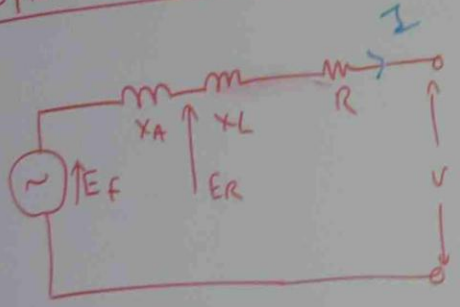
EQUIVALENT CIRCUIT AND VECTOR DIAGRAM OF SYNCHRONOUS MACHINE

TEST (1) Q

PLOT (i) VECTOR DIAGRAM FOR SYNCHRONOUS GENERATOR
(ii) VECTOR DIAGRAM FOR SYNCHRONOUS MOTOR

SYNCHRONOUS GENERATOR



X_A = SERIES CONNECTED REACTANCE OF VOLTAGE WINDING

X_L = LEAKAGE REACTANCE OF VOLTAGE WINDING

R = RESISTANCE OF VOLTAGE WINDING

U = TERMINAL VOLTAGE

E_F = GENERATED VOLTAGE

SYNCHRONOUS IMPEDANCE (Z_S)

$$E_F = V + I Z_S$$

$$E_F = V + I\left(R + j(X_L + X_A)\right)$$

$$Z_S = R + j(X_L + X_A)$$

$$= \sqrt{R^2 + (X_L + X_A)^2}$$

$$E_F = 4.44\, \phi\, f\, T_P\, K_P\, K_d$$

T_P = TURNS / PHASE

ϕ = FLUX / POLE (wb)

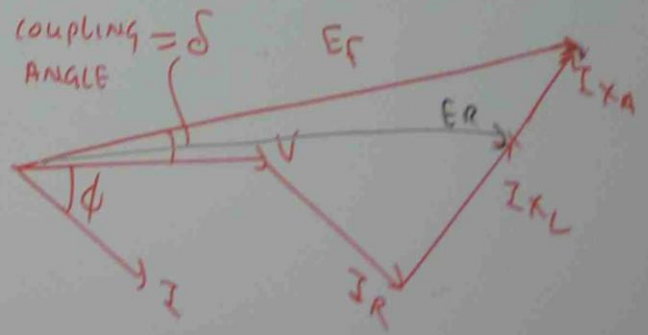
f = FREQUENCY

K_P = PITCH FACTOR
K_d = DISTRIBUTION FACTOR
} WINDING CONSTANT

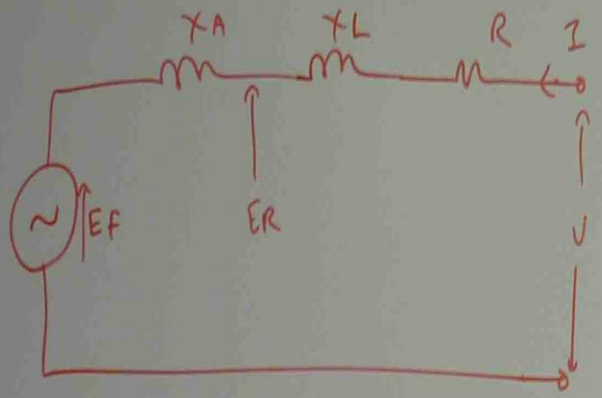
$$N_S = \frac{120 f}{P}$$

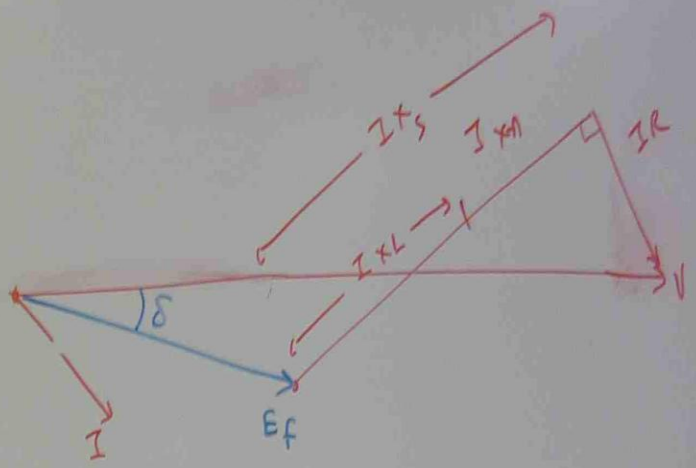
P = NO. OF POLES

N_S = SYNCHRONOUS SPEED (Rpm)



SYNCHRONOUS MOTOR





E_F = BACK EMF
(OR)
EXCITATION
EMF

$$E_f = V - I Z_s$$

(OR)

$$V = E_f + I Z_s$$

$$V = E_f + I\left(R + j(X_L + X_A)\right)$$