

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

### EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF ARTS

#### SOCI 475: SOCIAL STATISTICS II

STREAMS:

TIME: 2 HOURS

DAY/DATE: MONDAY 20/09/2021

8.30 A.M – 10.30 A.M

#### INSTRUCTIONS

- Answer question one and any other two questions
- Use illustrations where appropriate

1. (a) Distinguish between:
  - (i) Individual and grouped data [2 marks]
  - (ii) One tailed test and two tailed test [2 marks]
  - (iii) Parametric and non parametric test [2 marks]
  - (iv) Hypothesis and assumption [2 marks]
- (b) Identify the assumptions that data must meet to perform analysis of variance. [4 marks]
- (c) Discuss the four possible outcomes of hypothesis testing? [4 marks]
- (d) Absenteeism of college students from statistics classes is a major concern to statistics instructors because missing class appears to increase the dropout rate. Suppose that a study was done to determine if the actual student absenteeism rate follows faculty perception. The faculty expected that a group of 100 students would miss class as shown in the table below.

Number of absentees per term	Expected number of students
0 – 2	50
3 – 5	30
6 – 8	12
9 – 11	6
12 +	2

A random survey across all statistics courses was then done to determine the actual number (observed) of absences in a course. The table below displays the results of that survey.

Number of absences per term	Actual number of students
0 - 2	35
3 - 5	40
6 - 8	20
9 - 11	1
12+	4

Conduct a goodness of fit hypothesis test at 5% significance level. [7 marks]

(e) A one tailed test of two sample hypothesis involving the difference of sample means yields  $t = 1.85$  with 12 degrees of freedom. What is the P- value? [3 marks]

(f) Suppose we are interested in knowing whether the proportion of households in an area who own two cars differs from the city wide figure of 0.2. We survey  $n = 50$  households, and find  $p = 16/50 = 0.32$ . Use  $\alpha = 0.05$  and conduct a hypothesis testing to ascertain. [4 marks]

2. (a) A clinic provides a program to help their clients lose weight and asks a consumer agency to investigate the effectiveness of the program. The agency takes a sample of 15 people weighing each person in the sample before the program begins and 3 months later to produce the data in the table below. Determine whether the program is effective at  $\alpha = 0.05$ . [10 marks]

Person	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before	210	205	193	182	259	239	164	197	222	211	187	175	186	243	246
After	197	195	191	174	236	226	157	196	201	196	181	164	181	229	231

(b) For the data given in the table below; test at 0.05 level of significance whether the number of errors a composer makes in settling a gallery of type is a random variable having a poisson distribution with number of error, observed frequencies and poisson probabilities with  $\lambda = 3$ . [10 marks]

Number of errors	Observed frequencies	Poisson probabilities with $\lambda = 3$
0	18	0.0498
1	53	0.1494
2	103	0.224
3	107	0.224
4	82	0.1680
5	46	0.1008
6	18	0.0504
7	10	0.0216
8	2	0.0081
9	1	0.0038

3. (a) using the following data, perform a one way analysis of variance using  $\alpha = .05$   
[12 marks]

Group 1	Group 2	Group 3
51	23	56
45	43	76
33	23	74
45	43	87
67	45	56

- (b) in the comparison of two kinds of paint, a consumer testing finds that four 5 litre cans of one brand cover on average 546 square metres with a standard deviation of 31 square metres, whereas four 5-litre cans of another brand cover an average of 492 square metres with a standard deviation of 26 square metres. Assuming that the two populations sampled are normal and have equal variances, test the null hypotheses that mean area covered are equal at 5 per cent level of significance.  
[8 marks]

4. (a) An equal number of three butterfly species A,B and C were introduced into a forest to breed. The  $H_0$  was that all butterfly species will yield an equal proportions of butterflies. The  $H_1$  was that the three different butterfly species will actually yield different numbers of butterflies. During field work, a sample of 2,512 butterfly were caught randomly. Among these, 1123 were species A, 788 species B and 601 species C. Use the Chi-square test to establish whether the number of the different butterfly species caught is compatible with the  $H_0$  at 5% significance level.  
[10 marks]

(b) Male graduate students met at the annual sociology association conference last year, one of them was a graduate student from Chuka University and the other was a graduate student at Moi University. After the function they went to a club and after a few drinks the conversation quickly turned into an argument about which University, Chuka or Moi has a more attractive sociology undergraduate female population. The argument went on and as graduate students they decided to use their research abilities and answer the questions scientifically. They both randomly selected 35 undergraduate female sociology student from each school, 33 agreed to participate from Moi and 30 from Chuka. Each participant's photo was shown to a panel of judges and the average score (out of 10) is shown for each participant in the table below. Is there a difference in attractiveness of sociology female undergraduate population in the two Universities? Use 5% level of significance.

[10 marks]

Moi		Chuka		Moi		Chuka	
Subject	Rating	Subject	Rating	Subject	Rating	Subject	Rating
1	4	1	8	18	5	18	7
2	6	2	7	19	7	19	8
3	6	3	7	20	3	20	7
4	8	4	8	21	6	21	8
5	3	5	5	22	4	22	9
6	3	6	6	23	6	23	8
7	7	7	6	24	3	24	7
8	4	8	6	25	5	25	8
9	3	9	7	26	2	26	7
10	5	10	9	27	4	27	6
11	7	11	7	28	6	28	7
12	6	12	8	29	5	29	7
13	8	13	6	30	7	30	7
14	6	14	7	31	4		
15	8	15	6	32	2		
16	4	16	8	33	3		
17	3	17	7				

5. The table below shows hypothetical ages and weights of form 3 students at Chogoria Girls.

Student No.	Age (years)	Weight (kgs)	student No.	Age (years)	Weight (kgs)
1	20	59	16	18	56
2	17	51	17	17	61
3	18	62	18	20	62
4	17	54	19	19	61
5	19	65	20	21	59
6	22	66	21	16	52
7	21	60	22	24	65
8	17	66	23	17	56
9	23	68	24	20	62
10	20	63	25	23	59
11	21	59	26	18	60
12	22	59	27	16	54
13	19	57	28	20	59
14	21	58	29	19	64
15	18	63	30	18	57

- (i) Plot a scatter diagram of the students 'ages and weight. [4 marks]
- (ii) Calculate the Pearson's product moment correlation coefficient. [6 marks]
- (iii) Test the significance of correlation co-efficient at 0.05 significance level (2 tailed). [2 marks]
- (iv) Compute the least square regression equation. [6 marks]
- (v) Predict the weight of a student who weighs is 53kgs. [2 marks]
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