

2021

MATHEMATICS

GENERAL: course: 201

(Matrices, ordinary differential equations and  
Numerical Analysis)

Full marks: 20

Pass marks: 8/6

Time  $1\frac{1}{2}$  hrs

Answer any five questions:  $4 \times 5 = 20$

1. Prove that all elementary matrices are non singular.

2. Find the rank of  $A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$

by reducing it to normal form.

3. State and prove Cayley - Hamilton Theorem.

4. Solve  $\frac{dy}{dx} + y \cot x = 2 \cos x$

5. Solve  $\frac{d^2y}{dx^2} + 6 \frac{dy}{dx} + 5y = 16e^{3x}$

6. Removing the first-order derivative; solve

$$\frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + (4x^2 - 3)y = e^{x^2}$$

7. Find  $\int_0^1 \frac{x^2}{1+x^2} dx$  by trapezoidal rule

8. Describe Newton-Raphson method for solving an algebraic equation.