

UNIVERSITY OF MINES AND TECHNOLOGY, TARKW
SECOND SEMESTER EXAMINATIONS, MAY 2018

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COURSE NO : MA 470

COURSE NAME: DESIGN AND ANALYSIS OF EXPERIMENTS

CLASS: MA IV

TIME: 3 HOURS

Answer Question One and Any Other Two.

Q1 (a). Define the following as applied to experimental design:

i. Replication ii. Blocking iii. Interaction Effect iv. Experiment

(b). An experiment was conducted to study the performance of five tomato variety in a greenhouse using CRD. Tomato varieties were assigned to experimental units randomly. The experiment contained 25 plots and the yields values recorded from each plot are given in the table below:

Variety	Yield				
1	1.6	1.9	1.5	2.1	1.7
2	1.9	2.4	2.3	2.2	2.1
3	2.3	2.6	2.4	2.5	2.7
4	1.2	0.8	1.0	0.9	0.8
5	2.6	2.8	3.0	2.9	2.8

Use $\alpha = 0.05$ level of significance to test your result.

Q2 (a). State two assumptions of Randomized Complete Block Design

(b). To study the effectiveness of five different type of packaging, a processor of a breakfast food puts each kind into five different supermarkets J, K, L, M, N. Perform a two-way analysis of variance on the following data representing the number of sales of the breakfast food on a given day, to test the null hypothesis the packaging has no effect on sales at the 0.05 level of significance.

	J	K	L	M	N
Packaging 1	45	32	36	32	40
Packaging 2	37	34	46	44	34
Packaging 3	35	37	48	46	35
Packaging 4	36	38	50	36	45
Packaging 5	42	39	40	45	51

Q3 (a). Identify two limitations of Latin Square Design.

(b). Grain yield of three maize hybrids (A, B, and D) and a check (C) are presented in the table below. Test at $\alpha = 0.05$ level of significant, if there exist significant differences in the gain yield using Latin Square Design.

Row	Column 1	Column 2	Column 3	Column 4
1	1.640 (B)	1.210 (D)	1.425 (C)	1.345 (A)
2	1.475 (C)	1.185 (A)	1.400 (D)	1.290 (B)
3	1.670 (A)	0.710 (C)	1.665 (B)	1.180 (D)
4	1.565 (D)	1.290 (B)	1.655 (A)	0.660 (C)

Q4 (a). States two Advantages of Factorial Design.

(b). An investigation into the effect of the concentration of the reactant and the amount of the catalyst on the conversion (yield) in a chemical process was conducted. Let the reactant concentration be factor A, and the two levels of interest be 15% and 25%. The catalyst is factor B, with the high level denoting the use of two bags of the catalyst and the low level denoting the use of only one bag. The experiment is replicated three times. With the table below and 1% significant level, what conclusion can you give on the main effects?

Factor			Replicate		
A	B	Treatment Combination	I	II	III
-	-	A low, B low	28	25	27
+	-	A high, B low	36	32	32
-	+	A low, B high	18	19	23
+	+	A high, B low	31	30	29