THE OPEN UNIVERSITY OF SRI LANKA
B.Sc./ B.Ed. Degree Programme
APPLIED MATHEMATICS - LEVEL 05
ADU5307 - Numerical Methods
No BOOK TEST - 2024/2025
DURATION: ONE HOUR

Date: 29.09.2024 **Time: 4.00 p.m. to 5.00 p.m.**

ANSWER ALL QUESTIONS

1. Consider the integral

$$\int_{-2}^{2} e^{-x}\,dx$$

(a) Find the value of this integral by using an analytical method.

(b) Using the Trapezoidal Rule with four subdivisions (n = 4), find an approximation to the integral.

(c) Hence find the absolute error of this integral.

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2. (a) State the Simpson's 1/3 rule in approximating the integral $\int_{x_0}^{x_n} f(x)\,dx$ with the usual notation.

(b) Find the approximate value of $\int_2^3 \frac{1}{1+x}\,dx$ using the Simpson's 1/3 Rule with four subdivisions (n = 4).

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3. Applying Taylor's series method of fourth-order for the differential equation $\frac{dy}{dx} = x^2y - 1$ subject to initial condition $y(0) = 1$, evaluate $y(0.1)$ and $y(0.2)$ correct to five decimal places.

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4. (i) Applying Picard's method, with first approximation for the differential equation $\frac{dy}{dx} = 3x + y^2$ with initial condition $y(0) = 1$, find $y(0.1)$.

(ii) Applying Euler's method for the differential equation $y' = -2xy^2$ with the initial condition $y(1) = 1$, find $y(1.2)$ by taking step size $h = 0.1$.
