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Q. Let 'P' be a non-singular matrix & $I + P + P^2 + \dots + P^n = O$ then find P^{-1}

$$I + P + P^2 + \dots + P^n = O$$

multiplying by $(I-P)$ both side.

$$(I-P)(I + P + P^2 + P^3 + \dots + P^n) = (I-P)\cdot O$$
$$I - P^{n+1} = O$$

{using formula, $1 + x + x^2 + \dots + x^n = \frac{1-x^{n+1}}{1-x}$

$\Rightarrow (1-x)(1 + x + x^2 + \dots + x^n) = 1 - x^{n+1}$

or simply multiplying.}

$$P^{n+1} = I$$
$$(P^n)P = I$$

{If $AB = BA = I$, then $A^{-1} = B$}

Hence, $\boxed{P^{-1} = P^n}$

Ans.