

2021
MATHEMATICS
MAJOR
COURSE-201

Full Marks : 20

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

Pass Marks : 8/6

(Matrices, ordinary diff. equations and numerical Analysis)
Answer any five questions; $4 \times 5 = 20$

1. Show that $\text{rank}(AA^T) = \text{rank} A$

2. Find the rank of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix} \quad \text{reducing it into echelon form.}$$

3. State and prove Cayley-Hamilton theorem.

4. Solve $y = px + \frac{a}{p}$; $p = \frac{dy}{dx}$

5. Solve $(D^3 - 2D + 4)y = e^x \cos x$, $D = \frac{d}{dx}$

6. Solve $\frac{d^2 y}{dx^2} + \tan x \frac{dy}{dx} + y \cos^2 x = 0$

by putting $z = \sin x$

7. Deduce "Newton's forward" interpolation formula

8. Find a real root of the equation

$$x^3 + x^2 - 1 = 0 \quad \text{by using iteration method}$$

Correct to three places of decimal.

_____ x _____