



SCT 401-1 Data Handling and Statistics

Instructions to candidates

Answer All Questions

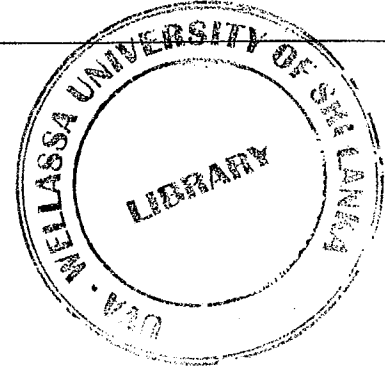
Number of Questions: Four (04)

Time Allocation: Two (02) hours

Total Marks Allocated: 100

This is a open book examination

Students are provided with computer facilities with Minitab software.



1. A bacteriologist is interested in knowing the effects of two different culture media and two different times on the growth of the particular bacteria. She performs six replicates. The following Table 01 gives the growth rates (number of cells)

Table 01: Growth rate (number of cells) of the bacteria

Time (hours)	Culture Medium	
	I	II
12	21, 22, 23, 26, 20, 26	37, 39, 38, 38, 35, 36
18	25, 26, 24, 25, 29, 27	31, 34, 29, 33, 30, 35

- Write down the linear model for a  $2^2$  factorial design, and the assumptions underlying its analysis of variance.
- Analyze the data to estimate the effects of two different culture media and two different times on the growth of the particular bacteria, and their interaction.
- The bacteriologist wishes to identify one or more culture medium and time as suitable for the growth of the bacteria. Conduct any Statistical tests that you consider necessary, and construct any graphs that will help in interpreting the results.

(30 marks)

2. A food tasting experiment was conducted for two fruit flavored soft drinks, *Banana and Mango*. A panel of 10 judges was asked to taste banana flavored soft drink and another 10 were asked to taste mango flavored soft drink and to give a score for the taste. The recorded data were stored in the *taste.mtw* Minitab worksheet.
- Analyze the data given in *taste.mtw* Minitab worksheet to determine whether the two fruit flavored soft drinks are equally taste or not.
  - Mix fruit flavored soft drinks are currently available at the market. This researcher wants to find whether there is a significant difference in taste of Mix Fruit, Mango and Banana flavored soft drinks. To check this, he has asked another panel of 10 judges to taste this soft drink and to give a score for the taste. Recorded data are given below.

3, 3, 4, 2, 1, 2, 4, 3, 5, 2

Is there a significant difference in taste of Mix fruit, Mango and Banana flavored soft drinks?

(25 marks)

3. A food enzyme is being studied to determine its effect on bread quality, and on the volume of bread produced. 10 samples of wheat flour were selected, and then the enzyme and other ingredients were added separately to the samples and finally the loaf volume of each sample was measured after baking the dough. The obtained loaf volumes ( $\text{cm}^3$ ) are given in the Table 02.

Table 02: The loaf volumes

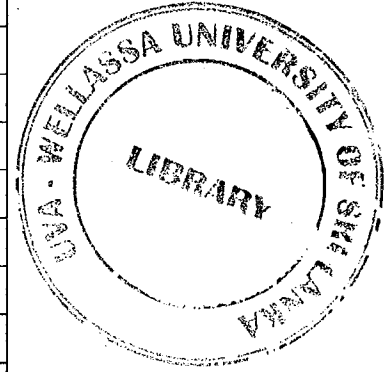
Sample no.	Loaf volume ( $\text{cm}^3$ )
1	846
2	845
3	839
4	859
5	839
6	834
7	838
8	842
9	835
10	859

- Conduct a suitable parametric test to determine whether the loaf volume of this bread is according to the standards (Standard loaf volume is  $840 \text{ cm}^3$ ). Comment on the results at 5% level of the significance.

- b. To determine shelf life, these breads were stored at 40 °C for two weeks. Loaf volumes of breads were measured again after two weeks and the obtained data are given in the Table 03.

Table 03: The loaf volume after two weeks

Sample no.	Loaf volume after 2 weeks
1	844
2	839
3	834
4	838
5	829
6	831
7	830
8	840
9	826
10	844



Using a suitable parametric test, test whether the loaf volume of the bread was changed or not. ( $\alpha=0.05$ )

[In part 3a and 3b, the null and the alternative hypotheses should be clearly stated and necessary analysis must be done prior to the application of the parametric tests]

(25 marks)

4. Blood type frequencies in Sri Lanka are in the ratios of 3:2:5:2 for types O, A, B, and AB, respectively. Local differences are often found depending upon a variety of demographic characteristics. A researcher is assigned to determine if, patients at a general hospital a particular in a large city exhibit blood types supporting the above model. The table below shows the data obtained from a random sample of 500 patients through lab reports.

Blood Type	O	A	B	AB
Observed frequencies	194	38	242	26

Do the data reported by the researcher support the 3:2:5:2 model for blood types of patients at the particular hospital? ( $\alpha=0.05$ )

(20 marks)