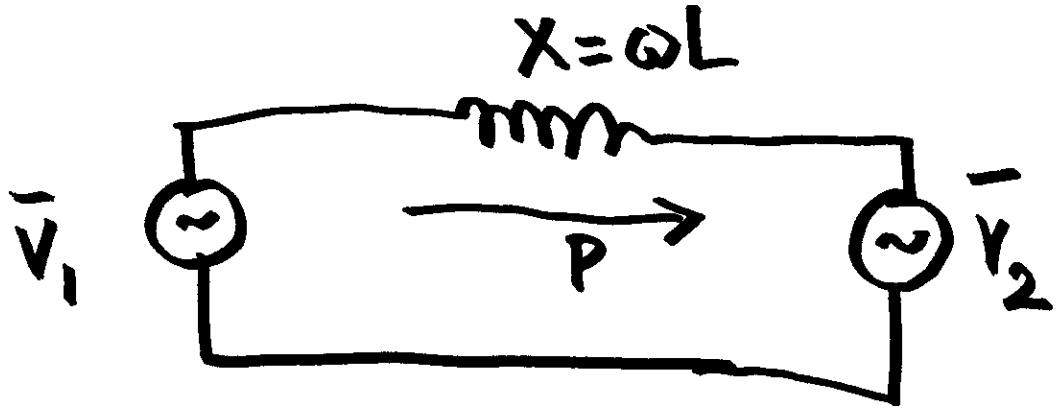
Prof. A.M. Kulkarni

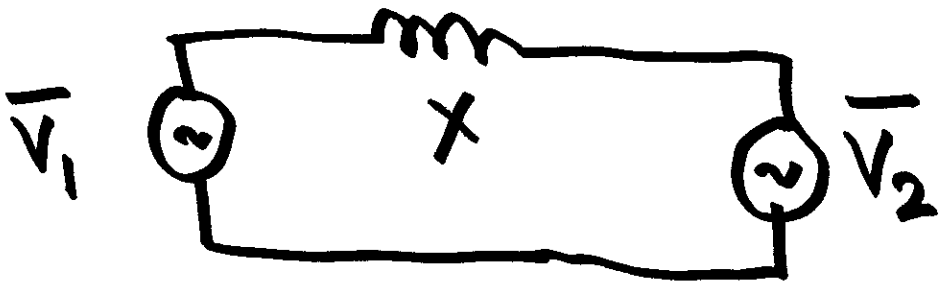


$\omega = 2\pi f_0$

$\bar{V}_1 = V_1 \angle \phi_1 \qquad \bar{V}_2 = V_2 \angle \phi_2$

$$\begin{cases} v_1(t) = \sqrt{2}\, V_1 \sin(\omega t + \phi_1) \\ v_2(t) = \sqrt{2}\, V_2 \sin(\omega t + \phi_2) \end{cases}$$

$$P = \frac{V_1 V_2 \sin(\phi_1 - \phi_2)}{X}$$ } constant!



$\bar{V}_1 \rightarrow f_1 \qquad \bar{V}_2 = f_0$

$f_1 \approx f_0$

$$P = \frac{V_1 V_2 \sin(\phi_1 - \phi_2)}{X}$$

$$v_1(t) = \sqrt{2}\, V_1 \sin(\omega_1 t + \phi_1) \qquad \omega_1 = 2\pi f_1$$
$$= \sqrt{2}\, V_1 \sin(\omega_0 t + \phi_1 + (\omega_1 - \omega_0)t).$$

