TAYLOR'S UNIVERSITY COLLEGE
Wisdom · Integrity · Excellence

CAMBRIDGE A LEVEL PROGRAMME

SEMESTER ONE EXAMINATION DECEMBER 2007

(July 2007 Intake)

Thursday **6 December 2007** **1.00 pm – 3.00 pm**

FURTHER MATHEMATICS 9231/01

PAPER 1 **2 hours**

Additional materials: Answer Booklet/Paper
List of formulae (MF 10)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your name and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of a calculator is expected, where appropriate.
Results obtained solely from a graphic calculator, without supporting working or reasoning, will not receive credit.
You are reminded of the need for clear presentation in your answers
The number of marks is given in brackets [ ] at the end of each question or part question.
The total marks for this paper is 50.
At the end of the examination, fasten all your work securely together.

This document consists of **2** printed pages.

1. Simplify the expression $\frac{1}{n^2+3n+2}-\frac{1}{n^2+5n+6}$. [1]

Hence, or otherwise find $S_n=\sum_{r=1}^{n}\frac{4}{(r+1)(r+2)(r+3)}$. [5]

Find also $\lim_{n\to\infty} S_n$. [1]

2. Prove that $9^n + 7^{2n+3}$ is divisible by 8 for every positive integer n. [7]

3. If the equation $5x^4+3x^2-x-1=0$ has roots $\alpha, \beta, \gamma, \delta$, find the equation having roots $2\alpha-1, 2\beta-1, 2\gamma-1, 2\delta-1$. [5]

If $S_n=(2\alpha-1)^n+(2\beta-1)^n+(2\gamma-1)^n+(2\delta-1)^n$, find S_4. [7]

4. Sketch the curve C:

$$y=\frac{2x^2-7x-13}{(x+1)(x-3)}.$$ [12]

5. a) Find the equation of the line of intersection of the planes $2x + 3y - z = 8$ and $4x + y - 9z = 6$. [7]

b) Find the perpendicular distance of the point (7, 5, -9) from the line $\mathbf{r} = \mathbf{i} + 9\mathbf{j} - 8\mathbf{k} + s(4\mathbf{i} - 3\mathbf{j} - 2\mathbf{k})$. [5]