



SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

**Higher National Diploma in Technology (Agriculture)
Second Year, Second Semester Examination - 2016
AG 2211: Field Experimentation and Design**

Instructions for Candidates:

The question paper contains part I and Part II
Answer all the questions in Part I & two questions in Part II
All questions do not carry equal marks.
Use given F and t tables.
Calculators are allowed to use.

No of questions : 05
No of pages : 05
Time: 1 ½ hours

Index Number.....

PART – I

Q1. (Total marks 20)

(i) Name four (04) activities perform during the **planning** of a field experiment

- a)
- b)
- c)
- d)

(04 marks)

(ii) Give two reasons for randomization.

- a)
- b)

(04 marks)

(iii) Give three advantages of Complete Randomized Design.

- a)
- b)
- c)

(06 marks)

(iv) Name the suitable experimental design for the following researches.

- a) Two factor level research under greenhouse
- b) Variety trial in a field having a moisture gradient and fertility gradient in opposite directions
- c) Fertilizer trial in a field having a moisture gradient in one direction

(06marks)

Q2. (Total marks 20)

A researcher has done an experiment and the results are given in the following ANOVA table. Answer the questions using the ANOVA table.

Sources of Variation	Degrees of freedom	Sum of squares	Mean Square	Calculated F value	Table F value at 5%
Treatment	5	255.28	51.06	17.19*	2.9
Replicate	3	192.56	64.19	21.61*	3.29
Error	15	44.52	2.97		
Total	23	492.36			

(i) What is the type of design that the researcher applied? **(02 marks)**

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(ii) How many treatments and experimental units did he apply for the research? **(04 marks)**

Treatment Experimental units

(iii) Briefly interpret the result. **(04 marks)**

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(iv) If the grand mean is 30.85, find the Coefficient of Variation. **(06 marks)**

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(v) Write two disadvantages of this type of design. **(04 marks)**

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PART II

Answer two (02) questions only.

Q3. (Total marks 30)

- (i) Compare Complete Randomized Design (CRD) with Randomized Complete Block Design (RCBD). **(04 marks)**
- (ii) Write the guidelines for “blocking” in field experimentation. **(06 marks)**
- (iii) Explain “systematic errors” in experiments. **(08 marks)**
- (iv) A researcher carried out a two-factor experiment (Factor A & Factor B) within a green house. He used 4 levels for Factor A and 3 levels for factor B and 4 replications for each.
- a) What is the experimental design he used? **(01 marks)**
- b) How many experimental units was he used? **(02 marks)**
- c) Write sources of variation for above experiment and find the degrees of freedom for each variation. **(09 marks)**

Q4. (Total marks 30)

- (i) List four factors to be considered in field experimentation. **(04 marks)**
- (ii) Give the suitable ranges of C.V (Co-efficient of Variation) values for following crop types.
- a) Field crops
- b) Horticultural crops
- c) Crops grown under soil **(06 marks)**
- (iii) Row-by-Column Summary table of data from a Latin Square Design and ANOVA table are given below.

Row	Column					Row total
	1	2	3	4	5	
1	34	34	30	33	24	155
2	37	29	34	35	33	168
3	36	36	37	27	35	171
4	33	37	37	38	34	179
5	35	39	33	37	36	180
Column total	175	175	171	170	162	853

ANOVA Table

Sources of Variation	df	SS	MS	Cal. F
Treatment	4?	28.96?
Rows	4??	
Columns	4??	
Error???	
Total	24	294.64		

If correction factor (CF) is 29104.36, Find,

- Error degrees of freedom (df) **(02 marks)**
- Treatment sums of squares (SS) **(02 marks)**
- Rows sums of squares (SS) and Mean Square (MS) **(04 marks)**
- Column sums of squares (SS) and Mean Square (MS) **(04 marks)**
- Error sums of squares (SS) and Mean Square (MS) **(04 marks)**
- Calculated F value for treatment **(02 marks)**
- The significance of the treatment at 0.05 level (Table F value for treatment at 0.05 level is 3.26). **(02 marks)**

Q5. (Total marks 30)

- Give the four (04) steps of field experimentation. **(04 marks)**
- The following data is given for an experiment conducted for five (5) treatments in CRD design with three (3) replicates.

Treatment	Replicates			Treatment total	Treatment means
	R1	R2	R3		
T1	42	35	30	107	35.7
T2	28	28	23	79	26.3
T3	19	20	13	52	17.3
T4	42	36	32	110	36.7
T5	33	26	31	90	30.0
Total				438	

Construct the ANOVA table and interpret your result at 5% significant level. Total Sums of Squares is given as 936.4. **(20 marks)**

iii. If the T5 is used as control, find which treatments are significantly differ at 5% significant level using LSD mean separation. (Standard error of mean difference (Sd) is 3.61). **(06 marks)**

F Distribution 5% level

Denominator	Numerator				
	df ₁ =1	2	3	4	5
df ₂ =1	161.4	199.5	215.7	224.6	230.2
2	18.51	19.00	19.16	19.25	19.30
3	10.13	9.552	9.277	9.117	9.014
4	7.709	6.944	6.591	6.388	6.256
5	6.608	5.786	5.409	5.192	5.050
6	5.987	5.143	4.757	4.534	4.387
7	5.591	4.737	4.347	4.120	3.972
8	5.318	4.459	4.066	3.838	3.688
9	5.117	4.256	3.863	3.633	3.482
10	4.965	4.103	3.708	3.478	3.326
11	4.844	3.982	3.587	3.357	3.204
12	4.747	3.885	3.490	3.259	3.106
13	4.667	3.806	3.411	3.179	3.025
14	4.600	3.739	3.344	3.112	2.958
15	4.543	3.682	3.287	3.056	2.901

Student's t distribution

(Two tailed Probability)

DF	0.10	0.05	0.01
1	6.314	12.706	63.657
2	2.920	4.303	9.925
3	2.353	3.182	5.841
4	2.132	2.776	4.604
5	2.015	2.571	4.032
6	1.943	2.447	3.707
7	1.895	2.365	3.499
8	1.860	2.306	3.355
9	1.833	2.262	3.250
10	1.812	2.228	3.169
11	1.796	2.201	3.106
12	1.782	2.179	3.055
13	1.771	2.160	3.012
14	1.761	2.145	2.977
15	1.753	2.131	2.947