Problem : To find the cross-over frequency of the given transfer function

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CONTROL SYSTEM

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- The phase crossover is a frequency at which phase angle first reaches -180 degree or at which frequency the imaginary part of denominator of transfer function is equal to zero.

- G(s)=$\dfrac{100}{(s+1)^3}$
- Now we will put s=jω

  Phase crossover frequency is when phase is 180 degree that is the nyquist plot crosses the real axis i.e We will equate the imaginary part of denominator to zero and that particular frequency is the phase crossover frequency.

solution

$$G(j\omega) = \frac{100}{(j\omega + 1)^3}$$

$$= \frac{100}{(j\omega)^3 + 1 + 3(j\omega)^2 + 3j\omega}$$

$$= \frac{100}{-j\omega^3 + 1 - 3\omega^2 + 3j\omega}$$

$$= \frac{100}{(1 - 3\omega^2) + j(3\omega - \omega^3)}$$

Now equating the imaginary part to zero

$(3\omega - \omega^3) = 0$
$\omega(3 - \omega^2) = 0$
$\omega = \sqrt{3}$
as phase should be greater than zero for stability.