

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc/B.Ed Degree Programme

Applied Mathematics – Level 05

APU 3143/APE5143 – Mathematical Methods

OPEN BOOK TEST (OBT) – 2015/2016



DURATION: ONE (01)–HOUR

Date: 09.04.2016.

Time: 10.30a.m.-11.30 a.m.

ANSWER ALL QUESTIONS.

1. (a) Find the Laplace transform of each of the following functions:

(i) $t \cosh 3t$. (ii) $\frac{e^{-2t} \sin t}{t}$.

- (b) Find the inverse Laplace transform of the function $\frac{1}{s^2(s^2 - a^2)}$.

- (c) Use the convolution theorem to find the inverse Laplace transform of the function

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

2. (a) Solve the following boundary value problems using the Laplace transform method:

$$\frac{d^2 y}{dt^2} + 16y = 32t, \text{ subject to } y(0) = 3, y'(0) = -2.$$

- (b) Consider the periodic function $f(x)$ defined by

$$f(x) = \begin{cases} x^2 & 0 \leq x < 1 \\ 2 - x & 1 \leq x \leq 2 \end{cases}$$

and $f(x + 2) = f(x)$

Find the Fourier series of $f(x)$.