



# MACHAKOS UNIVERSITY

University Examinations for 2017/2018

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

THIRD YEAR SECOND SEMESTER EXAMINATIONS FOR

BACHELOR OF ECONOMICS AND STATISTICS

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS

BACHELOR OF ARTS

EES 301: STATISTICS FOR ECONOMISTS II

DATE: 11/12/2017

TIME: 11:00 – 1:00 PM

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## INSTRUCTIONS:

Answer Question One and Any Other Two Questions

### QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain the conditions necessary for the applicability of the following discrete probability distributions in statistical analysis.
- i) Binomial distribution (2 marks)
  - ii) Poisson distribution (2 marks)
  - iii) Exponential distribution (2 marks)
- b) Given the following consumption function estimated from a sample of 25
- $$C_t = 40 + 0.8Y_t$$
- s.e. (30) (0.2)
- i) Test the null hypothesis that disposable income has no influence on consumption against an alternative that follows the Keynesian consumption theory. (4 marks)
  - ii) Does the model follow theory? Are the results consistent with expectations? Explain. (2 marks)

- c) State and explain four main properties of a good estimator (4 marks)
- d) Consider the following data for two variables x (independent) and y (dependent)

|   |    |   |    |    |
|---|----|---|----|----|
| x | 2  | 3 | 5  | 6  |
| y | 10 | 5 | 20 | 25 |

- Develop the estimated regression equation for these data and interpret the coefficient (5 marks)
- e) Explain the steps followed in Chi- square test of independence and dependence (4 marks)
- f) A Vending Machine in the student cafeteria disposes drinks into paper cups. A sample of 15 cups yields a mean of 15.3 ounces with a variance of 3.5 ounces. After adjusting the machine, a sample of 10 cups produces an average of 17.1 ounces with a variance of 3.9 ounces. If the variance of the paper cups in the cafeteria is constant, before and after the adjustment. Construct a 95% C.I for the difference in mean fills (5 marks)

## QUESTION TWO (20 MARKS)

- a) A supervisor has 6 workers with the following job experiences 2, 4, 6, 6, 7, 8 ( $\mu=5.5$ ). 4 workers are chosen randomly for different shifts and their mean of experience recorded.
- How many samples can be generated (4 marks)
  - Generate probability distribution of the mean (4 marks)
  - Calculate  $E(x)$  (2 marks)
- b) Agriculture extension officers would like test the effective of 4 different fertilizers on the yields of tomatoes. They prepare samples of 5 plots for each and applied the fertilizers accordingly. The yields per plot for each of the fertilizers are given below. Using a 5% level of significance, test whether the fertilizers are equally effective. (10 marks)

| PLOT            | A          | B          | C          | D         |
|-----------------|------------|------------|------------|-----------|
|                 | 2          | 3          | 5          | 6         |
|                 | 3          | 4          | 5          | 8         |
|                 | 1          | 3          | 5          | 7         |
|                 | 3          | 5          | 3          | 4         |
|                 | 1          | 0          | 2          | 10        |
| <b>TOTAL</b>    | <b>10</b>  | <b>15</b>  | <b>20</b>  | <b>35</b> |
| <b>VARIANCE</b> | <b>0.8</b> | <b>2.8</b> | <b>1.6</b> | <b>4</b>  |

### QUESTION THREE (20 MARKS)

- a) A market research firm located in Nairobi collected data on the daily prices and the daily quantities of a product traded for 12 days as shown by the following data.

| Day | Quantity (Y) | Price(X) |
|-----|--------------|----------|
| 1   | 69           | 9        |
| 2   | 76           | 12       |
| 3   | 52           | 6        |
| 4   | 56           | 10       |
| 5   | 57           | 9        |
| 6   | 77           | 10       |
| 7   | 58           | 7        |
| 8   | 55           | 8        |
| 9   | 67           | 12       |
| 10  | 53           | 6        |
| 11  | 72           | 11       |
| 12  | 64           | 8        |

