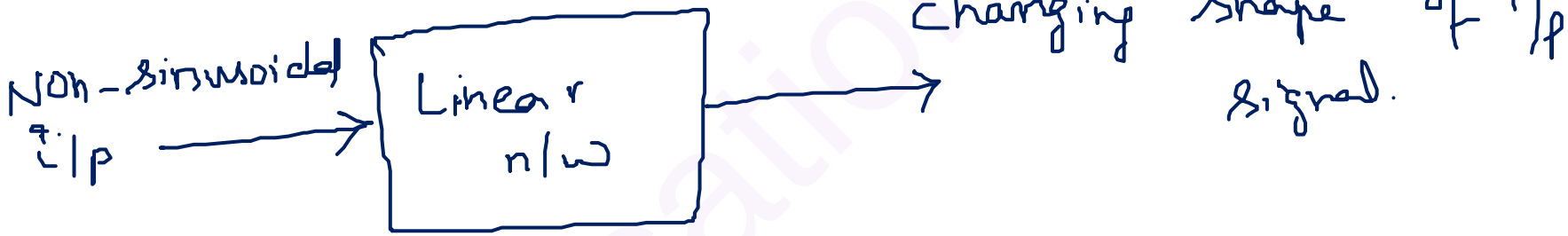
Linear wave shaping

Linear network Versus Non-linear network

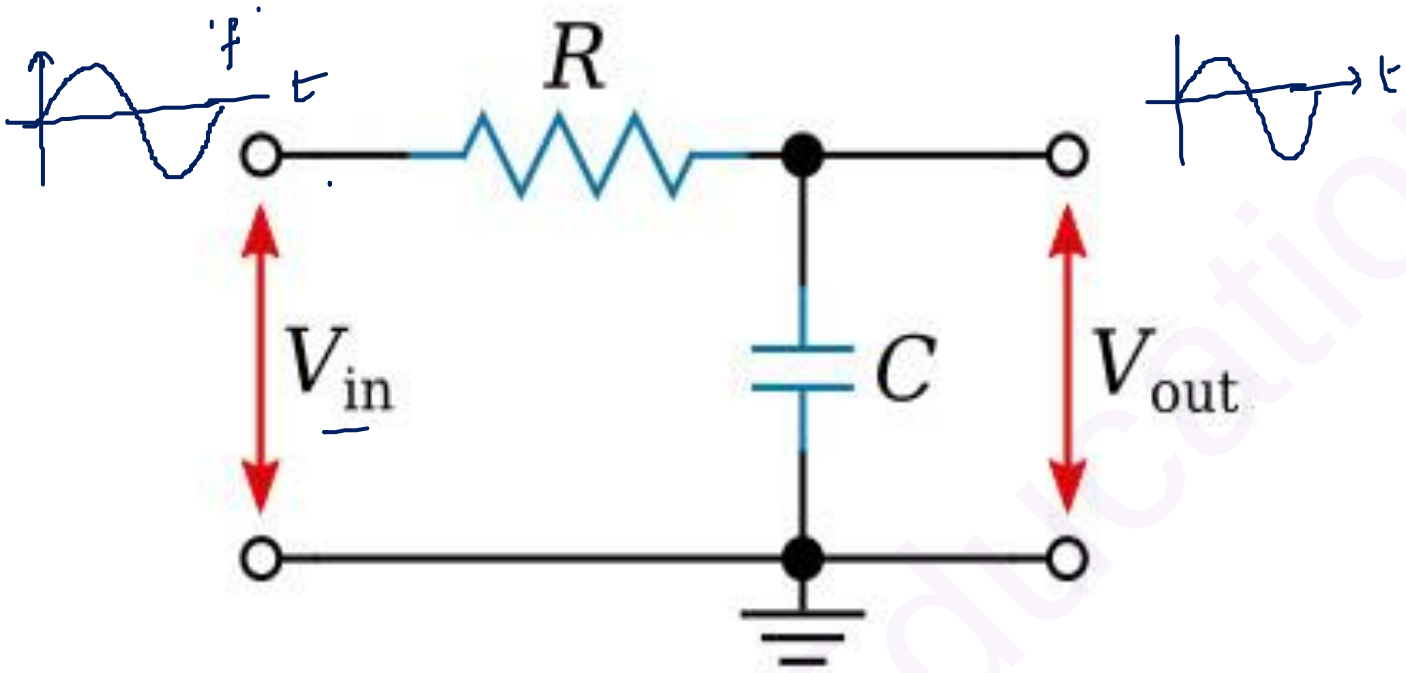
* Linear n/w is made up of — R, L, C + Active Source.
  - RC, RL, RLC Linear Components.
* Non-Linear n/w is made up of → Non-linear Component + R, L, C + Active Source.
  - Example — Diode, transistor.

