Answer Q. No. *8* and any *two* questions from rest.

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

(a) Define Type I and Type II errors in the context of testing of hypothesis.

(b) If X and Y are independently distributed poisson random variables with means unity, what will be the pmf X + Y ?

(c) Distinguish between an estimator and an estimate.

(d) When will you say an estimator T to be MVU estimator for a parameter θ ?

(e) Write down the pdf of χ^2-distribution with 10 degrees of freedom.

(f) Distinguish between null hypothesis and alternative hypothesis.

(g) If $(x_1, x_2, \ldots, x_n)$ form a random sample from $N(\mu, a^2 = 1)$ population, verify that $\frac{1}{n+1}\sum_{i=1}^{n} x_i$ is a consistent estimator of μ.

(h) Distinguish between parameter and statistic.

9. (a) Distinguish between one-sided and two-sided tests.

(b) Describe the test procedure for testing $H_0 : \mu = \mu_0$ against all alternatives for a normal distribution with unknown variance.

(c) Discuss Pearsonian χ^2 test for goodness of fit.

3+7+5

10. (a) Derive the MLE of a parameter α of a population having density function
$$f(x) = \begin{cases} \frac{2}{\alpha^2}(\alpha - x), & 0 < x < \infty \\ 0, & \text{otherwise} \end{cases}$$
for a sample of unit size.

(b) If T is strictly positive unbiased estimator of θ, show that $\frac{1}{T}$ and T^2 are biased estimators of $\frac{1}{\theta}$ and θ^2, respectively.

(c) If x_1, x_2 are independent random variables each distributed as normal with zero mean variance 5, derive the distribution of $x_1 + x_2$. 5+5+5

11. (a) Let $(x_1, x_2, \ldots, x_n)$ be a random sample from a normal population with mean μ and variance σ^2. Prove that the sample mean and sample variance are independently distributed.

(b) Derive the mean and variance of χ^2-distribution with n d.f. 8+7