Studio 8. Quiz

1. $K_t = 30\ mNm/A \quad R_a = 10\ \Omega$.

$P_{dev} = T_e \times \omega$

$V_e = K_t \times \omega$

$= 30\times10^{-3} \times 2\pi \frac{1910}{60}$

$= 6\ V$.

$I_a = \frac{V_a - V_e}{R_a} = \frac{6}{10} = 0.6A$.

$P_{dev} = 30\times10^{-3} \times 0.6 \times 2\pi \frac{1910}{60}$

$= 3.6w$.

2. $K_e = 40\ mVs/rad \quad R_a = 10\Omega \quad T_e = 30\ mNm$.

$I_a = 0.75A$

$V_e = K_e\ \omega$.

$\omega = \frac{V_e}{K_e}$

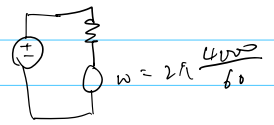
$= \frac{12 - 0.75(10)}{40\times10^{-3}}$

$= 112.5\ rad/s$.

3. $\omega = 2\pi \frac{4000}{6} = 418.8\ rad/s$. $I_a = 1A \quad V_a = 10V$.

$R_a = \frac{V}{I} = 5\Omega$.

$10 - 5 = 5V$



$5V = T_e \times 2\pi \frac{4000}{60}$.

$T_e = 0.0199\ Nm$.

4. $V_a = 12V \quad K_t = 30\ mNm/A$.

$T_e = 0.03 \times 0.6 = 0.018$.

$V_e = 6V$

$\omega = \frac{6}{0.03} = 200\ rad/s$.

$P = 200 \times 0.018 = 3.6w$.

$3.6 - 3.2 = 0.36\ w$.

$T_f = 0.36/200 = 0.0018\ Nm$.

5. $K_e = 20\ mV/rad/s \quad R_a = 5\Omega$.

$T_e = K_t I_a$

$= 20\times10^{-3} \times 1.16$

$= 0.0232\ Nm$.

$\omega = \frac{V_e}{}$

k_e

$= \frac{10 - 5(1.16)}{k_e}$

≈ 210 rad/s.

$P = T_e \cdot \omega$

$= 4.872.$

$\eta = \frac{4.872 - 0.07}{11.6} \times 100\%$

$= 41.4\%$

6. $V_e = 12V$ at 5000 RPM.

$V_e = k_e \omega.$

$k_e = 0.02279.$

$\frac{12}{2.4} = 5\Omega. = R_a.$

$V_e = 0.02279.(2\pi \frac{2000}{60})$

$= 4.80V.$

$I_a = \frac{12 - 4.8}{5}$

$= 1.44A.$

$P = T_e \cdot \omega$

$= 6.91\ W.$