

A 3 phase Y connected 220V (Line to Line), 60Hz, 6 pole has the following constants in ohms/phase with respect to the stator

$$R_1 = 0.294 \quad R_2' = 0.144$$

$$X_1 = 0.583 \quad X_2' = 0.209 \quad X_m = 13.25$$

$$s = 2\%$$

$$\frac{R_2'}{s} = \frac{0.144}{0.02} = 7.2 \Omega$$

$$W_{syn} \Rightarrow 12008 \text{ rpm} = \frac{60 \times 60}{\frac{6}{2}}$$

$$T_d = \left( \frac{220}{\sqrt{3}} \right)^2 \times \frac{1}{2\pi \times 20} \times \frac{1}{144} \times 3 \times (5W_{syn})$$

phase

$$5W_{syn} = 0.02 \times 2\pi \times 20$$

$$= 2.513 \text{ rad/sec}$$

$$T_d = 52.918 \text{ N-m} \Rightarrow 248 \text{ rpm}$$

$1200 \times 0.02$

$$T_{d1} = 30 \text{ N-m}$$

$$(5W_{syn})_+ = \frac{30}{52.918} \times 2.513 = 1.4246$$

$\Rightarrow 13.68 \text{ rpm}$

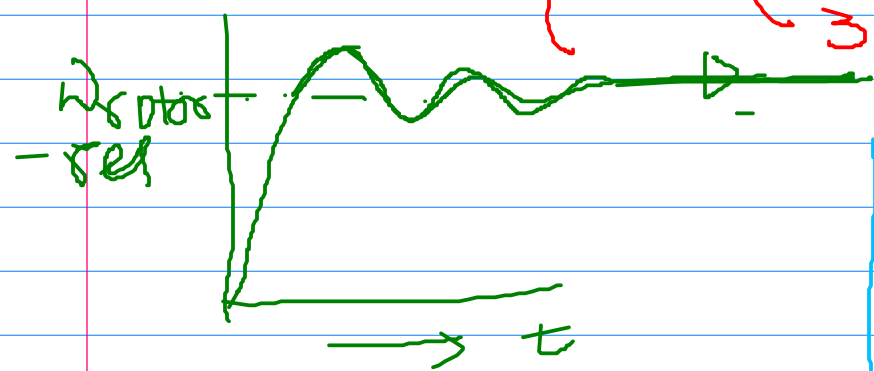
$$\left( \frac{220}{60} \right) (L-L)$$

Rotor speed <small>154 m</small>	Torque Demand	$s w_c$ (RPM)	$w_c$ (RPM)	$V_s$ ( <small>154 Hz</small> )	$f_s$
400	53 Nm	24 <small>rpm</small>	424 $\Rightarrow$	$\frac{220 \times 2.2}{60}$ $= 77.7$ * V	$\frac{424 \times 3}{60}$ <del>21.2</del> Hz *
400	30 Nm	13.6 <small>rpm</small>	413.6	$\frac{220 \times 20.7}{60}$ $= 75.9$ V	$\frac{413.6 \times 3}{60}$ $= 20.7$ Hz
✓ 600 ✓	30 Nm ✓	13.6 <del>rpm</del> rpm slip speed	613.6 <del>rpm</del>	✓ 112.5 V =	✓ 30 60 =

$$\frac{J d\omega_{\text{rotor}}}{dt} = T_d - T_L$$

30 Nm

3 phase 415V, 50Hz Utility supply



Rectifier

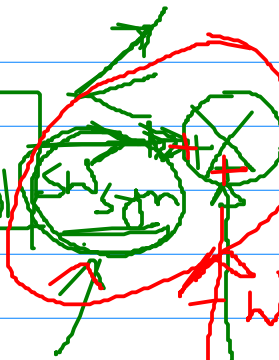
+600V

Gate signals

INVERTER

$\omega_{\text{rotor-ref}}$  (radians/s)

PI Control



$\omega_{\text{syn}}$

Modulator

$V_s$

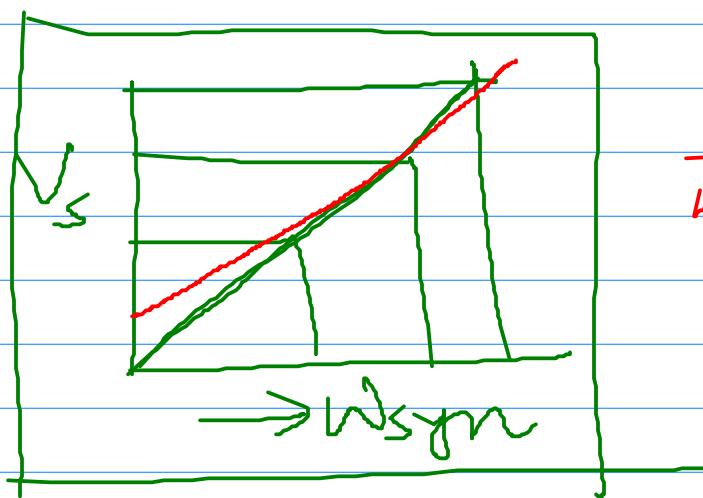
M/C

A/D

Tach

Load

15.6  
470



$$\frac{V_s}{\omega_{\text{syn}}} = \text{const}$$

Modulator