RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B. Sc. (General) Degree in Applied Sciences
Second Year - Semester II Examination – September/ October 2020

MAA 2203 – NUMERICAL ANALYSIS II

Time: Two (02) hours

Answer all (04) questions
Calculators will be provided

1. a) Use Newton divided difference method to construct interpolating polynomial for the following data set.

x_i	$f(x_i)$
0	1
0.25	1.64
0.5	2.71
0.75	4.48

(80 points)

b) Approximate $f(0.43)$ using the interpolating polynomial obtained in part (a).

(20 points)

2. a) Approximate the integral $\int_0^{0.5} \frac{2}{x-4}\,dx$ using Simpson's rule. Find a bound for the error, using the error formula, and compare this with the actual error.

(60 points)

b) Approximate the integral $\int_0^{\pi/4} e^{3x} \sin 2x\,dx$ using the Trapezoidal rule. Find a bound for the error, using the error formula, and compare this with the actual error.

(40 points)

3. The current i in a simple circuit involving a resistor of resistance R, an inductance loop of inductance L with applied voltage E satisfies the differential equation

$$L\frac{di}{dt} + Ri = E.$$

Consider the case where $L = 1.5, R = 120$ and $E = 600$. Given that $i(0) = 0$, use a value of $h = 0.0025$ in implementation of the trapezium method to approximate the current i at times $t = 0.0025$ and $t = 0.005$.

(100 points)

4. Suppose that $y = y(t)$ is the solution to the initial value problem

$$\frac{dy}{dt} = \frac{1}{1+y^2}, \qquad y(0) = 1.$$

Use Euler's method and the trapezium method as a predictor-corrector pair (with one correction at each time step) and take the time step as $h = 0.25$ to obtain approximations to $y(0.25)$ and $y(0.5)$.

(100 points)

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