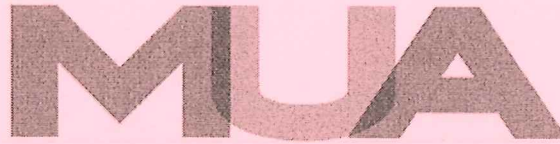


The
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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF BACHELOR OF EDUCATION ARTS

MTH 434: TEST HYPOTHESIS

DATE: 26TH MARCH 2025

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. Write all your answers in the Examination answer booklet provided.

QUESTION ONE

- a) i) Demonstrate the term hypothesis

(2marks)

ii) Differentiate between type - 1 and Type - 11 errors as used in statistical hypothesis testing

(2marks)

iii) Assume that a grade school teacher has a class of 28 learners. If she can demonstrate that the learners are above average, she can get extra resources to teach the class. She uses 19 scores as a measure of intelligence. IQ scores are standardized to have a population mean of 100 and a standard deviation of 16. Use this information to calculate the value of z - test. Assume the mean of IQ of the learners is 105.6

(5marks)

- b) A researcher hypothesizes that the average number of sports that colleges offer for males is greater than the average for females. A sample of the number of the sported offered by colleges shows the mean for males is 8.6 and mean for female is 7.9. At $\alpha = 0.10$, is there enough evidence to support the claim.

Assume σ_1 and $\sigma_2 = 3.3$

(6marks)

- c) Calculate the Spearman's rank correlation coefficient of the data in the table below

X	10	8	12	15	8	10
Y	7	4	6	7	9	8

(5marks)

- d) Based on the information from the U.S. Census Bureau, the median age of foreign-born U.S. residents is 36.4 years. A researcher selects a sample of 50 foreign born U.S. residents in his area and finds that 21 are older than 36.4 years. At $\alpha = 0.05$, test the claim that the median age of the residents is at least 36.4 years.

(5marks)

QUESTION TWO

- a) Find the P-value when the t test value is 2.056, the sample size is 11, and the test is right-tailed
- b) A physician claims that joggers maximal volume oxygen uptake is greater than the average of all adults. A sample of 15 joggers has a mean of 40.6 millilitres per kilogram (ml/kg) and a standard deviation of 6 ml/kg. If the average of all adults is 36.7 ml/kg, is there enough evidence to support the physicians claim of $\alpha = 0.05$?

(5 marks)

(5 marks)

- c) The Family and Medical Leave Act provides job protection and unpaid time off from work for a serious illness or birth of a child. In 2000, 60% of the respondents of a survey stated that it was very easy to get time off for these circumstances. A researcher wishes to see if the percentage who said that it was very easy to get off has changed. A sample of 100 people who used the leave said that 53% found it easy to use the leave. At $\alpha = 0.01$, has the percentage changed? (5 marks)

QUESTION THREE

- a) A university conducts both face and distance mode classes for a particular course indented both to be identical. A sample of 50 students of face to face mode yields examination results as a mean of 80.4 and standard deviation of 12.8 and other sample of 100 distance mode students yields mean and standard deviation of their examination results in the same course respectively as mean 74.3, standard deviation = 20.5. Are both educational methods statistically equal at 5 % level? (6 marks)
- b) A machine produced 60 defective articles in a batch of 400. After overhauling, it produced 30 defectives in a batch of 300. Has the machine improved due to overhauling? (Take $\alpha = 0.05$) (9 marks)

QUESTION FOUR

A dietitian wishes to see if a person's cholesterol level will change if the diet is supplemented by a certain mineral. Six subjects were presented, s and then they took the mineral for a 6-week period. The results are shown in the table (in milligrams per decilitre). Can it be concluded that the cholesterol level has been changed at $\alpha = 0.10$? Assume the variable is approximately normally distributed.

Subject	1	2	3	4	5	6
Before(x_1)	210	235	208	190	172	244
After(x_2)	190	170	210	188	173	228

(15 marks)

QUESTION FIVE

Calculate the two regression equations of X on Y and Y on X from the data given below, from the actual means of X and Y. Estimate the value of y when x = 55

X	40	50	38	60	65	50	35
Y	38	60	55	70	60	48	30

(15 marks)

QUESTION SIX

a) Transects for flowers, count two species as shown in the table below

Species	22	18	23	25	25	18	22	24
A								
Species B	16	21	19	18	22	21	15	22

Are the means of the population equal? With what confidence do we know?