#### Required

- Develop the estimated regression equation that could be used to describe the relationship between the Prices and the quantities of the product in the market (8 marks)
  - Is it a demand or a supply function? explain your answer (3 marks)
  - Do you believe the estimated regression equation would provide a good prediction of the quantities traded in the market? use  $r^2$  to support your answer (4 marks)
- b) Taxis arrive at the airport at the rate of 12 per hour. You have just landed at the airport and must get to town as fast as possible for a business deal. What is the probability that your will get a taxi in the next 5 minutes? (5 marks)

### QUESTION FOUR (20 MARKS)

- a) A supermarket sales manager wishes to determine if there are any significant differences between regions in terms of the degree of acceptance of the new product. Using a sample he obtained the following information

| Region               |      |       |      |       |
|----------------------|------|-------|------|-------|
| Degree of acceptance | East | South | West | North |
| Poor                 | 26   | 50    | 14   | 90    |
| Moderate             | 16   | 27    | 17   | 60    |
| Strong               | 11   | 19    | 20   | 50    |

**Required**

- i) What was the sample size in this study (1 mark)
- ii) Determine the expected sample results (3 marks)
- iii) Calculate the chi- square statistic (3 marks)
- iv) Determine the degrees of freedom (2 marks)
- v) Assuming the sales manager allows 5% error, test whether the degree of acceptance varies from region to region significantly (2 marks)
- b) Distinguish between the following terms
  - i) Type I error and Type II error (3 marks)
  - ii) One – tailed test and Two – tailed test (3 marks)
- c) State the conditions necessary for the applicability of the student t - probability distributions in statistical analysis. (3 marks)

**QUESTION FIVE (20 MARKS)**

- a) Imagine you are a manager at a major bottling company. Customers have begun to complain that the bottles of the brand of soda produced in your company contain less than the advertised sixteen (16) ounces of product. Your boss wants to solve the problem at hand and has asked you to investigate. You have your employees pull thirty (30) bottles off the line at random from all the shifts at the bottling plant. You ask your employees to measure the amount of soda there is in each bottle. The measurements are shown by the table below

| Bottle Number | Ounces | Bottle Number | Ounces | Bottle Number | Ounces |
|---------------|--------|---------------|--------|---------------|--------|
| 1             | 14.23  | 11            | 15.77  | 21            | 16.23  |
| 2             | 14.32  | 12            | 15.80  | 22            | 16.25  |
| 3             | 14.98  | 13            | 15.82  | 23            | 16.31  |
| 4             | 15.00  | 14            | 15.87  | 24            | 16.32  |
| 5             | 15.11  | 15            | 15.98  | 25            | 16.34  |
| 6             | 15.21  | 16            | 16.00  | 26            | 16.46  |
| 7             | 15.42  | 17            | 16.02  | 27            | 16.47  |
| 8             | 15.47  | 18            | 16.05  | 28            | 16.51  |
| 9             | 15.65  | 19            | 16.21  | 29            | 16.91  |
| 10            | 15.74  | 20            | 16.21  | 30            | 16.96  |

## Required

- Write a two to three (2-3) page report in which you: (10 marks)
  - Calculate the mean, median, and standard deviation for ounces in the bottles.
  - Construct a 95% Confidence Interval for the ounces in the bottles.
  - Conduct a hypothesis test to verify if the claim that a bottle contains less than sixteen (16) ounces is supported. Clearly state the logic of your test, the calculations, and the conclusion of your test.
- Provide the following discussion based on the conclusion of your test:

If you conclude that there are less than sixteen (16) ounces in a bottle of soda, speculate on three (3) possible causes. Next, suggest the strategies to avoid the deficit in the future.

**Or**

If you conclude that the claim of less soda per bottle is not supported or justified, provide a detailed explanation to your boss about the situation. Include your speculation on the reason(s) behind the claim, and recommend one (1) strategy geared toward mitigating this issue in the future.

- b) A population proportion is 0.4 . A simple random sample of size 200 will be taken and mean of sample proportions will be used to estimate the population proportion .What is the probability that the sample proportions will be within  $\pm 0.03$  of the population proportion? (5 marks)
- c) Distinguish between
- i) Central limit theorem and finite population correction factor (3 marks)
  - ii) Sampling error and standard error (2 marks)