$$v_1(t) = \sqrt{2}\, V_1 \sin(\omega_0 t + \phi_1')$$

$$\phi_1' = \phi_1 + (\omega_1 - \omega_0)t$$

$$v_2(t) = \sqrt{2}\, V_2 \sin(\omega_0 t + \phi_2)$$

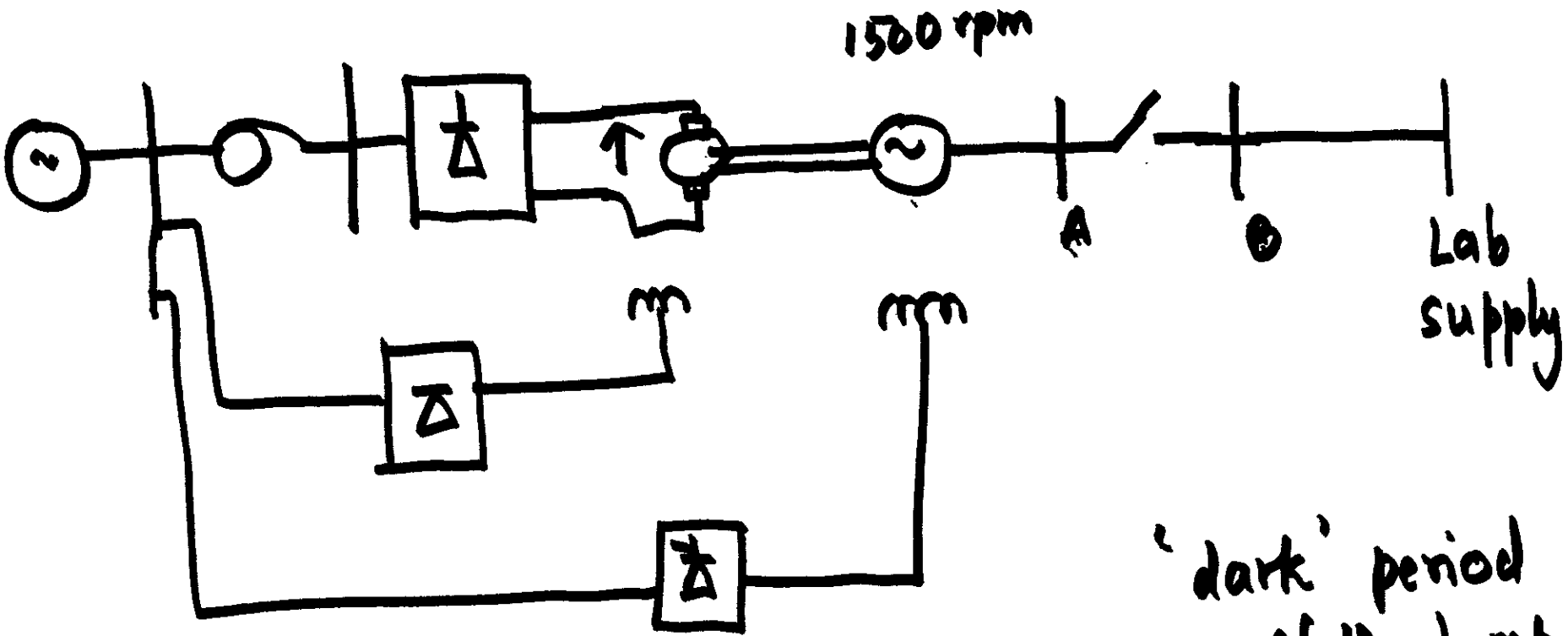
exact $\rightarrow$ $$P = \frac{V_1 V_2 \sin(\phi_1' - \phi_2)}{X}$$

