



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF QUANTITY SURVEYING

STATISTICS II

AQS 2209

Main Examination Paper

May 2015

This examination paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: C. Mhungu

INSTRUCTIONS

1. Answer any four (4) questions
2. Each question carries 25 marks

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25

Question 1

- a) Describe the following terms in relation to experimental design
- i. Randomization [2]
 - ii. Replication [2]
 - iii. Blocking [2]
 - iv. Treatment [2]
 - v. Factors [2]

- b) A survey of 320 construction firms with 5 Quantity Surveyors each classified as males or females are shown below: F- Females, M- Males

Number males & females Quantity Surveyors	5 M	4 M	3 M	2 M	1 M	0 M	Total
	0 F	1 F	2 F	3 F	4 F	5 F	
Number of construction firms	18	56	110	88	40	8	320

Required:

Test at 5% level of significance that the male and female Quantity Surveyors are proportionally the same [15]

Question 2

- a) Two groups A and B, consists of 100 people each who have a respiratory disease after working at a cement manufacturing company. A serum is given to group A but not to group B, otherwise the two groups are treated identically. It is found that in groups A and B, 75 and 65 people respectively recover from the disease. Use a Chi-Square test at 0.05 level of significance to test if the serum helps to cure the disease. [13]

- b) Workers Union Chairperson of a small Consultant Quantity Surveyor firm claims the standard deviation of salaries is less than \$270. A sample of 12 workers showed the salaries below (in US\$). Assume the variable is normally distributed

400 462 502 700
 1020 990 250 375
 560 360 425 400

At 0.10 level of significance, is there enough evidence to support the union's claim? [12]

Question 3

In an investigation to determine the amount of rainfall (0.01 centimetres) and the quantity of corrosion of a building (micrograms per cubic meter), the following data were collected:

Daily Rainfall (x)	4.3	4.5	5.9	5.6	6.1	5.2	3.8	2.1	7.5
Quantity of Corrosion(y)	126	121	116	118	114	118	132	141	108

(a) Draw a scatter diagram of y against x on graph paper. Fit the least squares straight line to these data and draw your fitted line on your scatter diagram. [10]

(b) Carry out an analysis of variance (ANOVA) to test at the 5 % level of significance whether the slope is significantly different from zero. From your ANOVA table, compute the coefficient of determination, r^2 , and interpret it. [9]

(c) Predict the amount of corrosion when the daily rainfall is $x = 4.8$. Compute the standard error of the predicted value and hence construct the 95 % confidence interval of this prediction. [6]

Question 4

Three different washing solutions are being compared to study their effectiveness in retarding bacteria growth in 5-gallon milk containers. The analysis is done in a laboratory, and only three trials can be run on any day. Because days could represent a potential source of variability, the experimenter decides to use a randomized block design. Observations are taken for four days, and the data are shown here. Analyze the data from this experiment (use $\alpha = 0.05$) and draw conclusions [25]

<i>Days</i>				
Solution	1	2	3	4
1	13	22	18	39
2	16	24	17	44
3	5	4	1	22

Question 5

The table below shows the analysis of attitude of students from 3 colleges in Zimbabwe to student participation in determining college curricula. Test at 5% significance level if the 3 samples come from populations with equal means. [25]

Group

1	2	3
15	17	6
18	22	9
12	5	12
12	15	11
9	12	11
10	20	8
12	14	13
20	15	14
	20	7
	21	