



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

**FACULTY OF COMPUTING**  
UTM Johor Bahru

**Semester II 2024/2025**

Subject : SECI1143 PROBABILITY & STATISTICAL DATA ANALYSIS

Task : Chapter 5 (Hypothesis Testing for 2 Samples) & Chapter 6 (Chi- Square Test).

**INSTRUCTION:**

1. This is a **GROUP** assignment. Please clearly write the group members' names and matric numbers on the front page of the submission.
  2. This assignment contributes to **5%** of overall course marks.
  3. Only **HANDWRITTEN** submission is accepted:
    - a. Submissions using any reporting or statistical tools (e.g.: MS Word, MS Excel, etc.,) will be **REJECTED**.
    - b. Make sure the submission is neatly written. Any submission with handwriting that is unreadable, will be **REJECTED**.
    - c. For answers that need to draw graphs, using graph paper(s) is optional. You can use plain paper.
    - d. Round your answers to **TWO** decimal places.
    - e. Please scan/snapshot your work and save it as a **PDF** file (or follow any instruction from your lecturer).
  4. Submission via eLearning – only **ONE** group member needs to submit on behalf of the group.
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### **QUESTION 1 (10 marks)**

A fitness coach wants to compare the effectiveness of two different training programs on weight loss.

- A group of 25 individuals following Program A lost an average of 4.3 kg after 8 weeks, with a standard deviation of 1.1 kg.
- Another group of 28 individuals following Program B lost an average of 5.1 kg, with a standard deviation of 1.3 kg.

Assuming the weight losses are approximately normally distributed and the population variances are not equal, test at the 0.05 significance level whether the mean weight loss for Program B is significantly greater than for Program A.

### **QUESTION 2 (8 marks)**

A manufacturing engineer is testing the consistency of two machines used to fill bottles with soda. To determine whether the variability (standard deviation) of fill amounts is the same, she collects the following data:

- Machine A: A sample of 21 bottles has a standard deviation of 2.1 ml.
- Machine B: A sample of 16 bottles has a standard deviation of 1.5 ml.

At a 0.05 significance level, test whether there is a difference in the variances of the two machines' outputs. Assume the fill amounts are normally distributed.

**QUESTION 3 (15 marks)**

A nutritionist wants to evaluate whether a new diet plan has a significant effect on cholesterol levels. She records the cholesterol levels (in mg/dL) of 10 patients *before* and *after* following the diet plan for 8 weeks. The data are as follows:

Patient	Before	After
1	220	200
2	210	190
3	215	212
4	225	210
5	230	215
6	218	205
7	212	200
8	208	198
9	220	210
10	214	205

- a) Calculate the  $D$ ,  $D^2$  and their sums as in the table below.

[7 marks]

Patient	Before	After	$D$	$D^2$
1	220	200		
2	210	190		
3	215	212		
4	225	210		
5	230	215		
6	218	205		
7	212	200		
8	208	198		
9	220	210		
10	214	205		
			$\Sigma D =$	$\Sigma D^2 =$

- b) Calculate the  $\bar{D}$  and  $s_D$ .

[2 marks]

- c) At a 0.05 significance level, test whether the diet plan has a significant effect on cholesterol levels.

[6 marks]

#### QUESTION 4

A wildlife researcher wants to test whether the observed distribution of bird species in a forest follows a known regional distribution. Based on prior regional data, the expected proportions of four bird species are as follows:

- Sparrows: 40%
- Finches: 30%
- Robins: 20%
- Woodpeckers: 10%

She observes the following counts of birds during a field study:

Species	Observed Count
Sparrows	42
Finches	33
Robins	15
Woodpeckers	10

- a) Calculate the difference between the observed ( $o$ ) and expected count ( $e_i$ ) as in the table below:

Species	Observed Count	$e_i$	$\frac{(o - e)^2}{e}$
Sparrows	42		
Finches	33		
Robins	15		
Woodpeckers	10		

[4 marks]

- b) Calculate the  $\chi^2$  test. [2 marks]
- c) At the 0.05 significance level, test whether the observed distribution matches the expected proportions. [4 marks]

### QUESTION 5

A researcher wants to determine whether preferred mode of transportation is associated with a person's type of employment. A random sample of 120 individuals is surveyed, and the results are recorded in the following table:

	Public Transport	Private Car	Bicycle	Total
Office Workers	20	30	10	60
Freelancers	15	20	5	40
Students	10	5	5	20
Total	45	55	20	120

At the 0.05 significance level, test whether type of employment and preferred mode of transportation are independent.