UNIVERSITY *of* LIMERICK
OLLSCOIL LUIMNIGH

College of Informatics and Electronics

MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002   SEMESTER: Spring 2007

MODULE TITLE: Engineering Mathematics 2   DURATION OF EXAMINATION: 45 minutes

LECTURER: Dr. N. Kopteva   PERCENTAGE OF TOTAL MARKS: 30%

INSTRUCTIONS TO CANDIDATES:

Write all your answers and rough work on the examination paper.

Do not write on anything else.

Under no circumstances should you use your own tables or be in possession of any writing material other than this exam paper.

Calculators are not permitted.

Answer **all questions**.

To obtain maximum marks you must show all your work **clearly and in detail**.

The examination rules of the University apply to this midterm. Any breaches of these rules (and in particular any attempt at cheating) will result in disciplinary proceedings. For a first offence this can result in a year's suspension from the University.

Your Name: (PLEASE PRINT)_____

Your UL ID:_____

ROUGH WORK

1   (a) Evaluate the indefinite integral $\int \dfrac{3x - 5x^{1/3}}{\sqrt{x}}\, dx$ 2%

(b) Calculate the area between $y = \frac{1}{x^2+1}$ and the x-axis for $0 \le x \le 1$.   2%

(c) Express as a definite integral and *evaluate* the limit of the Riemann

sum $\displaystyle \lim_{n \to \infty} \sum_{i=1}^{n} \left(x_i^2 + \sin(\sin x_i) \right) \triangle x$,   where P is the partition with

$x_i = -1 + \dfrac{2i}{n}$ for $i = 0, 1, \ldots, n$ and $\triangle x \equiv x_i - x_{i-1}$.   3%

$\left(\begin{array}{c}1\end{array}\right)$

(d) Evaluate $\dfrac{d}{dx} \displaystyle\int_{\sin x}^{1} e^{-(1-t^2)}\, dt$.   2%

(e) Find an upper bound for the error E_T in the Trapezoidal Rule approx-
imation of the definite integral $\displaystyle\int_0^1 \sin(2x)\, dx$, using n subintervals,
given that $M_2 \equiv \displaystyle\max_{x\in[0,\,1]}\left|\dfrac{d^2}{dx^2}\sin(2x)\right| = \max_{x\in[0,\,1]}\left|-4\sin(2x)\right| = 4$.
Choose n such that $E_T \leq \frac{1}{3}10^{-6}$.   3%

2 Evaluate the indefinite integral $\displaystyle\int \dfrac{\cos(\ln(t+1))}{t+1}\, dt$.   3%

3 Find the average value of $\dfrac{x-2}{x^2+5x+4}$ on the interval $[0,2]$.   5%

4 Evaluate the definite integral $\displaystyle\int_0^{\pi/2} x^2\,\sin(x)\,dx$.   5%

③

5 Perform a partial fraction expansion of $\dfrac{2x - 1}{(x + 1)(x^2 - 3x + 2)}$.

(but do not integrate this function.)   5%