The Management University of Africa

Sponsored by the Kenya Institute of Management

POST GRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP/ SCHOOL OF ARTS, HUMANITIES, DEVELOPMENT STUDIES AND SOCIAL SCIENCES (SADS)

DEGREE OF MASTER OF BUSINESS ADMINISTRATION/ DEGREE OF MASTER OF MANAGEMENT AND LEADERSHIP/ DEGREE OF MASTER OF ARTS IN DEVELOPMENT STUDIES/ EXECUTIVE MASTER OF BUSINESS ADMINISTRATION

MBA 505/ MML 5102/MDE 517/ EMBA 510: STATISTICAL DECISION ANALYSIS/QUANTITATIVE METHODS OF BUSINESS/SOCIAL STATISTICS

DATE: 3RD AUGUST 2026

DURATION: 3 HOURS

MAXIMUM MARKS: 60

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **FOUR (4)** questions.
4. Question **ONE is compulsory.**

5. Answer any other **TWO** questions.
6. Question **ONE** carries **30 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided**

QUESTION ONE

a) There are some missing values in the following ANOVA table. The data relate to four different varieties of the Electrical bulbs sold by a dealer in town.

Sources of variation	**Sum of the Squares *(SS)***	**Degree of Freedom, *df***	**Mean Squares *(MS)***	**Value of Statistical Test**
Between Samples	38	b=?_____	d= ?_____	f = ?___
Within Samples	a=?_____	c = ?___	e = ?____	
Total	142	10		

i) Complete the ANOVA table by filling in the missing values. **(3 Marks)**

ii) Test the hypothesis that there is no difference between the means at 5 percent level of significance

(3 Marks)

b) Giving examples in each case, explain the scales of measurement which can be used in statistical investigation

(4 Marks)

c) The mean yield of an acre plot is 800 Kgs with a standard deviation of 40Kg. Assuming that the distribution is normal, find the number of acres in a group of 140 plots that should be expected to yield

i. Over 830 Kg **(3 Marks)**

ii. Between 820 kg and 870 kg **(4 Marks)**

d) Ken chick production for chicken has increased tremendously. They have randomly selected a sample of 24 fully grown chicken which had a mean weight of 21.2kgs. If we can assume from past experience that

$\delta = 2.8$ kgs, construct 90% confidence interval for μ, the true mean weight **(6 Marks)**

e) Given the following data which relate to the age of a husband and the age of the wife:

Age of Husband (X)	25	22	28	26	35	20	22	40	20	18
Age of Wife (Y)	18	15	20	17	22	14	16	21	15	14

Estimate;

i. The age of wife, when the age of husband is 30. **(5 Marks)**

ii. The age of husband, when the age of wife is 19. **(2 Marks)**

QUESTION TWO

The following table shows the distribution of 105 families according to their expenditure per week. Number of families corresponding to the expenditure's groups Ksh. (10 – 20) and Ksh. (30 -40) are missing from the table. The Median for the distribution is Ksh. 25.

Expenditure (in Ksh)	**No of Families**
0-10	14
10-20	?
20-30	27
30-40	?
40-50	15

a) Using the data calculate the missing frequencies and coefficient of variance

(9 **Marks)**

b) Test the hypothesis that the mean expenditure for the families is Ksh. 26 at 90 percent level of confidence

(6 Marks)

QUESTION THREE

a) Giving examples in each case, explain Probability methods of sampling which can be applied in scientific research

(4 Marks)

b) A researcher wants to determine whether a new teaching method improves students' performance in statistics. A random sample of 10 students was taught using the new method and their test scores were recorded as follows:

Students	1	2	3	4	5	6	7	8	9	10
Score	68	72	75	70	69	74	71	73	76	72

The average score for students taught using the traditional method is known to be 68 marks. At 5% level of significance, test whether the new teaching method significantly improves students' performance. **(6 Marks)**

c) The mean stress endurance score of a random sample of 20 employees was found to be 145 with a Standard Deviation of 40. Construct a 95% confidence interval for the true mean. Assume the sample size is normally distributed.

