

36.
$$\frac{x^2 dx}{(x^2 + a^2)(x^2 + b^2)}$$

$$\text{Q)} \int \frac{x^2 dx}{(x^2+a^2)(x^2+b^2)}$$

$$\frac{x^2}{(x^2+a^2)(x^2+b^2)} = \frac{A}{x^2+a^2} + \frac{B}{x^2+b^2}$$

$$x^2 = A(x^2+b^2) + B(x^2+a^2)$$

$$x^2 = (A+B)x^2 + b^2A + Ba^2$$

$$A+B=1, \quad b^2A+Ba^2=0$$

$$A = -\frac{Ba^2}{b^2}$$

On solving we get

$$A = \frac{a^2}{a^2-b^2}, \quad B = \frac{b^2}{b^2-a^2}$$

$$\therefore \int \frac{x^2 dx}{(x^2+a^2)(x^2+b^2)} = \frac{a^2}{a^2-b^2} \int \frac{dx}{x^2+a^2} + \frac{b^2}{b^2-a^2} \int \frac{dx}{x^2+b^2}$$

$$= \frac{a^2}{a^2-b^2} \cdot \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + \frac{b^2}{b^2-a^2} \cdot \frac{1}{b} \tan^{-1}\left(\frac{x}{b}\right)$$