

Engineering Mathematics(1)

Started on	Thursday, 12 August 2021, 1:01 PM
State	Finished
Completed on	Thursday, 12 August 2021, 1:26 PM
Time taken	24 mins 12 secs
Marks	2.00/2.00
Grade	6.00 out of 6.00 (100%)

Question 1

Correct
Mark 1.00 out of 1.00
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Use Laplace transform to solve the IVP

$$y_1' = -y_1 + y_2$$

$$y_2' = 2y_1 + 6,$$

with $y_1(0) = y_2(0) = 0$, where y_1 and y_2 are unknown functions of t .

1. Applying Laplace transform to the system, we obtain the system of algebraic equations (here $Y_1 = L(y_1)$ and $Y_2 = L(y_2)$)

A. $sY_1 = -Y_1 + Y_2$ and $sY_2 = 2Y_1 + \frac{6}{s^2}$

B. $Y_1 = -Y_1 + Y_2$ and $Y_2 = 2Y_1 + \frac{6}{s}$

C. $sY_1 = -Y_1 + Y_2$ and $sY_2 = 2Y_1 + 6$

D. $sY_1 = -Y_1 + Y_2$ and $sY_2 = 2Y_1 + \frac{6}{s}$

2. We find Y_1 and Y_2 as functions in s .

A. $Y_1 = \frac{6}{s(s-1)}$ and $Y_2 = \frac{6}{s(s-1)(s+2)}$

B. $Y_1 = \frac{6}{s(s-1)(s+2)}$ and $Y_2 = \frac{6(s+1)}{s(s-1)(s+2)}$

C. $Y_1 = \frac{6}{s(s-1)(s+2)}$ and $Y_2 = \frac{6(s+1)}{s(s+2)}$

D. $Y_1 = \frac{6}{s(s+2)}$ and $Y_2 = \frac{6(s+1)}{s(s-1)(s+2)}$

3. The solution of the IVP is given by

A. $y_1 = e^{-2t} + 2e^t - 3$ and $y_2 = e^{-2t} + 4e^t - 3$

B. $y_1 = e^t - 3$ and $y_2 = -3 + e^{-2t} + 4e^t$

C. $y_1 = e^{2t} + e^t - 3$ and $y_2 = -3 + e^t$

D. $y_1 = e^{-2t} - 3$ and $y_2 = -3 + e^{-2t} + e^t$

Answers: 1.

D

2.

B

3.

A

Question 2

Correct
Mark 1.00 out of 1.00
Flag question

Consider the homogeneous system of linear ODEs

$$y_1' = y_1 + y_2$$

$$y_2' = 4y_1 + y_2,$$

where y_1 and y_2 are unknown functions of t .

1. The eigenvalue(s) of the coefficient matrix A are

A. $\lambda_1 = -1$ and $\lambda_2 = 0$ B. $\lambda_1 = -1$ and $\lambda_2 = 3$

C. $\lambda_1 = -2$ and $\lambda_2 = 2$ D. $\lambda_1 = \lambda_2 = 3$

2. The eigenvectors of the matrix A relative to λ_1 are

A. $\begin{bmatrix} x \\ -2x \end{bmatrix}, x \in \mathbb{R}$ B. $\begin{bmatrix} 0 \\ x \end{bmatrix}, x \in \mathbb{R}$

C. $\begin{bmatrix} x \\ x \end{bmatrix}, x \in \mathbb{R}$ D. $\begin{bmatrix} -2x \\ 0 \end{bmatrix}, x \in \mathbb{R}$

3. The eigenvectors of the matrix A relative to λ_2 are

A. $\begin{bmatrix} x \\ x \end{bmatrix}, x \in \mathbb{R}$ B. $\begin{bmatrix} x \\ -x \end{bmatrix}, x \in \mathbb{R}$

C. $\begin{bmatrix} 0 \\ x \end{bmatrix}, x \in \mathbb{R}$ D. $\begin{bmatrix} x \\ 2x \end{bmatrix}, x \in \mathbb{R}$

4. The general solution of the system is given by

A. $y_1 = c_1 e^{-t} + 2c_2 e^{3t}$ and $y_2 = -c_1 e^{-t} + c_2 e^{3t}$

B. $y_1 = c_1 e^{3t} + 2c_2 t e^{3t}$ and $y_2 = -c_1 e^{3t} + c_2 t e^{3t}$

C. $y_1 = c_1 e^{-t} + c_2 e^{3t}$ and $y_2 = -2c_1 e^{-t} + 2c_2 e^{3t}$

D. $y_1 = c_1 + 2c_2 e^{-t}$ and $y_2 = c_1 - c_2 e^t$

Answers: 1.

B

2.

A

3.

D

4.

C

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