8.a) Find y_n when $y = \frac{x+2}{(x+1)^2(3x+4)}$.

OR

b) If $u = \log_e\left(\frac{x^4+y^4}{x+y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3$.

9.a) Find the radius of curvature for the curve $2y = x - x^2 + x^3$ at $(1, \frac{1}{2})$.

OR

b) Find the centre of curvature of the curve $y = x^2$ at the origin.

10.a) Evaluate: $\int \sin^{-1} x \, dx$.

OR

b) Find the reduction formula for $\int x^n e^{ax} dx$.

SECTION -C (30 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11.a) Show that the matrix $\begin{pmatrix} \alpha + i\gamma & -\beta + i\delta \\ \beta + i\delta & \alpha - i\gamma \end{pmatrix}$ is unitary if $\alpha^2+\beta^2+\gamma^2+\delta^2=1$.

OR

b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$.

12.a) Solve the equation $32x^3 - 48x^2 + 22x - 3 = 0$ whose roots are in A.P.

OR

b) Solve: $x^4 - 4x^3 + 5x^2 - 4x + 1 = 0$.

13.a) Find the n^{th} derivative of $y = x^2 \log 3x$.

OR

b) If $u = \frac{1}{\sqrt{x^2+y^2+z^2}}$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$.

14.a) Find the radius of curvature for the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at the point $\left(\frac{a}{4}, \frac{a}{4}\right)$.

OR

b) Find the centre of curvature of the curve $y^2 = 4ax$.

15.a) Evaluate: $\int \frac{5x^2-27x+60}{(x-3)^2(x+5)} dx$.

OR

b) Establish a reduction formula for $\int \sin^n x \, dx$.

Z-Z-Z END