

1604-23-798-80

Code No: G-5012/N/BL/AICTE

FACULTY OF ENGINEERING**B.E. II-Semester (Backlog) (AICTE) (New) Examination, July/August-2025****Subject: Mathematics -II.****Time: 3 Hours****Max. Marks: 70**

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may be suitably assumed.

1. a) If $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ then find A^8 by using Cayley - Hamilton theorem.

b) Find the symmetric matrix corresponding to the quadratic form $x_1^2 + 2x_2^2 + 4x_2x_3 + x_3x_4$.

c) Solve $\frac{dy}{dx} + 2xy = e^{-x^2}$

d) Find the general solution of $\frac{d^3y}{dx^3} - 8y = 0$

e) Find the regular and singular points of the differential equation $(1-x^2)y'' - 2xy' + n(n+1)y = 0$.

f) Find $L\{(t^2+1)^2\}$

g) Find inverse Laplace transform of $\left\{\frac{s^2-3s+4}{s^3}\right\}$

2. a) Reduce the matrix $\begin{bmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$ into Echelon form and hence, find its rank.

b) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{bmatrix}$ and also find the eigen values of the matrix A^{-1} .

3. a) Solve $(y^2e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$.

b) Show that the system of confocal and coaxial parabolas $y^2 = 4a(x+a)$ are self orthogonal.

4. a) Solve the initial value problem $y''' + 3y'' - 4y = 0$, $y(0) = 1$, $y'(0) = 0$ and $y''(0) = 17/2$.

b) Find the general solution of Euler Cauchy's equation $x^2y'' + 2xy' - 6y = 15x^2$.

5. a) Evaluate $\int_0^1 (x \log x)^4 dx$

b) Prove that $\int_{-1}^1 P_m(x)P_n(x)dx = 0$ if $m \neq n$

6. a) Find $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$

b) Solve the differential equation by using Laplace transform $\frac{d^2x}{dt^2} + 3\frac{dx}{dt} + 2x = e^{-t}$, $x(0) = 0$, $x'(0) = 1$.

7. a) Find the equation of the curve satisfying the differential equation $(1+x^2)\frac{dy}{dx} + 2xy = 4x^2$ and passing through the origin.

b) Find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$ by using Convolution theorem.
