

MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002

SEMESTER: Spring 2019

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 $\int \frac{1}{x\sqrt{\ln x}} dx$ (for $x > 0$).
 Hint: use an appropriate substitution. 2%

(b) Calculate the area between $y = 5^x - \frac{8}{(x+2)^3}$ and the x -axis for $0 \leq x \leq 2$. 2%

(c) Express as a definite integral and then *evaluate* the limit of the Riemann sum $\lim_{n \rightarrow \infty} \sum_{i=1}^n \exp(-2x_i) \frac{1}{n}$, where we use the partition P with $x_i = \frac{2i}{n}$ for $i = 0, 1, \dots, n$. 2%

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

(e) Consider the three functions: x^4 , $\sin(x^5 + x)$ and $x^4 + \sin(x^5 + x)$.
 Specify which of them is odd, even or neither.
 Hence, evaluate the integral $\int_{-1}^1 (x^4 + \sin(x^5 + x)) dx$. 2%

.....

2 Evaluate the indefinite integral $\int \sin^2 x \cos^5 x dx$. 3%

.....

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

.....

4 Evaluate the indefinite integral $\int x^3 (\ln x)^2 dx$.
 (Hint: use integration by parts.) 4%

.....

5 Perform a partial fraction expansion of $\frac{10}{(x^2-9)(x^2+1)}$;

then *evaluate the indefinite integral* $\int \frac{10}{(x^2-9)(x^2+1)} dx$. 5%

.....