

**NAME** .....

**STUDENT ID** .....

**DEGREE** .....

Are You Approved for Extra Time in Exams (LENS students only) .....

### Examination Procedures

- This exam will start at 11:05, and will last 45 minutes.
- Each Question will be worth either 1 or 2 Marks. There are 15 Marks worth of questions.
- All Questions must be attempted (LENS students please see below)
- Write **all of your answers** in the exam script. Write the script number on any other documents you submit.
- It is your responsibility to return the script to collection box. An audit of scripts will take place immediately after the exam. If your script is account for in that audit, you are deemed to be absent, and will receive no marks.
- **LENS Student** Specifically approved LENS students have to answer any selection of questions that have an aggregate mark of 12 Marks.
  - They may skip any three 1-Mark Questions
  - OR - They may skip a 1-Mark Question and a 2-Mark Question
  - The mark will be rescaled by 125 %.

## Formula Sheet

### Difference of Two Cubes

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

### Sequences and Series

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$S_n = \frac{n}{2} (2a + (n-1)d)$$

$$S_n = a \left( \frac{1 - r^n}{1 - r} \right)$$

$$S_\infty = \frac{a}{1 - r}$$

## Part A Fundamentals of Mathematics (6 Marks)

- (i) (2 Marks) Determine the values of A and B from the following expression

$$\frac{7}{x^2 - x - 12} = \frac{A}{x + 3} + \frac{B}{x - 4}$$

- (ii) (2 Marks) Evaluate the function for the values of  $x = \{0.25, 0.5, 0.75\}$

$$f(x) = \sqrt{1 + x^2}$$

(iii) (1 Mark) Find the value of  $x$

$$\log_3(x + 1) + \log_3(5) = 5$$

(iv) (1 Mark) Find the value of  $x$

$$e^{x+5} = 3.$$

## Part B Limits of Functions (3 Marks)

(i) Compute the limit of the following function

$$\lim_{x \rightarrow 4} \frac{x^2 - 15}{x - 4}$$

(ii) Compute the limit of the following function

$$\lim_{x \rightarrow 4} \frac{x^2 - x - 12}{x - 4}$$

(iii) Compute the limit of the following function

$$\lim_{x \rightarrow \infty} \frac{3 + 2x^2 - 8x^3}{4x^3 - 7x + 5}$$

## Part C Sequences and Series (6 Marks)

(i) (1 Mark) Compute the following summation

$$\sum_{i=1}^{80} i$$

(ii) (2 Marks) Find the sum of the following geometric series:

$$5 + 15 + 45 + \dots + 3645$$

- (iii) (1 Mark) Express the following repeating decimal number as a simple fraction. Show your workings.

$$0.243243243243....$$

- (iv) (2 Marks) Find the sum of the following telescoping series

$$\sum_{n=1}^{\infty} \frac{6}{(3n+1)(3n+4)}$$