

The Open University of Sri Lanka
B.Sc/B.Ed. Degree Programme
Open Book Test (OBT) - 2016/2017
Applied Mathematics - Level 05
APU3143/APE5143 Mathematical Methods



Duration: One Hour

Date: 23.04.2017

Time: 02.30pm - 03.30pm

Answer ALL questions.

1. (a) Obtain the Laplace transform of the function $f(t)$ where $f(t) = t \sinh 4t$.
(b) Find $g(t)$ where

$$g(t) = \begin{cases} 0, & \text{if } t < a; \\ f(t - a), & \text{if } t > a; \end{cases} \quad a > 0$$

$$\text{if } f(s) = \frac{se^{2s}}{s^2 - a^2}.$$

- (c) Show that $L^{-1} \left\{ \frac{1}{s^3(s^2 + 1)} \right\} = \frac{t^2}{2} + \cos t - 1$.

2. (a) Use the convolution theorem to find the inverse Laplace transform of the function

$$\frac{1}{(s + 2)^2(s - 2)}.$$

- (b) Solve the following boundary value problem using the Laplace transform method

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0,$$

subject to the initial conditions $y(0) = 4$ and $y'(0) = 5$.

- (c) Consider the function $f(x)$ defined by

$$f(x) = x^2, \quad -\pi \leq x \leq \pi$$

Find the trigonometric fourier series of $f(x)$ in $-\pi \leq x \leq \pi$.