UNIVERSITY OF FORT HARE

AGB 321

DEGREE EXAMINATIONS

NOVEMBER 2018

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Time: 3Hours

Subject: Applied Agricultural Biometry

Mark: 100

This paper consists of 6 pages including the cover page

Internal Examiners

Mr. A. Odeyemi

Prof Y Qin

External Examiner

Prof D J de Waal

INSTRUCTIONS

- Answer ALL questions
- Statistical Tables will be provided.

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QUESTION 1

1.1 Define mutual orthogonal contrast. Give one example.**[4]**

1.2 An experiment consisted of 5 treatments(control and 4 other treatments, A,B,C,D).Using the data below, collected from 4 reps, make the following comparisons using appropriate contrasts.

	Treatments					
Rep	Control	A	B	C	D	Total
1	24.7	32.3	33.3	30.8	29.3	150.4
2	25.3	34.0	33.0	34.3	26.0	152.6
3	26.9	34.3	36.3	35.3	29.8	162.6
4	25.0	35.0	36.8	32.3	28.0	157.1
Total	101.9	135.6	139.4	132.7	113.1	622.7

ANOVA

SV	DF	SS	MS	F
Rep	3	17.45	5.82	3.19
Trt	4	263.29	65.82	36.04***
Error	12	21.92	1.83	
Total	19	302.66		

***$p<0.001$ CV=4.34 RMSE=1.352 R^2= 0.928

1.2.1 Control versus others

1.2.2 C versus D

1.2.3 A versus B

1.2.4 C+D versus A+B

1.2.5 Are the contrasts mutually orthogonal? **[15]**

1.3 Separate the means of the same data using Duncan's New Multiple Range Test (DMRT). Present your results using the table format $\overline{X} \pm SD$. **[9]**

1.4 Suggest other four methods that can be used in place of DMRT.**[2]**

.....**[30MKS]**

QUESTION 2

2.1 What is the purpose of trend analysis? Give one example. **[5]**

2.2 The yields below are extracted from an experiment on the timing of harvesting rhubarb for canning.

	Blocks				
Date	1	2	3	4	Total
03-May	21.2	21.4	12.0	17.2	71.8
07-May	19.3	17.4	24.5	20.2	81.4
11-May	22.8	29.0	18.5	14.5	84.8
15-May	26.0	34.0	33.0	20.2	113.2
19-May	43.5	37.0	25.1	20.4	126.0
Total	132.8	138.8	113.1	92.5	477.2

ANOVA

SV	DF	SS	MS	F
Date	4	529.63	132.41	3.96*
Trt	3	263.84	89.95	2.63
Error	12	401.12	33.43	
Total	19	1194.59		

*$p<0.05$ CV=24.23 RMSE=5.782 R^2= 0.664

Using orthogonal polynomials , test the assumption that the yield is related to data of harvesting. **[15]**

2.3 State the basic assumptions of ANOVA. What is the implication of failure of these assumptions? **[5]**

.....[25MKS]

QUESTION 3

An animal researcher is interested in the relationship between urea nitrogen and the energy balance and the phosphorous balance. The researcher has randomly selected 16 cows that have been fed rations that contain high and low levels of energy and phosphorus. The data and SAS output result for the experiment are given below.

Treatment number	Y Urea N(mg/100ml)	X1 Energy Balance(kcal/d)	X2 P Balance(g/d)
1	9.5	8.1	21.3
2	10.2	8.4	25.9
3	11.0	8.5	24.8
4	11.2	10.9	28.4
5	12.3	7.5	-2.7
6	10.8	7.8	22.2
7	10.8	11.3	19.0
8	11.1	-5.4	8.5
9	11.7	7.6	17.9
10	11.8	8.3	-9.9
11	10.9	9.6	-8.4
12	12.4	9.5	-10.1
13	12.6	10.5	12.4
14	10.9	-5.4	7.8
15	11.3	6.4	8.9
16	10.8	5.7	9.4

Using the attached SAS output, answer the questions below.

3.1 What is response variable? What are the explanatory variables? **[5]**

3.2 Write the least-squares regression equation for this problem. **[5]**

3.3 Explain what each term in the regression equation represents in terms of the problem. **[5]**

3.4 Determine the lower and upper bound for the 95% confidence interval for β_1 and β_2.**[10]**

3.5 State a conclusion in the context of the problem. **[5]**

.....**[30MKS]**

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: Urea

Number of Observations Read	16
Number of Observations Used	16

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3.11594	1.55797	3.02	0.0839
Error	13	6.71343	0.51642		
Corrected Total	15	9.82937			

Root MSE	0.71862	R-Square	0.3170
Dependent Mean	11.20625	Adj R-Sq	0.2119
Coeff Var	6.41269		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.35729	0.33605	33.80	<.0001
energybalance	1	0.03276	0.03728	0.88	0.3954
Phosphorousbalance	1	-0.03419	0.01438	-2.38	0.0334

QUESTION 4

4.1 Name two tests that can be used to investigate

4.1.1 Normality of distribution of treatment groups. **[2]**

4.1.2 Homogeneity of variances across treatment groups. **[2]**

4.2 Given the following data set. You are required to verify whether the data set meet the assumption of equality of variances among treatment groups.

Data set

Data for weight gain by pigs fed with three different treatments (A, B, C):

Treatment		
A	B	C
4.2	1.4	38.7
2.3	10.7	26.3
6.6	14.3	5.4
6.1	10.4	10.3
10.2	15.3	16.9
11.7	11.5	43.1
7.0	19.8	48.6
3.6	12.6	29.5
$\overline{y_A}$ =6.46	$\overline{y_B}$ =12.34	$\overline{y_C}$ =27.35
S = 3.22	S = 4.53	S = 15.66

[6]

4.3 Give five common data transformation methods. **[5]**

..... **[15MKS]**