CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN ECONOMICS & STATISTICS AND BACHELOR OF ARTS IN MATHEMATICS AND ECONOMICS

MATH 343: APPLIED STATISTICS

STREAMS: BSC (ECON & STAT), BA (MATH & ECON) **TIME: 2 HOURS**

DAY/DATE: FRIDAY 09/7/2021 **11.30 A.M. – 1.30 P.M.**

INSTRUCTION: Answer Question One and any other TWO Questions

QUESTION ONE (30 MARKS)

(a) An experiment was conducted to test the efficacy of chloromycetin in checking typhoid. In a certain hospital chloromycetin was given to 285 out of the 392 patients suffering from typhoid as shown below.

	Typhoid	No Typhoid	Total
Chloromycetin	35	250	285
No Chloromycetin	50	57	107
Total	85	307	392

Required

With the help of χ^2, test at 5%, test the effectiveness of chloromycetin in checking typhoid. [6 marks]

(b) A certain kind of plants grown as fodder for animal had yields of 6 test plots has 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 [5 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? [4 marks]

(d) The advisor of Statistics club of a large college believes that the group consists of 10% freshmen, 20% sophomores, 40% juniors and 30% seniors. The membership for the club this year consisted of 14 freshmen, 19sophomores, 51 juniors and 16 seniors. At $\alpha = 10\%$ test the advisors conjecture. [5 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 evidence 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 15 patients in a certain Health facility in Kenya. The level of illness is classified in stages (Efficacy) against two concentration variables namely CA Breast concentration(X_1), and Health control concentration (X_2) as shown below.

Model Summary				
Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	*.953[a]*	*.909*	*.895*	*.375*
a. Predictors: (Constant), HEALTH CONTROL, CA BREAST CONC				

ANOVA[a]						
Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	*Regression*	*18.173*	*2*	*9.086*	*64.637*	*.000[b]*
	Residual	*1.827*	*13*	*.141*		
	Total	*20.000*	*15*			
a. Dependent Variable: EFFICACY						
b. Predictors: (Constant), HEALTH CONTROL, CA BREAST CONC						

Coefficients[a]						
		Unstandardized Coefficients		*Standardized Coefficients*		
Model		*B*	*Std. Error*	*Beta*	*t*	*Sig.*
1	*(Constant)*	*1.018*	*.177*		*5.736*	*.000*
	CA BREAST CONC	*.064*	*.132*	*.173*	*.483*	*.637*
	HEALTH CONTROL	*.547*	*.251*	*.784*	*2.184*	*.048*
a. Dependent Variable: EFFICACY						

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 Open	190.8	215.5	207.0	204.5	202.0
	185.7	204.1	187.8	208.8	215.6
Windows closed	205.4	177.6	199.4	192.2	193.5
	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.

X	72	82	93	65	76	89	81	58	95	91
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. Construct the ANOVA table and interpret the results
iii. Compute coefficient of determination and make comment

[20 marks]
