UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

Faculty of Science and Engineering

MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002 SEMESTER: Spring 2012

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

LECTURER: Dr. N. Kopteva PERCENTAGE OF TOTAL MARKS: **25%**

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 $\int \frac{11\sqrt[4]{x} - 15\,x}{\sqrt[3]{x}}\,dx$. 2%

(b) Calculate the area between $y = 5^x + \sin(x^7) + x^{11} + 2$ and the x-axis for $-2 \le x \le 2$. 2%

(c) Express as a definite integral and then *evaluate* the limit of the Riemann sum $\lim\limits_{n\to\infty} \sum\limits_{i=1}^{n} \frac{1}{\sqrt{c_i + 1}} \triangle x$, where $c_i \in [x_{i-1}, x_i]$, and we use the partition P with $x_i = -1 + \frac{4i}{n}$ for $i = 0, 1, \ldots, n$ and $\triangle x \equiv x_i - x_{i-1}$. 1%

(d) Evaluate $\dfrac{d}{dx}\displaystyle\int_{x^3-x}^{\pi}\big(\sin t+1\big)\,dt$. 1%

(e) Find an upper bound for the error E_S in the Simpson's Rule approximation of the definite integral $\displaystyle\int_0^1 e^{-\sqrt{3}\,x}\,dx$, using N subintervals. Choose N such that $E_S \le 5\cdot 10^{-6}$. Hint: evaluate $M_4 = \max\limits_{x\in[0,\,1]}\big|\frac{d^4}{dx^4}e^{-\sqrt{3}\,x}\big|$. 2%

2 Evaluate the indefinite integral $\displaystyle\int \cos^3 x\cdot\sin^2 x\;dx$. 3%

3 Find the average value of the function $\dfrac{4x-6}{x^2-8x+15}$ on the interval $[0,1]$. 4%

4 Evaluate the indefinite integral $\int e^x \cos(2x)\, dx$.
(Hint: use integration by parts.) 4%

5 Perform a partial fraction expansion of $\dfrac{x^2+8x+3}{x^2\,(x^2+1)}$;

then *evaluate the indefinite integral* $\displaystyle\int \frac{x^2+8x+3}{x^2\,(x^2+1)}\,dx$. 6%