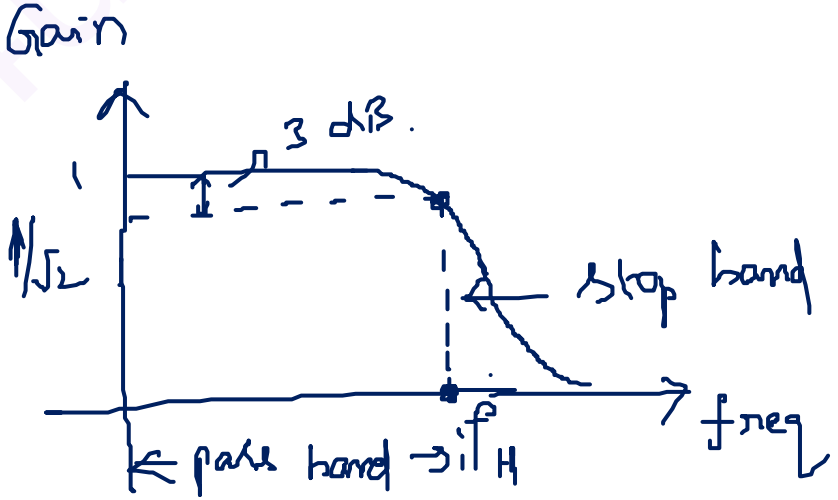
Linear Wave Shaping :- The process of changing the shape of or non-sinusoidal signal when passing through a linear n/w.



Linear N/W :-

Low-pass RC network





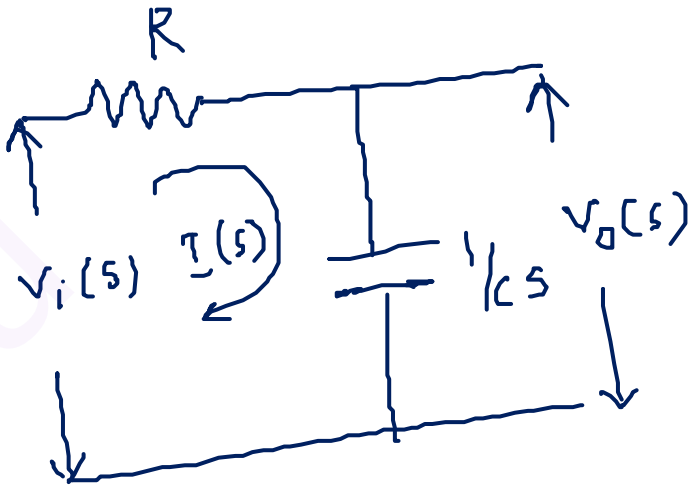
$|A| = ?$

$f_H = ?$

Gain, $A = \dfrac{V_0(s)}{V_i(s)}$

$= \dfrac{\frac{1}{Cs} \cdot I(s)}{\left(R + \frac{1}{Cs}\right) I(s)}$

$= \dfrac{1}{1 + RCs}$



We know, $s = j\omega = j\,2\pi f$

$A = \dfrac{1}{1 + j2\pi f RC}$ ①

$\Rightarrow |A| = \dfrac{1}{\sqrt{1 + (2\pi f RC)^2}}$ ②

At frequency, $f = f_H$, $|A| = \frac{1}{\sqrt{2}}$

$$\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{1 + (2\pi f_H RC)^2}}$$

$$2\pi f_H RC = 1$$

$$\boxed{f_H = \frac{1}{2\pi RC}}$$

from eq-(1); $A = \frac{1}{1 + j\frac{f}{f_H}}$, $|A| = \frac{1}{\sqrt{1 + \left(\frac{f}{f_H}\right)^2}}$

angle, $\theta = \tan^{-1}\left(\frac{f}{f_H}\right)$

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