NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF QUANTITY SURVEYING

STATISTICS II

AQS 2209

Supplementary Examination Paper

July 2015

This examination paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: C. Mhungu

INSTRUCTIONS

1. Answer **ALL** questions
2. Each question carries 25 marks

MARK ALLOCATION

QUESTION	MARKS
1.	**25**
2.	**25**
3.	**25**
4.	**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) In one of the Boston city parks, there has been a problem with muggings in the summer months. A police cadet took a random sample of 10 days (out of the 90-day summer) and compiled the following data. For each day, *x* represents the number of police officers on duty in the park and *y* represents the number of reported muggings on that day.

X	10	15	16	1	4	6	18	12	14	7
Y	5	2	1	9	7	8	1	5	3	6

a. Construct a scatter diagram of *x* and *y* values. [5]

b. From the scatter diagram, do you think the computed value of *r* will be positive, negative, or zero? Explain [5]

c. Find the value of r [5]

Question 2

A chemist wishes to test the effect of 4 chemical agents on the strength of a particular type of cloth. Because there might be variability from one bolt to another, the chemist decides to use a randomized block design, with the bolts of cloth considered as blocks. She selects 5 bolts and applies all 4 chemicals in random order to each bolt. The resulting tensile strengths follow. Analyse the data from this experiment (use α =0.05) and draw appropriate conclusions. [25]

		Bolt			
Solution	***1***	***2***	***3***	***4***	***5***
1	73	68	74	71	67
2	73	67	75	72	70
3	75	68	78	73	68
4	73	71	75	75	69

Question 3

Consider an experiment to determine the effects of alcohol and marijuana on driving. Five randomly selected subjects are given alcohol to produce legal drunkenness and then are given a simulated driving test (scored from a top score of 10 to a bottom score of 0). Five different randomly selected subjects are given marijuana and then the same driving test. Finally a control group of five subjects is tested for driving while sober. Given the following driving test scores, test for the significance of differences among means of the following groups. Assume $\alpha = 0.05$

[25]

Alcohol	Marijuana	Control
3	1	8
4	6	7
1	4	8
1	4	5
3	3	6

Question 4

The marks of an assignment and the final examination for Quantity Surveying Course are as follows for some 7 students.

Student	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Assignment (X)	50	35	72	45	85	47	79
Final Exam (Y)	62	45	77	56	91	50	83

a. It is assumed that the exam mark depends on the assignment marks. Draw a scatter diagram for the relationship and from the scatter diagram comment whether it is possible to fit a linear model. [5]

b. Assuming that the linear model exists, fit the model. [2]

c. Carry out an analysis of variance (ANOVA) at α =0.05 level of significance to test whether the slope is significantly different from zero. [10]

d. From the ANOVA table in (d) compute the correlation coefficient r and coefficient of determination r^2 and interpret both of them. [2]

e. Calculate the fitted values for the exam and the corresponding residual model in (b) above. Plot the residual versus the fitted values and comment on them. [6]