



# MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR  
BACHELOR OF SCIENCE (HOSPITALITY AND TOURISM MANAGEMENT)

HTM 402-4: STATISTICS

DATE:

TIME:

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**INSTRUCTION: Attempt question ONE and any other TWO questions**

**SECTION A**

**QUESTION ONE (30 MARKS)**

- (a) Explain the meaning of the following terms as applied in Statistics:-
- (i) Null hypothesis (2 marks)
  - (ii) Significance level (2 marks)
- (b) Differentiate between EACH of the following terms:-
- (i) Acceptance and critical regions (2 marks)
  - (ii) Type I and Type II errors (2 marks)
  - (iii) Point and Interval estimation (2 marks)
- (c) A study of 49 randomly chosen 8-year olds shows that they watch television an average of 38 hours per week with standard deviation of 6.4 hours. Assuming normal distribution, construct a 99% confidence interval for the average time per week that all such children watch television. (5marks)

- (d) A 5-Star Hotel believes that many of its employees are taking advantage of a liberal absence policy by taking off a disproportionate number of Mondays and Fridays. The data below shows the number of employee absences by the day of the week.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
$f$	57	39	37	54	63

At  $\alpha=0.05$  level of significance, test if there is any difference in the number of employee absence based on the day of the week. (6 marks)

- (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	354.67	$b$	$c$	$e$
Error	$a$	9	$d$	
Total	676.67	11		

(5 marks)

- (f) Given that  $H_0: \mu = 100, H_a: \mu < 100, n = 36, \bar{x}=94, s=30$ , test the null and alternate hypothesis at a significance of  $\alpha=0.05$ . (4 marks)

### QUESTION THREE (20 MARKS)

- (a) Manufacturers of a brand of dietetic cheesecake claim that a 1-ounce serving of their product contains an average of 88 calories. A sample of 36 servings of this cheesecake are tested and found to contain a mean of 90 calories with a standard deviation of 4 calories. Test if the true mean is higher at the 5% level of significance. (7 marks)
- (b) A consumer research organization conducts a survey of Tour company drivers to determine if there is any difference in their choice of brand of Japanese-made car based on their gender. These are results:

	Toyota	Nissan	Subaru
Women	70	80	150
Men	40	60	100

- (i) State the null and alternative hypothesis. (1 mark)
- (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)

**QUESTION THREE (20 MARKS)**

- (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 advertising. (8 marks)

- (b) Given the following set of data construct the ANOVA table and compare the F value calculated with the critical value at  $\alpha = 0.01$  level of significance

A	B	C
12	10	8
14	8	20
9	12	12

(12 marks)

**QUESTION FOUR (20 MARKS)**

- (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. (8 marks)
- (b) The data below shows gross weekly earnings of employees by age of a Tour company in the year 2008.

Age (years)	18	20	22	27	35	45	55
Weekly earnings ('000)	15.50	23.20	34.0	44.90	53.10	55.0	57.20

- (i) Calculate the least squares regression line of gross weekly earnings on age. (10 marks)
- (ii) Use the equation in (i) to estimate the weekly earnings of an employee aged 50 years (2 marks)

**QUESTION FIVE (20 MARKS)**

- a) Steve and Miriam are neighbors and work around the corner from each other. Over a 3-week period, they decide to compare two different routes to work (A and B) in terms of which takes less time if they leave home at the same time. They randomly choose who will drive each day. The commuting times in minutes, as they experience are as follows

Route A	27	23	20	27	36	23	20	27	24	32	24	32	25	29	31
Route B	29	26	25	22	27	38	30	25	29	26	27	26	25	26	34

Based on this data, can one conclude that route A is usually faster than route B at  $\alpha = 0.05$  level of significance? (8 marks)

- b) Two police cars patrol the same stretch of a major freeway. The officer in charge decides to compare the number of tickets issued daily by each officer over the course of 2-week period as shown below:

Officer McCarthy	32	14	26	37	45	28	32	36	25	30
Officer Abraham	44	37	24	33	27	31	41	29	25	34

Use the rank-sum test to determine whether there is any difference in the average number of tickets issued daily by the two officers at the  $\alpha=0.05$  level of significance

(12 marks)