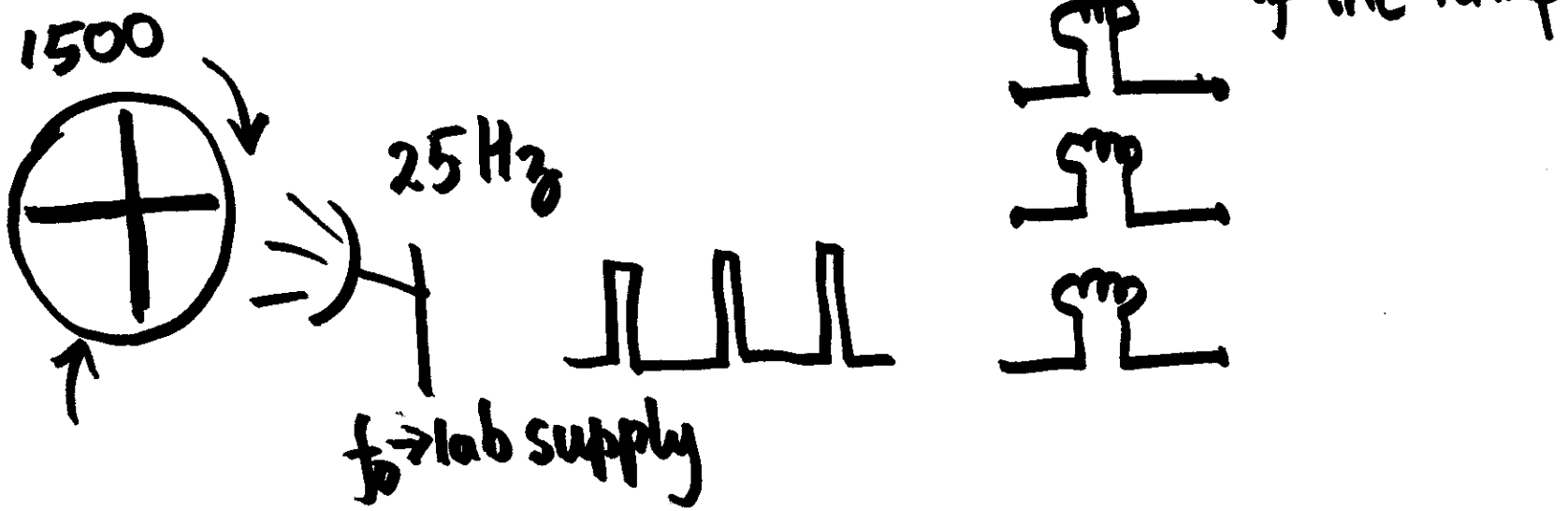
$X \leftarrow \omega_1 L$ or $\omega_0 L$

