CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE, ART AND EDUCATION

MATH 343: APPLIED STATISTICS

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

DAY/DATE: TUESDAY 06/04/2021 **8.30 A.M. – 10.30 A.M.**

INSTRUCTION: Answer Question One and any other TWO Questions

QUESTION ONE (30 MARKS)

(a) Explain the following terms as used in statistical hypothesis [5 marks]

(i) Null and alternative hypothesis

(ii) Simple and composite hypothesis

(iii) Level of significance

(b) Alfafa (kind of plants grown as fodder for animal) yields of 6 test plots are 1.5, 1.9, 1.2, 1.4, 2.3 and 1.3 tons respectively per hectare. Use a critical region of $\alpha = 0.05$ to test the hypothesis $H_0: \mu = 1.8$ vs $H_1: \mu \neq 1.8$. Assume that the yields have a normal distribution [6 marks]

(c) The following data represent the change (in ml) in the amount of carbon monoxide transfer in smokers with chickenpox over a one week period:

33 2 24 17 4 1 -6

Is there evidence of significant improvement in lung function

(i) If the data are normally distributed with alpha=10? [4 marks]

(ii) If the data are normally distributed with alpha unknown? [3 marks]

(d) The efficacy of a treatment for hypertension is to studied using a small clinical trial. 38 hypertensive patients were randomly allocated to either group 0 (Placebo control) or group 1(treatment) and a tree month follow-up study was carried out. At the end of the study the difference in blood pressure was measured for patients in each group and recorded. The summary of the results is presented below.

Group	Sample size	Mean	Variance
0	21	-0.208	4.101^2
1	17	3.953	4.630^2

Is there evidence of significant improvement in the treatment group? At 5% significance level [6 marks]

(e) A departmental store A has for competitors; B,C,D & E. Store A hires a consultant to determine if the percentage of shoppers who prefer each of the five stores is the same. A survey of 1100 randomly selected shoppers is conducted and the results about which one of the stores shoppers prefer are as shown below.

Store	A	B	C	D	E
No. of shoppers	262	234	204	190	210

Is there enough using a significant level of 5% to conclude that the proportions are really the same? [6 marks]

QUESTION TWO (20 MARKS)

(a) The following data is a sample of 11 loan applicants in a certain bank in Kenya. The applied loan is either approved or declined (status) against five risk variables namely age of applicants(X_1), applicants gender (X_2), amount of loan applied (X_3), applicant's salary (X_4) and proposed repayment period (X_5) as shown below.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.793	.246		3.225	.002
X_1	-.040	.066	-.043	-.607	.546
X_2	.186	.074	-.201	-2.511	.014
X_3	.200	.074	.203	2.691	.009
X_4	.685	.053	.883	12.992	.000
X_5	.345	.049	.526	17.523	.000

R Square=0.740: Adjusted R Square=0.727; F-Statistic=59.687(**.000)**

Required

Write a report on Multiple regression function and interpret the results [10 marks]

(b) A study investigating the association between size of cars and country found the following frequency counts

	USA	JAPAN	UK	FRANCE
ECONOMY	21	24	33	55
COMPACT	27	35	37	40
FULL SIZE	36	11	12	4
LUXURY	15	3	7	8

Is there sufficient evidence of a significant relationship between size of car and country?

[10 marks]

QUESTION THREE (20 MARKS)

(a) Patel is the manager of a bakery in Chuka town. He believes that the smell of fresh baking will encourage customers to purchase goods form his bakery. To investigate the this belief , he recorded the daily sales for ten weeks when all bakery windows are open and the daily sales for another ten weeks when all the windows are closed as shown below.

Windows	190.8	215.5	207.0	204.5	202.0
Open	185.7	204.1	187.8	208.8	215.6
Windows	205.4	177.6	199.4	192.2	193.5
closed	192.8	172.2	169.2	181.8	200.6

Assuming that these data may be deemed to be random samples from normal populations with same variance, investigate the bakers belief at 5% significance level. [10 marks]

(b) The data below represents a sample of mathematics achievement test scores and calculate grades for 10 independently selected Chuka University students.

Math test score (X)	72	82	93	65	76	89	81	58	95	91
Final calculate grade (Y)	75	79	84	71	82	91	85	68	90	92

Required:

Test whether the achievement test scores and calculated grades are independent at 5% significance level. [10 marks]

QUESTION FOUR (20 MARKS)

(a) The table of unit of fertilizer used and the units of yield in a science laboratory experience is as shown below.

Fertilizer	23	27	28	29	30	31	33	35	36	39
Yield	18	22	23	24	25	26	28	29	30	32

Required:

(i) Determine the Pearson correlation coefficient between fertilizer(X) and Yield (Y) [4 marks]

(ii) Using the results in b(i), test for the significance of the correlation coefficients at 5% significance level [6 marks]

(b) Two random samples taken from two normal populations are as follows

sample I	20	16	26	27	23	22	18	24	25	19		
Sample II	17	23	32	25	22	24	28	18	31	33	20	27

Estimate the variances of the populations and test whether the two populations have equal variance at 5% level of significance. [10 marks]

QUESTION FIVE (20 MARKS)

The data in the accompanying table relate mean yields of soybean plant obtained in response to the indicated levels of ozone exposure over the growing season.

X	Y
10	5
14	3
7	5
12	2
5	7
6	8

Required

i. Fit a simple linear regression model

ii. Compute the ANOVA

iii. Compute coefficient of determination and make comment

[20 marks]
