Tutorial Letter 101/0/2023

Differential Equations

APM2611

Year Module

Department of Mathematical Sciences

This tutorial letter contains important information about Assignment 4.

BARCODE

ASSIGNMENT 04
Due date: Thursday, 21 September 2023
Total Marks: 50
UNIQUE ASSIGNMENT NUMBER:

ONLY FOR YEAR MODULE

Question 1: **16 Marks**

Calculate the Laplace transform of the following function

(1.1) (5)

$$te^{2t}\cos(6t)$$

(1.2) (5)

$$t^2\mathcal{U}(t-2)$$

(1.3) (6)

$$t\int_0^t(\tau-1)e^{-\tau}d\tau$$

Question 2: **12 Marks**

Calculate the following inverse Laplace transforms

(2.1) (4)

$$\mathcal{L}^{-1}\left\{s^{-3}e^{-3s}\right\}$$

(2.2) (8)

$$\mathcal{L}^{-1}\left\{\frac{2s+4}{(s-2)(s^2-4s+3)}\right\}$$

Question 3: **7 Marks**

Solve the following initial value problem by using Laplace transforms:

$$x''(t)-5x'(t)+6x(t)=e^{2t},\ \text{with } x(0)=1=x'(0).$$

Question 4: **15 Marks**

Compute the Fourier series for the following functions:

(4.1) (7)

$$x-\frac{\pi}{2}\text{ on }\left(-\frac{\pi}{2},\frac{\pi}{2}\right),$$

(4.2) (8)

$\pi - x^2$ on $\left(-\sqrt{\pi}, \sqrt{\pi}\right)$.