

MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002

SEMESTER: Spring 2023

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

(b) Calculate the area between $\int \frac{e^{-\sqrt{x}}}{\sqrt{x}} dx$ and the x -axis for $x > 0$.
Hint: you may use the result of the previous question. 2%

(c) Express as a definite integral and then evaluate the limit of the Riemann sum $\lim_{n \rightarrow \infty} \left(\frac{1}{n} \sum_{i=1}^n \cos \left(\frac{3(i-1)}{n} \right) \right)$. 2%

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

(e) Evaluate the integral $\int_{-\pi/2}^{\pi/2} (\sin^2 x + \sin(x^3)) dx$. 2%

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2 Evaluate the indefinite integral $\int \sin^5 x dx$. 5%

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

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

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5 Perform a partial fraction expansion of $\frac{2 - 4x}{(x^2 - 2x + 1)(x^2 + 1)}$;
then evaluate the indefinite integral $\int \frac{2 - 4x}{(x^2 - 2x + 1)(x^2 + 1)} dx$. 6%

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