

NEW

Part-III 3-Tier

2015

STATISTICS

PAPER—IV (A+B)

(General)

Full Marks : 50

Time : 2 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.

Illustrate the answers wherever necessary.

Group—A

[Full Marks : 23]

Answer any *two* questions from Q. No. 1 to 4 : 8×2

1. Describe the following three fundamental principles of design in brief :

(a) Replication ;

(Turn Over)

- (b) Randomised block design ; *and*
 (c) Latin square design.

2. Discuss how the efficiency of an experiment can be increased by increased replication and local control.
3. In a Latin Square Design, the expectation of the yield X_{ijk} of the plot in the i^{th} row, j^{th} column receiving the k^{th} treatment is $\mu + \alpha_i + \beta_j + \gamma_k$ where $\sum \alpha_i = 0$, $\sum \beta_j = 0$ and $\sum \gamma_k = 0$ and variance of X_{ijk} is $\frac{\sigma^2}{r}$. How do you estimate the parameters μ , α_i , β_j and γ_k and find the variance of the estimate of α_i .
4. Explain what is meant by main effects and interactions in factorial experiment. A complete 2^3 -experiment is replicated r times. Describe the procedure for testing the presence of different main effects and interactions.

Answer *one* of the following *two* questions :

7

5. State the mathematical model used in analysis of variance in a one-way classification. Explain the hypothesis to be used and give the analysis of variance table.
6. Explain what you understand by 'Analysis of variance'. State the basic assumption in an analysis of variance. Write down the analysis of variance table for a two-way layout.

Group—B

[Full Marks : 22]

Answer any *two* questions from Q. No. 7 to 10: 8×2

7. What are the main sources of error in sample surveys designed to estimate the yield of what in India? How will you minimise these errors?
8. Using 'Random Number Tables', explain how you will obtain a simple random sample of size n from a population with a given p.d.f. (or, p.m.f.) $f(x)$.
9. Prove that in simple random sampling without replacement, sample mean square is an unbiased estimate of population mean square.
10. Explain the purpose of stratification in sample surveys. Obtain the estimate of the population mean by the method of stratified simple random sampling and compare its efficiency with that of simple random sampling.

Answer any *one* question from Q. No. 11 and 12: 6

11. Nine villages in a certain administrative area contain 793, 170, 970, 657, 1721, 1603, 864, 383 and 826 fields respectively. Make a random selection of 6 fields using the random numbers 7358, 922, 4112, 3596, 633 and 3999.

12. Explain the following terms in brief :

- (a) Population ;
- (b) Sampling with replacement ; *and*
- (c) Sampling without replacement.

[*Internal Assessment* — 5]

NEW
Part-III 3-Tier
2015

STATISTICS

(General)

PAPER—IV (C & D)

(PRACTICAL)

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full Marks.

Answer all questions.

1. Three different washing solutions are being compared to study their effectiveness in retarding bacteria growth in five-gallon milk containers. The analysis is done in a laboratory, and only three trails can be run on any day. Because days could represent a potential source of variability, the experimenter decides to use a randomized block design. Observations are taken for four days, and the data are shown here. Analyse the data and draw conclusions :

Solution	Days			
	1	2	3	4
1	13	22	18	39
2	16	24	17	44
3	5	4	1	22

2. A sample survey was conducted in a certain district of Bengal to estimate the number of apple orchards. Four strata A, B, C and D of villages were formed according to the acreage of temperate fruit trees as obtained from revenue records. A random sample of villages was selected from each stratum and the number of apple orchards in each selected village was noted. The relevant data are shown below :

Stratum	Total Number of villages (N_j)	Number of villages in sample (n_j)	Number of orchards in the selected villages
A (0-3 acres)	275	15	2, 5, 1, 9, 6, 7, 0, 4, 7, 0, 5, 0, 0, 3, 0
B (3-6 acres)	146	10	21, 11, 7, 5, 6, 19, 5, 24, 30, 24
C (6-15 acres)	93	12	3, 10, 4, 11, 38, 11, 4, 46, 4, 18, 1, 39
D (15 acres & above)	62	11	30, 42, 20, 38, 29, 22, 31, 28, 66, 41, 15

- (a) Estimate the number of orchards in the district.
 (b) Find the standard error of estimate of the number of orchards in the district. 10
3. Project Work (Using Computer Software). 20
4. Practical Note Book. 5
5. Viva-voce. 5