NORTH SOUTH UNIVERSITY

Committed to the Highest Standards of Academic Excellence
School of Engineering & Physical Sciences
Department of Mathematics & Physics
MAT 350 (Engineering Mathematics) - Section: 06
Assignment:05   Semester: Summer 2022
Deadline: 31/08/2022

Questions:

Solve the following system of differential equations by systematic elimination.
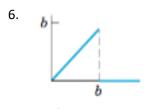
1.
$$Dx + D^2y = e^{3t}$$
$$(D + 1)x + (D - 1)y = 4e^{3t}$$

2.
$$2\frac{dx}{dt} - 5x + \frac{dy}{dt} = e^t$$
$$\frac{dx}{dt} - x + \frac{dy}{dt} = 5e^t$$

3.
$$\frac{dx}{dt} - 4y = 1$$
$$\frac{dy}{dt} + x = 2$$

4.
$$\frac{dx}{dt} = -y + t$$
$$\frac{dy}{dt} = x - t$$

Find the Laplace transform. Show the details of your work. Assume that a, b, ω, θ are constants.

5. $e^{-t} \sinh 4t$

6.

Given $F(s)=\mathcal{L}(f)$, find $f(t)$. a, b, L, n are constants. Show the details of your work

7. $ke^{-at}\cos\omega t$

8. $\dfrac{21}{(s+\sqrt{2})^4}$

Solve the following IVPs by the Laplace transform showing the procedure in details

9. $y'' + 0.04y = 0.02t^2,\quad y(0) = -25,\quad y'(0) = 0$

10. $y'' - \frac{1}{4}y = 0,\quad y(0) = 12,\quad y'(0) = 0$

Solve the shifted data IVPs by the Laplace transform showing the procedure in details

11. $y'' - 2y' - 3y = 0,\quad y(4) = -3,$
    $y'(4) = -17$

12. $y'' + 3y' - 4y = 6e^{2t-3},\quad y(1.5) = 4,$
    $y'(1.5) = 5$

Sketch and represent the following function using unit step functions and find its Laplace transform

13. $\sinh t\ (0 < t < 2)$

14. $t^2\ (1 < t < 2)$

15. $\sin t\ (\pi/2 < t < \pi)$

Please submit the hardcopy during class time.