# MACHAKOS UNIVERSITY

**University Examinations 2020/2021 Academic Year**

**SCHOOL OF HUMANITIES AND SOCIAL SCIENCES**
**DEPARTMENT OF FASHION DESIGN AND MARKETING**

University Supplementary Examinations
**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)