MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002	SEMESTER: Spring 2022
MODULE TITLE: Engineering Mathematics 2	DURATION OF EXAMINATION: 40 minutes
LECTURER: Prof. N. Kopteva	PERCENTAGE OF TOTAL MARKS: **30%**

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 $\int x\, e^{-x^2}\, dx$.
Hint: use an appropriate substitution. 2%

(b) Calculate the area between $y = x\, e^{-x^2}$ and the x-axis for $0 \le x \le 2$.
Hint: you may use the result of the previous question. 1%

(c) Express as a definite integral and then *evaluate* the limit of the Riemann sum $\lim\limits_{n\to\infty} \left(\frac{1}{n} \sum\limits_{i=1}^{n} 5^{1+2i/n} \right)$ (where one may use the partition P with $x_i = \frac{2i}{n}$ for $i = 0, 1, \ldots, n$). 3%

(d) Evaluate $\frac{d}{dx} \left(\int_x^{x^2+x} \cos\sqrt{t+8}\; dt \right)$. 2%

(e) Consider the four functions: $\cos x$, $\tan x$, $\cos^2 x$, and $\tan(x^5)$.
Specify which of them is odd, even or neither.
Hence, evaluate the integral $\int_{-\pi/4}^{\pi/4} \big(\cos^2 x + \tan(x^5)\big)\, dx$. 3%

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

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3 Find the average value of the function $\frac{1}{x^2+6x+10}$ on the interval $[0, 2]$. 4%

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4 Evaluate the indefinite integral $\int x^8 \ln^2 x\; dx$.
(Hint: use integration by parts.) 5%

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5 Perform a partial fraction expansion of $\frac{3x^2+5}{(x^2-2x+1)(x^2-1)}$;
then *evaluate the indefinite integral* $\int \frac{3x^2+5}{(x^2-2x+1)(x^2-1)}\, dx$. 6%

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