

**Hindi Vidya Prachar Samiti's**  
**Ramniranjan Jhunjunwala College of Arts, Science and Commerce(Autonomous)**

**Programme: MSc. (Statistics)**

**Part-1**

**Semester-2**

**Practical based on Designs of Experiments**  
**Factorial Analysis**

- 1) A  $2^3$  factorial experiment was conducted to study the effect of variety, organic matter and weed control on rice. Experiment was established as three factorial effects with ABC effect confounded. In addition, four replicates were used in the experiment. The yield (kg/plot) recorded from the experiment is given as follows in the table.

	Block 1				Block 2			
	A	B	C	ABC	1	AB	AC	BC
1	1.9	1.6	2.1	3.8	1.3	3.2	2.8	3.2
2	3.0	2.7	3.0	4.8	2.2	4.1	3.9	4.1
3	4.0	3.8	4.1	5.9	4.2	5.2	5.1	5.0
4	1.9	1.5	2.0	3.9	1.1	3.4	3.0	3.0

Where three factors are A: Variety (Control, Improved) B: Organic matter (without, with) C: Weed control (without, with). Test the above dataset and interpret the result.

- 2) In a study carried by agronomists to determine it major differences in yields response to N fertilization exist among different varieties of jowar, the main plot treatment were three varieties of jowar (V1:CO-18, V2:CO-19 and V3:CO-22) and the sub plot treatments were N rates of 0.30 and 60 kg/ha. The study was replicated four times and the data gathered for the experiment is as follows

Replication	Variety	0	30	60
		Yield kg/plot		
I	V1	15.5	17.5	20.8
	V2	20.5	24.5	30.2
	V3	15.6	18.2	18.5
II	V1	18.9	20.2	24.5
	V2	15.0	20.5	18.9
	V3	16.0	15.8	18.3
III	V1	12.9	14.5	13.5
	V2	20.2	18.5	25.4
	V3	15.9	20.5	22.5
IV	V1	12.9	13.5	18.5
	V2	13.5	17.5	14.9
	V3	12.5	11.9	10.5

Analyze the data and draw conclusion

- 3) Consider a typical provenance study where a forest geneticist collects 3 seed from 2 trees in each of 5 forests. The seeds are germinated in a greenhouse and the seedlings are measured for height growth. The data is given as follows

	Forest				
Tree	A	B	C	D	E
1	15.8	18.5	12.3	19.5	16
	15.6	18.0	13.0	17.5	15.7
	16.0	18.4	12.7	19.1	16.1
2	13.9	17.9	14.0	18.7	15.8
	14.2	18.1	13.1	19.0	15.6
	13.5	17.4	13.5	18.8	16.3

Seedlings are nested within tree are nested within forest. Analyze the above data and interpret.

- 4) The surface finish of metal parts made on four machines is being studied. An experiment is conducted in which each machine is run by three different operators and two specimens from each operator are collected and tested. Because of the location of the machines, different operators are used on each machine, and the operators are chosen at random. The data are shown in the following table. Analyze the data and draw conclusions

	M1			M2			M3			M4		
Operator	1	2	3	1	2	3	1	2	3	1	2	3
	79	94	46	92	85	76	88	53	46	36	40	62
	62	74	57	99	79	68	75	56	57	53	56	47

- 5) Case Study

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