30.01.2019

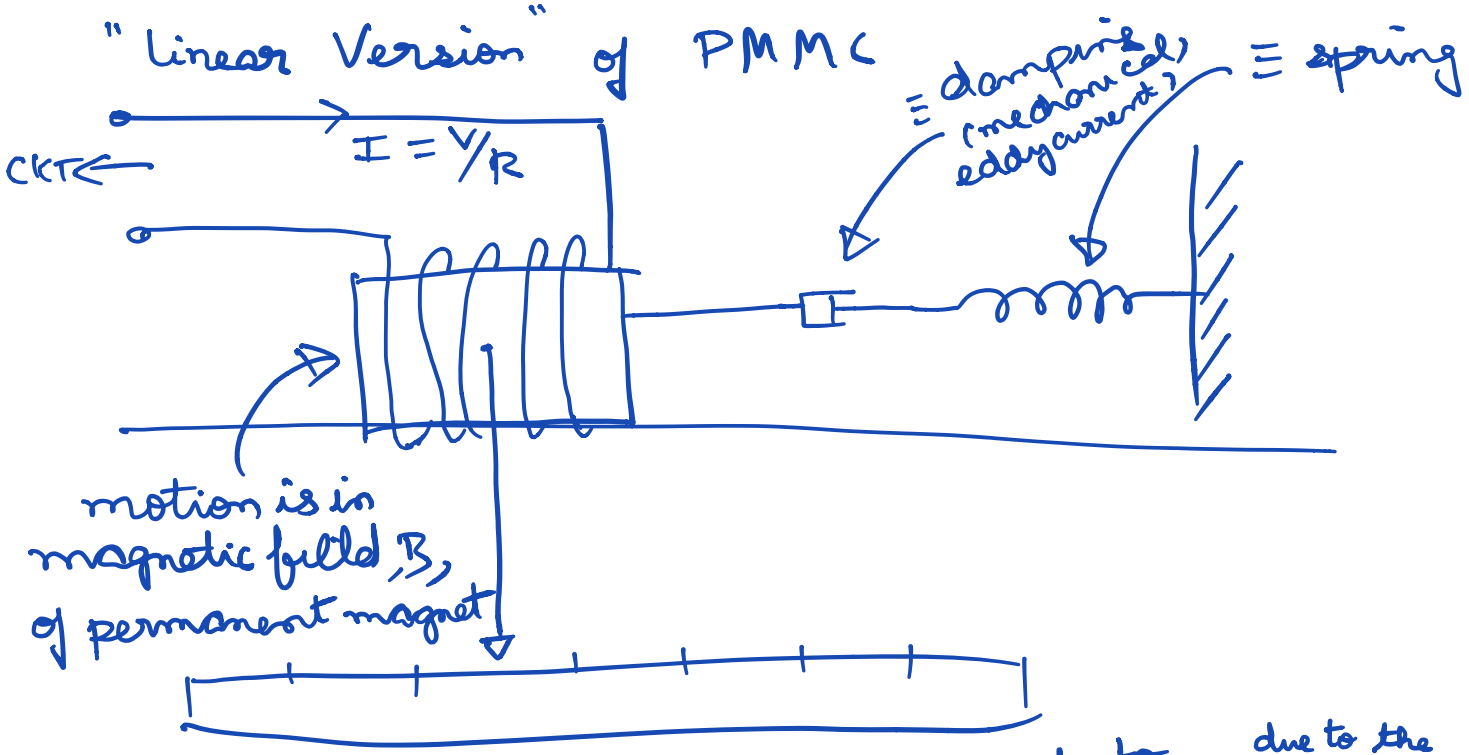
ELL301

Bowens → Library
Textbook section

Minor Test 1
05.02.2019
1 – 2 PM TUE
LH 114

1:30 – 2:30 PM
1/2 → office hour
Block II – 214

"Linear Version" of PMMC



$$m\ddot{x} + b\dot{x} + kx = F \rightarrow \sim B \times I$$

B: due to permanent magnet
I: due to the coil → or $\frac{V}{R}$, R is coil resistance

$$\Rightarrow m\ddot{x} + b\dot{x} + kx = KV$$

K includes
- B
- R
- geometric factor

Different from MI in the presence of 'V' rather than 'V^2' on RHS.

Consequences

- Scale can be linear, not needed to be nonlinear.
- Suppose 'V' was dc voltage

⇒ What is steady-state response of 'x'?

(like before), take Laplace Transform.

$$X(s) = \frac{1}{ms^2 + bs + k} \cdot \frac{KV}{s}$$

Final Value Theorem: $\lim_{t\to\infty} x(t) = \lim_{s\to 0} sX(s)$

$$= \lim_{s\to 0} s \cdot \frac{1}{ms^2+bs+k} \cdot \frac{KV}{s}$$

$$= \frac{K}{k} \cdot V$$

- Suppose we try to measure 'ac' voltage

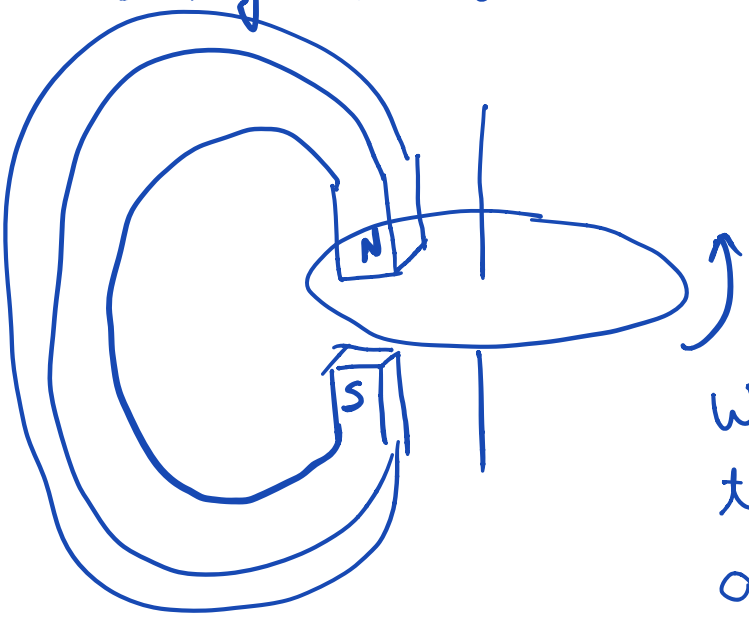
$$m\ddot{x} + b\dot{x} + kx = KV_0 \sin \omega t$$

can see that the output is also sinusoidal

⇒ the needle does not settle to a fixed value.

∴ This PMMC instrument is not used to measure AC voltages / currents. It is used only for DC case.

Eddy Current



Al disc, rotating

What are the directions of the eddy currents which are generated?