(7 marks)

b) The table below shows a test of a new drug.

Before	265	262	267	260	264	266
After	261	257	263	259	261	265

Are the means of before and after equal? With what confidence do we know?
(Take $\alpha = 0.05$)

(8 marks)

MTH 434: TEST OF HYPOTHESIS TABLES AND FORMULAE

Tables and Formulae

- 1) $Z = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$, The degrees of freedom are d.f = n - 1
- 2) $t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$, or $t = \frac{-\mu}{\frac{s}{\sqrt{n}}}$, The degrees of freedom are d.f = n - 1
- 3) Formula for the z Test for proportions $Z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$, where $\hat{p} = \frac{x}{n}$, $q = 1 - p$
- 4) $z = \frac{\overline{X1 - X2} - (\mu1 - \mu2)}{\sqrt{(\frac{s1^2}{n1} + \frac{s2^2}{n2})}}$
- 5) $t = \frac{\overline{X1 - X2} - (\mu1 - \mu2)}{\sqrt{(\frac{s1^2}{n1} + \frac{s2^2}{n2})}}$
- 6) $D = X_1 - X_2$, $\bar{D} = \sum \frac{D}{n}$, $S_D = \sqrt{\frac{n \sum D^2 - (\sum D)^2}{n(n-1)}}$
- 7) $S\bar{D} = \frac{SD}{\sqrt{n}}$, $t = \frac{\bar{D} - \mu_D}{\frac{SD}{\sqrt{n}}}$, level of confidence $\frac{\bar{X}d}{S\bar{P}}$, $\sqrt{n}$
- 8) $Z = \frac{\hat{p}1 - \hat{p}2 - (p1 - p2)}{\sqrt{(\bar{p}\bar{q}(\frac{1}{n1} + \frac{1}{n2}))}}$, where $\hat{p}1 = \frac{x1}{n1}$, $\hat{p}2 = \frac{x2}{n2}$, $\bar{q} = 1 - \bar{p}$
- 9) $Z = \frac{x1 - x2}{\sqrt{(\frac{s1^2}{n1} + \frac{s2^2}{n2})}}$
- 10) $z = \frac{\overline{X1 - X2} - (\mu1 - \mu2)}{\sqrt{(\frac{s1^2}{n1} + \frac{s2^2}{n2})}}$, with d.f = n - 1, $Z = \frac{S1^2 - S2^2}{\sqrt{2(\frac{S1^4}{n1} + \frac{S2^4}{n2})}}$
- 11) $F = \frac{S1^2}{S2^2}$, $Z = \frac{X + 0.5 - \frac{n}{2}}{\sqrt{\frac{n}{2}}}$, x = smaller number of + or - signs, n = sample size
- 12) $r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2][n(\sum y^2) - (\sum y)^2]}}$, $t = r\sqrt{\frac{n-2}{1-r^2}}$, d.f = n - 2
- 13) $y' = a + bx$, where $a = \frac{(\sum y)(x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$, $b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$ OR
- $b_{yx} = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$, $Y - \bar{Y} = b_{yx}$
- $b_{xy} = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum y^2) - (\sum y)^2}$, $X - \bar{X} = b_{xy}(Y - \bar{Y})$
- 14) Rank $(r_k) = 1 - \frac{6\sum D^2}{n(n^2 - 1)}$

15) $Z = \frac{(x+0.5) - \frac{n}{2}}{\sqrt{\frac{n}{2}}}$, where x = smaller number of + or – signs, n = sample size

Two-tailed test Z Level of significance		Confidence level % Z	Comparison operator		Tails of the Test	
1.01	2.58	80	HA	H0		
1.02	2.33	1.282	≠	=	2-tailed	$\frac{\partial}{2}$
1.04		85			1-right	
2.054		1.440		≤	tailed	→ ∂
0.05		90	>		1-	
1.96		1.645			lefttailed	
0.1		95		≥		
1.645		1.960	<			$\partial \leftarrow$
0.15		99				
1.439		2.576				
0.18		99.5				
1.341		2.807				
		99.9				
		3.291				