

Model Question Paper

Third Semester M.Sc Degree Examination (CSS)

ST3C15 : STATISTICAL COMPUTING - 2

Time: 3 hours

Total Weights: 30

(Answer any three questions. Each question carries weightage 10.)

1. Samples of sizes 100 and 60 from two districts on 3 characters are given below:

$$\bar{X}_1 = \begin{bmatrix} 71 \\ 87 \\ 95 \end{bmatrix}, \quad \bar{X}_2 = \begin{bmatrix} 75 \\ 76.7 \\ 93.3 \end{bmatrix},$$

$$A_1 = \begin{bmatrix} 2049 & -447 & 2275 \\ & 1681 & -735 \\ & & 2965 \end{bmatrix}, \quad A_2 = \begin{bmatrix} 1435 & -421 & 1329 \\ & 1680 & -312 \\ & & 1435 \end{bmatrix}.$$

Test for equality of population mean vectors, stating assumptions.

2. An experiment was carried out in RBD layout with 5 varieties of wheat in 3 replications. The results of the experiment are given below with two missing observations. Estimate the missing observations and analyse the data draw your conclusions.

		Varieties					
	<i>Blocks</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	
	1	...	185	157	162	141	136
	2	...	154	—	155	157	184
	3	...	165	186	135	—	215

3. An experiment to compare the performance of 5 varieties of rice were carried out using an incomplete block design. The five varieties are denoted as A, B, C, D and E. The result of

the experiment is reported below :

R_1	R_2	R_3	R_4	Blocks
A(12.4)	B(18.3)	C (6.5)	D(13.4)	B_1
C(13.1)	D (4.9)	E(15.5)	A(19.3)	B_2
D (6.6)	E(17.4)	A(18.7)	B(13.6)	B_3
E(18.5)	A(25.0)	B(16.4)	C(14.7)	B_4
B(13.1)	C (8.6)	D (6.4)	E(12.7)	B_5

4. For a Poisson population, construct an SPRT of strength (0.05, 0.01) to test the hypothesis mean = 1.75 against mean = 2.25.

- (i) Plot the acceptance and rejection regions on a graph.
- (ii) Draw the OC and ASN curves taking 5 appropriate points.
- (iii) Carry out the test for the following data on the number of defects observed in successively produced units in a factory.

2, 1, 0, 3, 4, 1, 3, 1, 0, 6, 2, 3, 4, 5, 1, 1.

5. Using the data given below, and considering the size classes a strata, compare the efficiencies of the following alternative allocations of a sample of 3000 factories for estimating the total output. The sample is to be selected with SRSWOR, within each stratum :

- (a) Proportional allocation.
- (b) Allocation proportional to total output.
- (c) Optimum allocation.

Sl.No.	Size class number of works	No. of factories	Output per factory (1000 Rs.)	Standard deviation (1000 Rs.)
1	1 – 49	18260	100	80
2	50 – 99	4315	250	200
3	100 – 249	2233	500	600
4	250 – 999	1057	1760	1900
5	1000 and above	567	2250	2500

6. An experienced farmer makes an eye estimate of the weight of peaches x_i on each tree in an orchard of $N = 200$ trees. He find the total weight of $X = 11,600$ lb. The peaches are picked and weighed on a simple random sample of 10 trees, with the following results:-

Tree Number	Actual wt. (y_i)	Est. wt. (x_i)
1	61	59
2	42	47
3	50	52
4	58	60
5	67	67
6	45	48
7	39	44
8	57	58
9	71	76
10	53	58
Total	543	569

Estimate the total actual weight using :

- (a) Ratio method
- (b) Regression method
- (c) Simple mean per element method

Compare their efficiencies.