Attempt ALL questions

Q1. Theory for Inference Procedures (4 Marks)

Answer the four short questions. Each correct answer will be awarded 1 mark.

i. What is a $p-$value?

ii. Briefly describe how $p-$value is used in hypothesis testing

iii. What is meant by a Type I error?

iv. What is meant by a Type II error?

Q2. Independent Two Sample Test (8 Marks)

The mean and the standard deviation of the number of marks obtained in the biology leaving certificate exam by randomly selected male and female pupils are described below:

	Number	Mean	Std. Dev.
Male	10	57	12
Female	12	61	11

Test the hypothesis that males and females on average obtain the same mark in the biology leaving certificate exam. Use a significance level of 5%. You may assume that all required assumptions have been validated.
There are 8 questions listed below, with 1 mark awarded for each correct answer.

i. Formally state the null hypothesis.

ii. Formally state the alternative hypothesis.

iii. Compute the pooled variance for the aggregate sample.

iv. Compute the standard error for difference in mean values.

v. Compute the Test Statistic.

vi. When using the Student $t-$distribution, what is the appropriate value for *degrees of freedom*?.

vii. What is the Critical Value?

viii. Discuss your conclusion to this test, supporting your statement with reference to appropriate values.

Q3. Confidence Intervals

This question relates to the scenario (i.e. results in a leaving cert biology exam) discussed in Question 2. You may use any previously calculated values for answering this question.

i. Determine the appropriate quantile for constructing a 99% confidence interval of the difference in the means of both groups.

ii. What is the margin of error?

iii. Compute the 99% confidence interval (i.e stating the lower and upper limits).

Formulae