



**KABARAK**

**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2010/2011 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN  
ECONOMICS AND MATHEMATICS**

**COURSE CODE: MATH 317**

**COURSE TITLE: STATISTICS THROUGH APPLICATIONS**

**STREAM: Y3S1**

**DAY: THURSDAY**

**TIME: 9.00 – 11.00 A.M**

**DATE: 17/03/2011**

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**INSTRUCTIONS:**

1. Answer question **ONE** and any other **TWO** questions
2. Show your workings clearly

**PLEASE TURN OVER**

**QUESTION ONE (30 marks)**

- a) Outline research procedure cycle one has to follow for a credible study as taught to you in this course **[5 marks]**
- b) Define the following terms: Completely randomized design, replication, two-tailed test, paired comparison, one -way classification and two- way classification **[4 marks]**
- c) Distinguish between Karl Pearson’s correlation coefficient and Spearman’s rank correlation coefficient, showing clearly when one selected over the other **[ 4 marks]**
- d) Why do we code the data? **[3 marks]**
- e) In a survey, what is an open ended question? Describe the difficulties you encounter in coding the answers in open ended questionnaire **[6 marks]**
- f) Write in full the terms: SPSS and SAS **[4 marks]**
- g) Which hypotheses does chi-squares test **[ 4 marks]**

**QUESTION TWO (20 MARKS)**

- a) State the model and assumption associated with a one way classification **[2 marks]**
- b) A research worker was interested in finding out whether or not there were differences in disintegration times of a narrow group of four types of tablets; A, B, C, and D. The data is presented in Table 1.

Table 1. Disintegration times (seconds) for the tablets

Types of tablets	Observations	Totals
A	6, 2, 5, 4, 6, 7	30
B	10, 8, 11, 7, 7, 9	52
C	3, 7, 6, 4, 8, 6	34
D	10, 4, 6, 6, 7, 8	41

- i) Test the hypothesis of equal response of tablets at  $\alpha = 0.05$  **[5 marks]**
  - iii) Separate treatment means using LSD at 5% and comment on the results **[4 marks]**
  - iv) Estimate model parameters **[3 marks]**
- c) The researcher took a random sample of residents and asked about their attitudes toward future population growth. The following table cross-tabulates community participation with attitudes towards growth. Test the hypothesis of agreement at  $\alpha=0.05$ .  $\{ \chi_{0.05}^2(3) = 7.815 \}$ . **[6 marks]**

Community participation	Attitude Towards Growth			Total
	Negative	Positive	Neutral	
Leader	10	6	38	54
Nonleader	30	71	19	120
Total	40	77	67	174

**QUESTION THREE (20 MARKS)**

a) Calculate Karl Pearson correlation coefficient of the following data and test the appropriate hypothesis at  $\alpha = 0.05$  **[8 marks]**

b) Estimate parameters of the linear regression from the data and test appropriate hypothesis for intercept and slope at  $\alpha=0.10$  Tabulated ( $t_{0.05}(7) = 1.833$ ) **[12marks]**

Table 3. Income(y) and input (X) data

X	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	14	13	16	15

**QUESTION FOUR (20 MARKS)**

a) The response in time in milliseconds was determined for three different types of circuits used in an automatic value machine. The results were:

Circuit type	Response time				
1	9	12	10	8	15
2	20	21	23	17	30
3	6	5	8	16	7

i) Test the hypothesis that the three circuit types have the same response time. Use  $\alpha=0.01$  and tabulated  $F_{0.005}(2,12)=6.93$ . **[5 marks]**

ii) use LSD's test to compare pairs of treatment means (Use critical value  $t_{0.05(12)}=1.782$ ). **[5 marks]**

iii) Construct a set of orthogonal contrasts, assuming that at the outset of the experiment you suspected the response time of circuit type 2 to be different from the other two. **[5 marks]**

b) A new filtering device was installed in purifying water at KABU. Before installation, a random sample yielded the following information about the percentage of impurity:  $\bar{y}_1=12.5$ ,  $S_1^2 = 101.17$  and  $n_1=8$ . After installation, a random sample yielded  $\bar{y}_2=10.2$ ,  $S_2^2 = 94.73$ , and  $n_2=9$ . Can you conclude that the two variances are equal? Has the filtering devices reduced the percentage of impurity significantly? (i.e. test  $H_0:\mu_1=\mu_2$  against  $H_1:\mu_1\neq\mu_2$ ).  $\{F_{0.05}(7,8)=3.23\}$ ,  $t_{(0.025,15)}=2.131$  **[5 marks]**

**QUESTION FIVE (20 MARKS)**

a) You are given this hypothetical table made by a biological research scientist of yield of four maize varieties planted in three replications under 3 applied nitrogen fertilizer level. Arrange the data in a appropriate layout so that we can analyze it using either SPSS, SAS or GenStat softwares. **[8 marks]**

Yield bags/ha Total			
Variety	Rep 1	Rep2	Rep 3
$N_1$ (0 Kg N/ha)			
$V_1$	46	74	69
$V_2$	80	106	95
$V_3$	71	93	92
$V_4$	80	118	78
$N_2$ (60 Kg N/ha)			
$V_1$	71	139	92
$V_2$	93	147	125
$V_3$	96	142	131
$V_4$	97	139	96
$N_3$ (120 Kg N/ha)			
$V_1$	139	131	163
$V_2$	134	159	120
$V_3$	162	144	160
$V_4$	134	175	139

b) The following data was collected from an RCBD. State the model and analyze by constructing ANOVA table and testing the hypothesis of equal varieties as well as blocks at  $\alpha = 0.05$  [use

Yield bags/ha			
Variety	Rep 1	Rep2	Rep 3
$V_1$	46	74	69
$V_2$	80	106	95
$V_3$	71	93	92
$V_4$	80	118	78

critical value  $F_{0.05}(3,6) = 4.76$ ;  $F_{0.05}(2,6) = 5.14$

**[6 marks]**

c) Assume 1<sup>st</sup> and third varieties are controls and 2<sup>nd</sup> and 4<sup>th</sup> varieties New. In your ANOVA table partition the varieties by compare controls vs New varieties; among the new varieties and among the controls at  $\alpha = 0.05$

$$F_{0.05}(1,6) = 5.99$$

**[6 marks]**