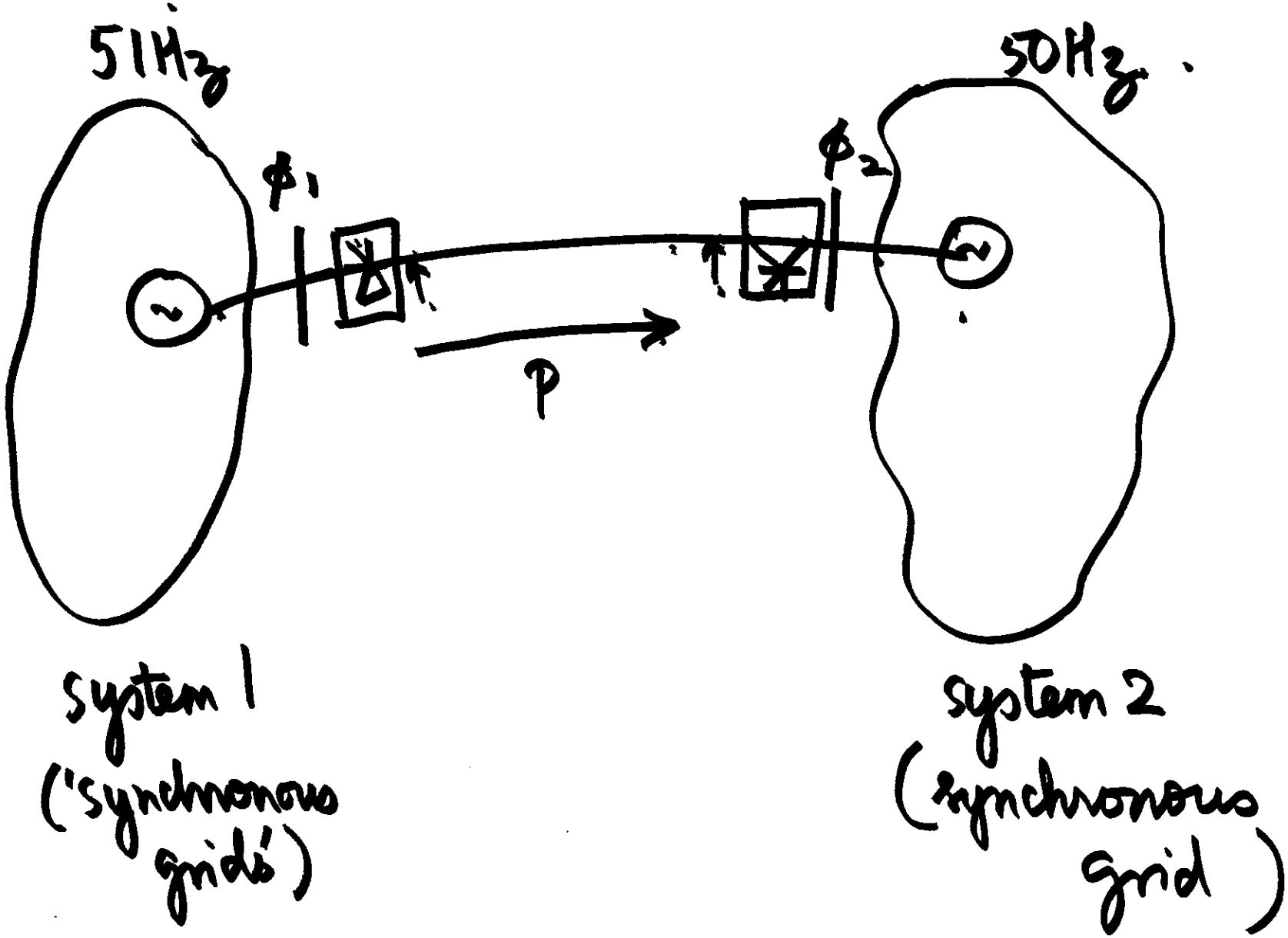
$\omega_1 \approx \omega_0$

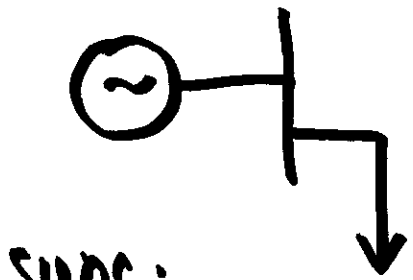
P will NOT BE A CONSTANT.

V_m also not a constant

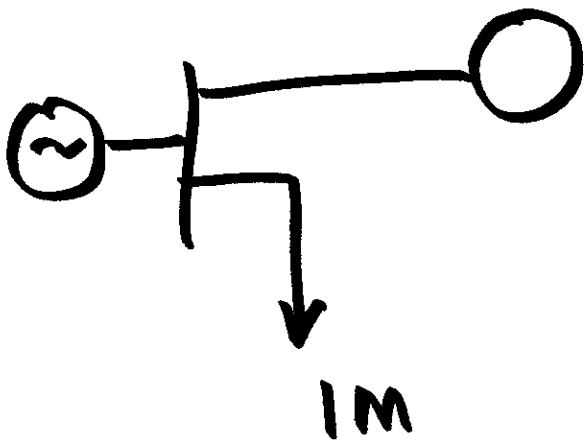

1500 rpm
A
B
Lab supply


1500
25 Hz
f_b → lab supply
'dark' period of the lamp


51Hz
50Hz
ϕ_1
ϕ_2
P
System 1
('synchronous grid')
System 2
(synchronous grid)



fan (1.m.) } phase
bulb } voltage magnitude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