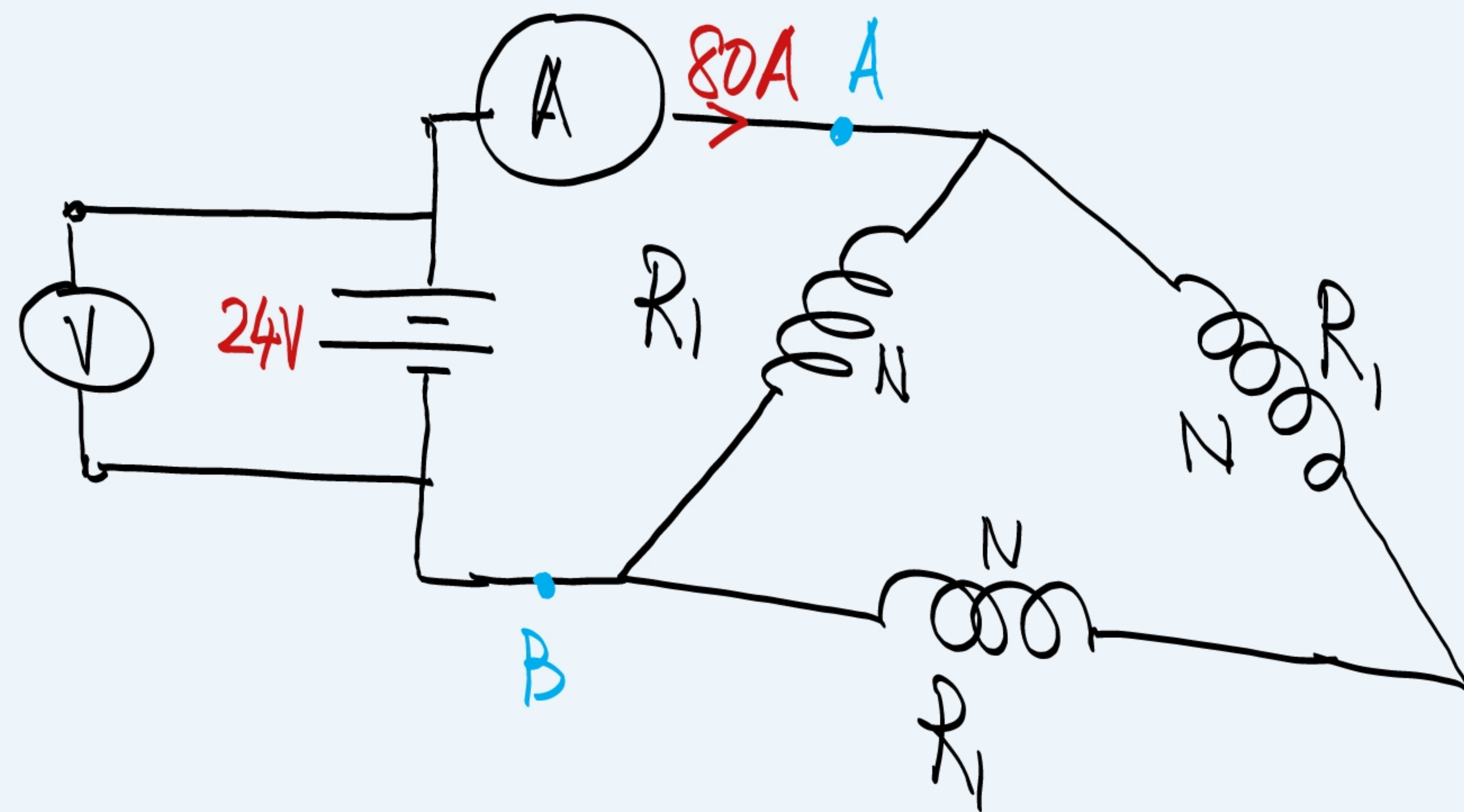


Problem 7.1

Let assume number of poles = 2

& since the induction motor is Δ -connected



stator winding (3-phase)

$$R_{eq}(AB) = R_1 \parallel 2R_1 = \frac{2}{3}R_1$$

$$\frac{2}{3}R_1 = \frac{24V}{80A} \Rightarrow R_1 = \frac{24 \times 3}{80 \times 2} \Omega \approx 0.45 \Omega$$

Problem 7.4.

