

**MATH20802: STATISTICAL METHODS
SECOND SEMESTER
IN CLASS TEST - 18 APRIL 2018**

YOUR FULL NAME:

YOUR ID:

This test contains ONE question. Please answer the question and fully explain your answers. This test will account for 10 percent of your final mark.

Each paper will be marked by myself. Each part of the question will be marked as follows: i) 100 percent of the mark if the answer and the approach leading to it are correct, significant details of the approach must be given; ii) 50 percent of the mark if the answer is not correct (or if no answer is given), but approach taken is correct, significant details of the approach must be given; iii) 0 marks if the answer is correct/incorrect but little or no details are given on the approach taken.

Good luck.

PLEASE DO NOT TURN OVER UNTIL I SAY SO

In a series of m independent Bernoulli trials there are X successes. In a further series of n trials there are Y successes. Assuming that the probability of success, p , consider the following estimators for p :

$$\hat{p}_1 = \frac{1}{2} \left(\frac{X}{m} + \frac{Y}{n} \right)$$

and

$$\hat{p}_2 = \frac{X + Y}{m + n}.$$

Assume further that X and Y are independent. Do the following.

- (i) Find the bias of \hat{p}_1 . (2 marks)
- (ii) Find the bias of \hat{p}_2 . (2 marks)
- (iii) Find the MSE of \hat{p}_1 . (2 marks)
- (iv) Find the MSE of \hat{p}_2 . (2 marks)
- (v) Which of the estimators (\hat{p}_1 and \hat{p}_2) is better with respect to mean squared error and why? (2 marks)

[Total: 10 marks]

