MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002	SEMESTER: Spring 2016
MODULE TITLE: Engineering Mathematics 2	DURATION OF EXAMINATION: 45 minutes
LECTURER: Prof. N. Kopteva	PERCENTAGE OF TOTAL MARKS: **25%**

Please, do NOT open this paper

until ANNOUNCED by your lecturer

EVERYBODY IS SUPPOSED TO START AT THE SAME TIME

1 (a) Evaluate the indefinite integral $\displaystyle\int \frac{x-2}{\sqrt[3]{x+4}}\,dx$.
Hint: use an appropriate substitution. 2%

(b) Calculate the area between $y = 2^x - x^{-2}$ and the x-axis for $1 \le x \le 3$. 2%

(c) Express as a definite integral and then *evaluate* the limit of the Riemann sum $\displaystyle\lim_{n\to\infty}\sum_{i=1}^{n} \frac{1}{c_i^2+1}\,\triangle x$, where $c_i \in [x_{i-1}, x_i]$, and we use the partition P with $x_i = -1 + \dfrac{2i}{n}$ for $i = 0, 1, \ldots, n$ and $\triangle x \equiv x_i - x_{i-1}$. 2%

(d) Evaluate $\displaystyle\frac{d}{dx}\left(\int_{x^2}^{3+x^3} \sin\sqrt{t+1}\;dt\right)$. 1%

(e) Find an upper bound for the error E_T in the Trapezoidal Rule approximation of the definite integral $\displaystyle\int_0^3 e^{-2x}\,dx$, using n subintervals.
Choose n such that $E_T \le 10^{-4}$.
Hint: evaluate $M_2 \equiv \max\limits_{x\in[0,3]} \left|\dfrac{d^2}{dx^2} e^{-2x}\right|$. 2%

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2 Evaluate the indefinite integral $\displaystyle\int \sin^4 x\;dx$. 3%

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

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4 Evaluate the indefinite integral $\displaystyle\int x^2\, e^{3x}\;dx$.
(Hint: use integration by parts.) 4%

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5 Perform a partial fraction expansion of $\dfrac{9-x}{x(x^2-6x+9)}$;

then *evaluate the indefinite integral* $\displaystyle\int \frac{9-x}{x(x^2-6x+9)}\,dx$. 5%

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