Induction motor 60Hz.

$$n_{m,NL} = 890 \text{ rpm}$$

$$n_{m,FL} = 840 \text{ rpm}$$

\Rightarrow max speed of the motor
 $n_{sync} > n_{m,max}$

a) Find the number of poles:

$$n_{sync} = \frac{120 f_e}{P}$$

$$\Rightarrow P = \frac{120 f_e}{n_{sync}} = \frac{120 \times 60}{n_{sync}}$$

$$P = \frac{7200}{n_{sync}} = \frac{7200}{900} = 8$$

b) Rated load corresponds to full load condition

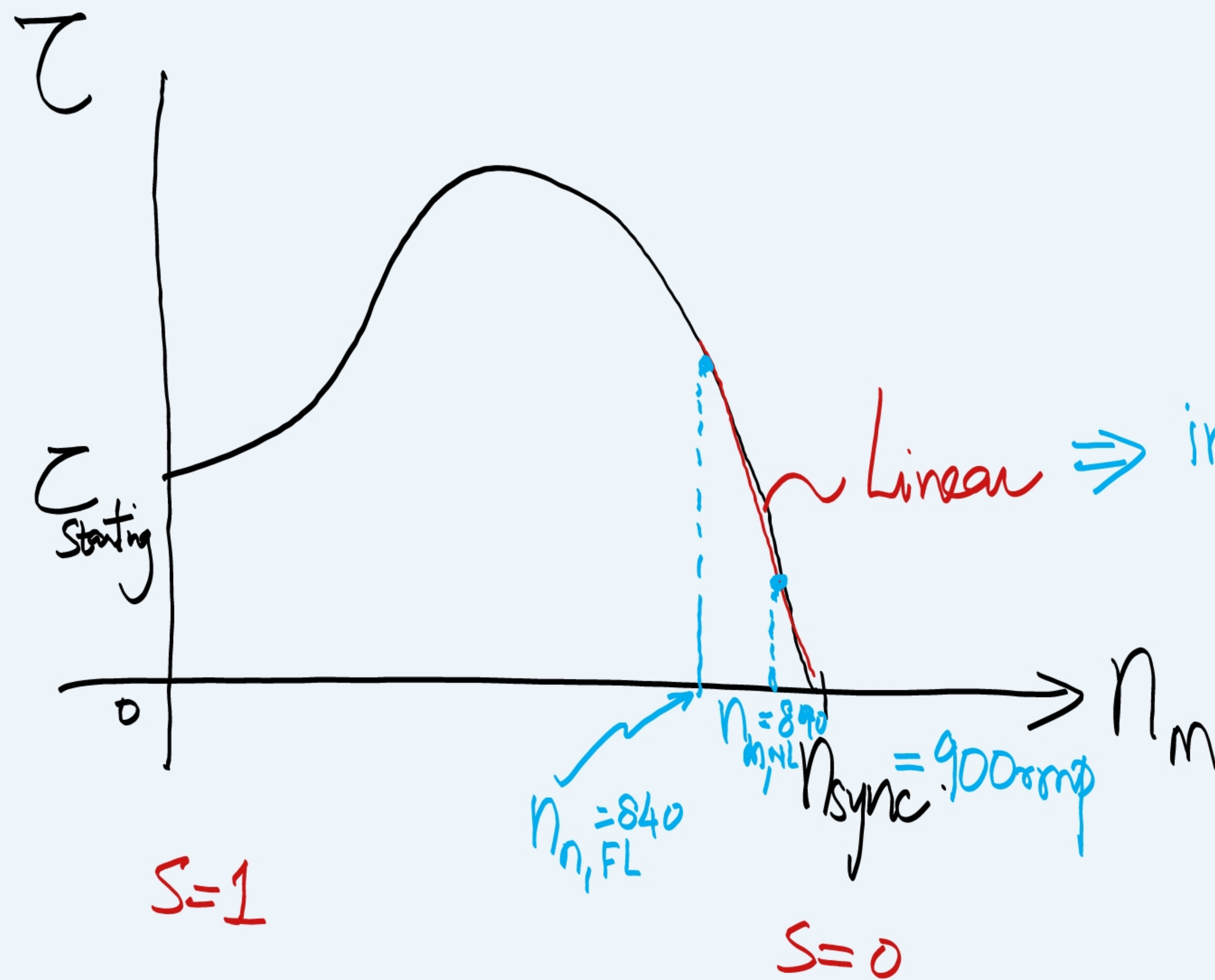
$$n_{m,FL} = 840 \text{ rpm}$$

also, $n_m = (1-s) n_{sync} \Rightarrow n_{m,FL} = (1-s) n_{sync}$

$$\Rightarrow 840 \text{ rpm} = (1-s) 900 \text{ rpm}$$

$$\Rightarrow s = 0.066 \Rightarrow s = 6.67\%$$

c)



\Rightarrow in linear region of operation, the value of slip (s) also varies linearly.

What is the speed of the motor when load is $\frac{1}{4}$ of the rated load?

$$S_{\frac{1}{4}FL} = \frac{1}{4} S_{FL} = \frac{1}{4} (0.067) = 0.0167$$

$$n_{m,\frac{1}{4}FL} = (1 - S_{\frac{1}{4}FL}) n_{sync} = (1 - 0.0167) 900 \text{ rpm}$$

$$a) \quad f_r = s f_e$$

$$f_{r, FL} = S_{FL} \cdot 60\text{Hz} = 0.067 \times 60\text{Hz} =$$

$$f_{r, \frac{1}{4}FL} = S_{\frac{1}{4}FL} \times 60\text{Hz} = 0.0167 \times 60\text{Hz} =$$

Speed Regulation; $SR = \frac{n_{NL} - n_{FL}}{n_{FL}} \times 100 \%$