CHUKA **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE, BACHELOR OF EDUCATION & BACHELOR OF ARTS

MATH 454: NON-PARAMETRIC METHODS

STREAMS: BSC, BED, BA **TIME: 2 HOURS**

DAY/DATE: MONDAY 07/12/2018 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS: Answer question ONE (Compulsory) and any other TWO questions

QUESTION ONE (30 MARKS)

(a) The following are the number of hours which ten students studied for an experimentation and the marks which they obtained

Number of hours	8	2	15	18	5	10	13	11	5	8
Marks scored	65	33	85	94	54	70	72	79	44	56

(i) Compute the spearman's rank correlation coefficient [4 marks]

(ii) Is the spearman's rank coefficient in (i) significantly greater than zero? Assume alpha = 1% [4 marks]

(b) The cost of land per acre (in thousands of dollars) is presented below for 15 pieces of land is an exclusive housing subdivisions

98.2	96.0	97.3	95.2	97.5
100.3	97.0	96.1	99.1	93.2
98.5	96.8	95.3	94.5	97.4

Using the Wilcoxon tables, Person the signed rank test at alpha = 5% to test the claim that median cost of land is 98.5 [8 marks]

(c) A movie producer is bringing out a new movie. In order to map out her advertising, she wants to determine whether the movie will appeal most to a particular age group or whether it will appeal equally to all age groups. The powder takes a random sample from persons, advertising a pre-reviewing show of the new movie and obtained the result in the table below

	Age group (years)			
Persons	< 20 years	20.39 years	40-60 yrs	60>
Liked the movie	320	80	110	200
Disliked the movie	50	15	70	60
Indifference	30	5	100	40
Total	400	100	200	300

Required: use chi-square test to arrive at the conclusion (Assume alpha = 5%)

[8 marks]

(d) Let $Y_1 < Y_2 < \ldots < Y_{28}$ denoted the order statistics of a random sample of size 28 from a distribution of a continuous type

Compute $P\left(Y_{20} < \pi_{0.75} < Y_{28}\right)$ [6 marks]

QUESTION TWO (20 MARKS)

The weights of 50 cartons of cooking fat are given below

61 40 43 42 77 67 63 59 63 59

76 52 52 59 59 67 51 46 63 57

62 66 47 63 56 70 77 42 67 69

46 58 60 56 70 66 48 54 62 41

39 45 52 62 69 53 65 67 65 72

Test the null hypothesis that the sample is random at 5% significance level [20 marks]

QUESTION THREE (20 MARKS)

(a) The following is an arrangement of men (M) and women (W) lined up to purchase tickets for FIFA world cup final 2018 in Russia.

WMWMMMMWWMMMMWWW

MMMMMWWWMWMMMMWM

MWMMMWMWWWMWMMMM

Test for randomness at 5% significance level [10 marks]

(b) The following are the marks awarded to three groups of student taught by different methods

Group X	Group Y	Group W
26	29	19
19	18	31
16	29	16
28	19	31
24	20	26
23	21	30
33	34	28
24	33	33
31	30	28
20	23	25

Use the Kruskas – Wallis test to test whether there is a different in the mark awarded to student taught by different methods at 5% significance level [10 marks]

QUESTION FOUR (20 MARKS)

(a) The following data are measured for the number of customer serviced per shift at counter of equity and KCB bank in Chuka town.

Equity	120	136	107	109	129	117	125	110	124	-	-	-	-
KCB	131	144	116	111	103	122	141	139	130	133	132	135	148

Required:

Test whether the two samples come from the same population at 5% significance level

[10 marks]

(c) The following measurement of the voltage per seconds recounted by an engineer

14	24	17	20	13	31	18	23	10	19
19	23	28	19	16	22	24	17	20	13
9	27	25	22	18	19	29	20	15	17
24	20	17	6	24	14	15	23	24	26

Use the sign test to test whether the mean is less than 21.5 at 5% significance level.

[10 marks]

QUESTION FIVE (20 MARKS)

(a) The following values form a random samples from a uniform distribution on the interval $[0,2]$

0.19	1.65	1.77	1.43	0.33	1.59	1.81	0.17
0.03	0.81	1.15	0.45	1.51	0.83	1.33	

Required:

Using the kolmagorov-Smirrov method, test the hypothesis that the values form a random samples from a uniform distribution at 5% significance level

(b) Given that $\sum_{ri} ¿ \sum s_i = \frac{n(n+1)}{2}$ and $\sum_{si}^{2} ¿ \frac{n(n+1)(2n+1)}{6}$ where r_i & s_i are rank of two samples. Prove that $r = 1 - \frac{\sum d_i^2}{n(n^2-1)}$

where d = difference of paired ranks

n = no. of observations [10 marks]
