

- d) The following are scores of certain randomly selected students at Midterm (MT) and final examinations.

MT scores X	55	57	72	90	57	74	
Final scores Y	80	76	63	58	56	37	75

Use the Mann-Whitney U test to test the hypothesis that the distribution of the scores at the two occasions is the same against the alternative that it's not the same at a 5% level of significance.

(7 Marks)

- e) Given the following data 2.4, 2.8, 3.6, 4.1, 3.9, 2.2, 3.8; use the Wilcoxon signed rank test at 0.05 level of significance that

$$H_0 : m = 3$$

$$H_1 : m > 3$$

Where m is median of the distribution

(6 Marks)

QUESTION TWO (20 MARKS)

- a) Nine experts rated four brands of Kenyan Coffee in a taste-testing experiment as shown in the table below;

EXPERT	BRAND			
	A	B	C	D
E1	24	26	25	22
E2	27	27	26	24
E3	19	22	20	16
E4	24	27	25	23
E5	22	25	22	21
E6	26	27	24	24
E7	27	26	22	23
E8	25	27	24	21
E9	22	23	20	19

Test at 0.05 level of significance if there is evidence of difference of the four brands of Kenyan Coffee

(10 Marks)

- b) In an experiment to determine which of three different missile systems is preferable, the propellant burning rate is measured. The data, after coding, are given in the table below;

Missile system 1	20	31	24	33	23	24	28	16	19	26
Missile system 2	29	18	29	19	20	21	34	33	30	23
Missile system 3	19	31	16	26	31	33	28	28	25	30

Test the hypothesis that the propellant burning rates are the same for the three missile systems at the 0.05 level of significance.

(10 Marks)

QUESTION THREE (20 MARKS)

- a) The Table below presents voter reactions to a new property tax plan according to party affiliation. From these data, construct a table of the expected frequencies based on the assumption that there is no relationship between party affiliation and reaction to the tax plan.

Party Affiliation	Reaction			Total
	In favor	Neutral	Opposed	
Jubilee	120	20	20	160
ODM	50	30	60	140
KANU	50	10	40	100
Total	220	60	120	400

Test the null hypothesis that there is no relationship between party affiliation and voter reaction, using the 1% level of significance.

(10 Marks)

- b) Test the hypothesis by the Kolmogorov – Smirnov test that the following sample values came from a normal distribution with Mean 7.737 and Standard Deviation 1.497 at 5% level of significance

5.8, 7.3, 8.7, 7.1, 8.8, 6.8, 10.1, 8.6, 9.0, 9.3, 6.4, 6.4, 7.0, 7.2, 9.9, 5.2

(10 Marks)

QUESTION FOUR (20 MARKS)

- a) Let $(X_1, Y_1), (X_2, Y_2), \dots, (X_n, Y_n)$ be a random sample of n papers drawn from a bivariate population. Suppose that the X and Y observations are ranked from the smallest to largest. Let R_i be the rank of X_i and S_i be the rank of Y_i . If we define $D_i = R_i - S_i$. Show that the Spearman Rank Correlation is given by;

$$r_s = 1 - 6 \frac{\sum_{i=1}^n D_i^2}{n(n^2 - 1)}$$

(10 Marks)

- b) A joint stock company, had the prices of preferences shares and debentures given below

Shares	73.2	85.8	78.9	77.2	75.8	81.2	83.8
Debentures	97.8	99.2	98.8	98.3	98.3	96.7	97.1

Use the Spearman's Rank Correlation to check the hypothesis of independence of the prices for the shares and debentures.

(10 Marks)

QUESTION FIVE (20 MARKS)

- a) A convenience food store was introduced into the market in Jan 2011. After a poor year in sales, the owners initiated an intensive advertising campaign during Jan 2013. The table shows records of sales in Shs. 10,000, for one month period before and a one month period after the advertising campaign for each of the 10 regions.

Region	1	2	3	4	5	6	7	8	9	10
Before Campaign	2.4	2.6	3.9	2.0	3.2	2.2	3.3	2.1	3.1	2.2
After campaign	3.0	4.0	4.1	4.8	2.4	3.4	4.0	3.3	4.2	3.9

Test at 5% level of significance the hypothesis that coaching has no effect on average marks against a two – sided alternative hypothesis using a sign test

(10 Marks)

- b) A survey of 320 families with 5 children each revealed the following distribution.

Number of boys	5	4	3	2	1	0
Number of girls	0	1	2	3	4	5
Number of families	14	56	110	88	40	12

Is this result consistent with the null hypothesis that male and female are equally likely? Use 5% level of significance.

(10 Marks)