

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_



**Jyothi Engineering College(Autonomous)**  
B. Tech Degree S1 (S) Examination, June 2026 (2025 Scheme)

**25MAT102 - MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE -**

1



Total Mark: 60

Total Time: 2hrs 30 min

**PART A**

(Answer All Questions. Each question carries 3 marks)

1. Find the rank of the matrix  $A = \begin{bmatrix} 3 & 2 & 1 & 4 \\ 5 & 4 & 0 & 7 \\ 1 & 0 & 2 & 1 \end{bmatrix}$ . CO1 (3)
2. Find the eigenvalues of  $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ . Also find the eigenvalues of adjoint A and  $A^3$  without using its characteristic equation. CO1 (3)
3. Find the general solution of  $y'' + 4y' + 2.5y = 0$ . CO2 (3)
4. Find the Wronskian of  $e^{-x}\cos 5x$  and  $e^{-x}\sin 5x$ . CO2 (3)
5. Find the Laplace Transform of  $\sin 4t \cos 3t$ . CO3 (3)
6. Find the inverse Laplace transform of  $\frac{e^{-s}}{(s+2)^2}$ . CO4 (3)
7. Write down the Eulers formula for the function  $f(x)$  defined on the interval  $(-2, 2)$ . CO5 (3)
8. Write down Maclaurin Series expansion of  $\sin x$ . CO5 (3)

**PART B**

(Answer any one full question from each module, each question carries 9 marks)

**Module - 1**

9. a) Find the eigenvalues and eigenvectors of the matrix  $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ . CO1 (5)
- b) For what values of  $\lambda$  and  $\mu$  the given system of equations  $x + y - z = 4, x - 2y + 3z = 2, -x + 2y + \lambda z = \mu$  has (i) No solution (ii) Unique solution (iii) Infinite number of solutions. CO1 (4)

OR

10. a) Diagonalize the matrix  $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$  if possible. CO1 (5)
- b) Test for consistency and solve the following system of equations:  $10x + 4y - 2z = 14, -3w - 15x + y + 2z = 0, w + x + y = 6, 8w - 5x + 5y - 10z = 26$  CO1 (4)

**Module - 2**

11. a) Solve the initial value problem  $y'' + y' - 2y = 0, y(0) = 4, y'(0) = -5$ . CO2 (5)
- b) Solve  $y'' + 5y' + 6y = 12e^{-x}$ . CO2 (4)

OR

12. a) Find the steady- state motion of the mass- spring system modelled by the ODE  $y'' + 6y' + 8y = 42.5\cos 2t$ . CO2 (5)  
b) Solve  $y'' + y = \operatorname{cosec} x$  by the method of variation of parameters. CO2 (4)

Module - 3

13. a) Using Laplace Transform solve the initial value problem  $y'' + 9y = 10e^{-t}$ ,  $y(0) = 0$ ,  $y'(0) = 0$  CO3 (5)  
b) Find  $L(e^{3t}t\sin 2t)$ . CO3 (4)

OR

14. a) Using Convolution theorem find  $L^{-1}\left(\frac{1}{(s^2 + a^2)^2}\right)$ . CO3 (5)  
b) Find the Laplace Transform of  $f(t) = \begin{cases} t, & 0 < t < 1 \\ 1, & t > 1 \end{cases}$  CO3 (4)

Module - 4

15. Find the Fourier Series for  $f(x) = |\sin x|$ ,  $-\pi < x < \pi$  CO5 (9)

OR

16. Find the Fourier series for the function  $f(x) = \begin{cases} x; & 0 < x < 1 \\ 1 - x; & 1 < x < 2 \end{cases}$  CO5 (9)

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