SYNCHRONOUS MOTORS

EE 340
Spring 08
Per-Phase Equivalent Circuit

\[ V_\phi = E_A + jX_S I_A + R_A I_A \]

\[ E_A = V_\phi - jX_S I_A - R_A I_A \]

Power in and power out
Phasor Diagram (with Rs = 0) and Corresponding Magnetic Field Diagram

E lags behind V
Torque-Speed Characteristic

\[ SR = \frac{n_{nl} - n_{fl}}{n_{fl}} \times 100\% \]

Torque eqn
Effect of Change in Field Current
Effect of Increase in Motor Load

V-curve
Dual Use of Synchronous Motor

- As a Motor Drive
- As Power Factor Correction Device
Starting Problem of Sync. Motor

Average Torque = 0
Motor Starting with Amortisseur Winding
Homework Problems

• 6.1
• 6.2