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2007

NOTES

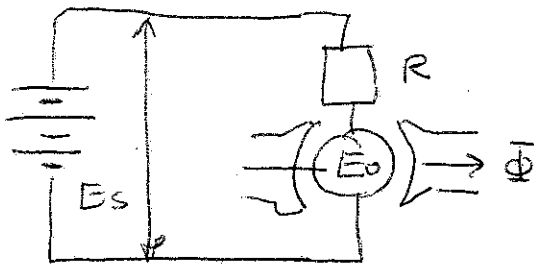
DC MOTORS:

$$I = (E_s - E_o) / R \quad \text{MOTOR ROTATING}$$

E_o = MOTOR AT REST \rightarrow STARTING CURRENT

$$I = E_s / R > 20-30 \text{ FULL LOAD CURRENT}$$

E_o = COUNTER-ELECTROMOTIVE FORCE
DUE TO MOTOR ROTATION



$$E_o = Z n \Phi / 60$$

n = SPEED OF ROTATION

Φ = MAGNETIC FLUX PER
POLE

$Z \approx$ FOR LAP WINDINGS #
OF ARMATURE CONDUCTORS

AT NO LOAD $E_o \approx E_s - \epsilon$ TO PRODUCE
LOW CURRENT

ELECTRICAL POWER SUPPLIED =

$$P_a = E_s I$$

$$= (E_0 + IR) I = E_0 I + I^2 R$$

↑
DISSIPATED
HEAT

MECHANICAL POWER = $P = E_0 I$ [W]

$$= T \omega = \frac{Tr}{9.55} \quad \left(r \frac{\text{rev}}{\text{min}} \right)$$

$T =$ TORQUE [Nm]

$$\omega = 2\pi f = 2\pi \text{ r/sec} = \frac{2\pi}{60} \frac{\text{r}}{\text{min}} = \frac{\pi}{30} \text{ r}$$

$$\frac{Tr}{9.55} = E_0 I = \frac{Z \Phi I}{60}$$

$$\Rightarrow T = \frac{Z \Phi I}{6.28} \Rightarrow T/I = \frac{Z \Phi}{6.28}$$

NOLOAD

$$E_0 = Z \Phi / 60 \approx E_s \Rightarrow r = \frac{60 E_s}{Z \Phi}$$

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STALL CURRENT: $I_s = E_s / R$

STALL TORQUE: $T_s = \frac{z\Phi}{6.28} I_s$

CURRENT LIMIT:

$$I_{\text{MAX}} < 2A$$

CURRENT-LIMITED TORQUE

$$T_{\text{MAX}} = \frac{z\Phi}{6.28} I_{\text{MAX}}$$

SINGLE GEAR EFFICIENCY: $\eta = 0.85$