MID-SEMESTER ASSESSMENT PAPER

MODULE CODE: MA4002	SEMESTER: Spring 2020
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 $\int \frac{1}{x \ln x}\, dx$ (for $x > 1$).
Hint: use an appropriate substitution. 2%

(b) Calculate the area between $y = 3^x - x^3$ and the x-axis for $0 \le x \le 2$. 1%

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

(d) Evaluate $\frac{d}{dx}\left(\int_{x^2}^{x^4+1} \sqrt{t \sin t}\, dt\right)$. 1%

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

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

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3 Find the average value of the function $\frac{x+5}{x^2+6x+9}$ on the interval $[-1, 2]$. 4%

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4 Evaluate the indefinite integral $\int \sin^{-1} x \, dx$.
(Hint: use integration by parts.) 5%

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

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