THE OPEN UNIVERSITY OF SRI LANKA

B.Sc/B.Ed., Continuing Education Degree Programme

Applied Mathematics – Level 05

ADU5302/ADE5302 – Mathematical Methods

Open Book Test (OBT) – 2024/2025

**DURATION: ONE (01)–HOUR**

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**Date: 01.09.2024.** **Time: 09.00a.m.-10.00 a.m.**

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ANSWER **ALL** QUESTIONS.

1. Obtain the Laplace transform of each of the functions $f(t)$:

   (i) $f(t) = \sinh^3 t$

   (ii) $f(t) = te^{-t}\cosh t$

2. Find the inverse Laplace transform of $\dfrac{32}{s^3 + 4s^2 + 4s}$.

3. Use the convolution theorem to find the inverse Laplace transform of

$$H(s) = \frac{1}{s^2(s^2+4)}.$$

4. Using Laplace Transform solve the following boundary value problem:

$$\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = e^{2t},\ y(0) = 0,\ y'(0) = 1.$$

5. Find the Fourier series of the function defined as

$$f(x) = \begin{cases} x+\pi & \text{for } 0 < x < \pi \\ -x-\pi & -\pi < x < 0 \end{cases} \quad \text{and} \quad f(x+2\pi) = f(x).$$