MACHAKOS UNIVERSITY

University Examinations 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

HCU 301-INTRODUCTORY STATISTICS

Date: **Time:**

Instruction: Attempt question ONE and any other TWO questions

QUESTION ONE (30 MARKS)

(a). Explain the meaning of the following terms as applied in Statistics

(i) Population

(ii) Sample (2marks)

(b).Differentiate between EACH of the following terms:

i. Point and interval estimation (2marks)

ii. Acceptance and critical regions. (2 marks)

(c).The table below shows marks scored by students in a statistics examination

Class	40-44	45-49	50-54	55-59	60-64
Frequency	6	10	25	11	2

Calculate the mean and standard deviation (6marks)

(d).In the course of an audit it was found that from a simple random sample of 200 bad debts that the mean debt was £48.50 with a standard deviation of £6.50.Calculate a 95% interval for the mean debt (6marks)

(e).Given that $H_0: \mu = 100, H_a: \mu > 100, n = 64, \bar{x}$=110, s=40, test the null and alternate hypothesis at a significance of α=0.05. (3marks)

(e) Determine the values of a, b, c, d, e from the following ANOVA Table

	Sum of Squares	Degrees of Freedom	Mean Squares	F-Ration
Factor	205	b	c	e
Error	a	16	d	
Total	287	19		

(5 marks)

(f) A number is chosen at random from the numbers 1,2,….30.Determine the probability that it is:

i. divisible by 3

ii. divisible by 4

iii . divisible by both 3 and4

iv divisible by 4, given that it is divisible by 3. (4marks)

QUESTION TWO

(a) .A small company is interested in analyzing the effects of advertising on its sales over a five week period as shown below:

Money spend on advertising	2	5	7	10	11
Total sales	10	20	35	50	65

Use the data to determine correlation coefficient between the total sales and the money spend on adverting. (8marks)

b) A supermarket owner is studying how the average waiting time in minutes for customer checkout depends on the number of checkout clerks working as shown below

Checkout clerk	3	4	5	5	6	7
Waiting time	9	6	6	4	2	1

i) Determine the linear regression equation for waiting time as a function of the number of clerks on duty. (10marks)

ii) Use the equation on (i) above to predict the most likely waiting time for 9 checkout clerks (2marks)

QUESTION THREE

(a) Explain the meaning of the following terms as used in probability theory:

(i) An event

(ii) Random experiment

(i) Mutually exclusive events

(ii) Independent events (8marks)

b). The following are the speed, in miles per, of a group of cars on a high-way as measured with radar gun

58,62,59,53,61,55,57,54,59,53,66,60,58,60,61,58,56,60,58,62,57,55,53,55,61,57,52,58,49, 54,52,55,57,60,64,67.

(i) Construct a frequency distribution table with class interval by 45-49,…etc (6marks)

(ii) use the table in (i) above to calculate the mode and median (6marks)

QUESTION FOUR

a) The following frequency distribution, the lower quartile is 44.5. Determine the values of *a* and *b*

CLASS	**FREQUENCY**
30 – 34	7
35 – 39	12
40 – 44	a
45 – 49	b
50 – 54	38
55 – 59	15
60 – 64	8
	$\sum f = 200$

(8 marks)

(a) The mean weight of a consignment of 500 sacks of sugar is 151 kg and the standard deviation is 15kg.Assuming that the weight are normally distributed, determine how many sacks weigh:

(i) Between 120kg and 155kg (4marks)

(ii) More than 185kg (4marks)

(iii) Less than 128kg (4marks)

QUESTION FIVE

(a).A company has a computer system that can process 1200 bills per hour. A new system is installed that can process an average of 1260 bills per hour with a standard deviation of 215 bills in a sample of 40 hour. Test if the new system is significantly better than the old one at the 5% level of significance. (6marks)

(b).A survey is conducted among workers in a certain city to determine if there is any difference between proportions of women, men who drive, take a bus, or take a train to work. The results are as shown below:

	Drive	**Bus**	**Train**
Women	25	100	125
Men	75	120	205

(i) State the null and alternative hypothesis. (2 marks)

(ii) Construct the corresponding cross-tabular contingency table for the expected frequencies. (6 marks)

(iii) Test whether there is any difference in the proportions using the different modes of transport based on gender at $\alpha = 0.01$ level of significance. (6 marks)