(5 Marks)

QUESTION FOUR

a) A researcher wants to determine whether there is a relationship between gender and preference for a new product. The following data were collected:

Gender	**Prefer the product**	**Do not Prefer the product**
Male	40	20
Female	30	10

Determine whether gender and product preference are related at 10% level of significance **(7 Marks)**

b) A company manufactures two products X and Y. The objective is to maximize profit subject to labour and material constraints.

Maximization, Z = 15X + 40Y

Subject to; $4X + Y \leq 100$ (Labour Hours)

$3X + 2Y \leq 110$ (Materials)

And $X, Y \geq 0$ (Non-Negativity Conditions)

i. Formulate the dual problem for the above problem. **(3 Marks)**

ii. If the available labour hours increase to 110 units and materials reduce by 20%, explain the likely effect on the optimal solution using sensitivity analysis.

(5 Marks)

FORMULAS

Mean = $\frac{\Sigma X}{n}$ Mean, = $\frac{\Sigma FX}{\Sigma F}$ $Z = \frac{X - \mu}{\square}$

Mode = $L + \frac{F1}{F1 + F2} \times i$ or Mode $= L + \left(\frac{D_1}{D_1 + D_2}\right).c$

Median = $L + \frac{i}{F}(m - c)$ or Median $= L + \left(\frac{\frac{N}{2} - F_{m-1}}{f_m}\right).c$

Variance = $\frac{\sum f(X - Mean)^2}{\sum f}$ or Variance, $S^2 = \frac{\sum fx^2}{\sum f} - \bar{x}^2$

$S = \sqrt{\frac{\sum F(X - Mean)^2}{\sum F}}$ or $S \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$

$CV = \frac{SD}{Mean} \times 100$ $SKp = 3 \times \frac{(mean - median)}{Standard\ deviation}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\bar{X}_{12} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2}{N_1 + N_2}$$

$$\mu = x_1 p(x_1) + x_2 p(x_2) + \ldots x_n p(x_n) = \sum_{i=1}^{n} x_i p(x_i)$$

$$\delta_{12} = \sqrt{\frac{N_1 \delta_1^{\,2} + N_2 \delta_2^{\,2} + N_1 d_1^{\,2} + N_2 d_2^{\,2}}{N_1 + N_2}}$$

$$Var(X) = \sum_{i=1}^{n} (x_i - \mu)^2 . p(x_i)$$

$$\bar{x} - z_{\alpha/2} \frac{\delta}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2} \frac{\delta}{\sqrt{n}}$$

$$\bar{x} - t_{n-1,\alpha/2} \frac{S}{\sqrt{n}} < \mu < \bar{x} + t_{n-1,\alpha/2} \frac{S}{\sqrt{n}}$$

$$Z = \frac{\bar{x} - \mu_0}{\delta / \sqrt{n}}$$

$$\chi^2 = \sum_{i=1}^{6} \frac{(O_i - E_i)^2}{E_i}$$

$$F = \frac{\text{MSB}}{\text{MSW}}$$

$$\text{MSB} = \frac{\text{SSB}}{\text{k-1}}$$

$$\text{MSW} = \frac{\text{SSW}}{n - k}$$

$$\text{SSB} = \sum_{j=1}^{k} \frac{T_j^2}{n_j} - \frac{T^2}{N}$$

$$\text{SSW} = \sum_{j=1}^{k} \sum_{i=1}^{n_j} X_{ij}^2 - \sum_{j=1}^{k} \frac{T_j^2}{n_j}$$

$$r = \frac{n \sum XY - \sum X \sum Y}{\sqrt{\left[n \sum X^2 - \left(\sum X \right)^2 \right] \left[n \sum Y^2 - \left(\sum Y \right)^2 \right]}}$$

$$r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

$$r \sqrt{\frac{n - 2}{1 - r^2}}.$$

$$\hat{b} = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - \left(\sum X \right)^2}$$

$$\hat{a} = \frac{1}{n} \left(\sum Y - \hat{b} \sum X \right) = \bar{Y} - \hat{b} \bar{X}$$

$$T = \frac{\bar{x} - \mu_0}{S / \sqrt{n}}$$