Example of Real DC machines

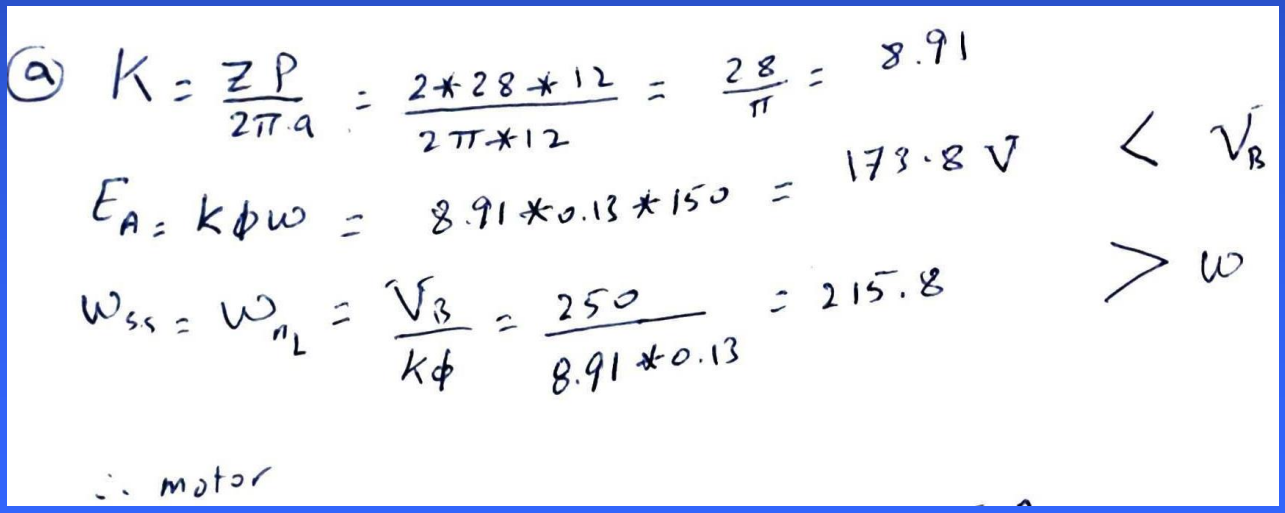
A dc machine has 12 poles, 28 loops, 12 parallel current path, R=0.8 Ω, ϕ=0.13 wb, V_B=250 V, ω=150 rad/s and r=12.5 cm, l=50cm.

a. Is this machine motor or generator? Explain.

b. Find i and τ_{ind} .

c. calculate η.

d. if ϕ increased to 0.5 wb, calculate $\omega_{s.s}$.



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(b) $i = \frac{V_B - E_A}{R} = \frac{250 - 173.8}{0.8} = 95.25\ A$

$\tau_{ind} = k\phi i = 8.91 * 0.13 * 95.25 = 110.36\ N.m$

(c) $P_e = V_B \cdot i = 250 * 95.25 = 23.8\ kW$

$P_m = \tau \cdot \omega = 110.36 * 150 = 16.55\ kW$

$\eta_m = \frac{P_m}{P_e} = \frac{16.55}{23.8} * 100\% = 69.5\%$

(d) $\omega_{s.l} = \frac{V_B}{k\phi} = \frac{250}{8.91 * 0.5} = 56.1\ rad/s.$