

## Electrical Engineering Department

EE 360-01

Term 071

Sequence #

Quiz #4

Student Id #

Student name

A 250-V DC **shunt** motor draws a full load current of 100-A at rated speed of 1200 rpm. The motor has the following parameters:

Armature resistance = 0.1 Ohms

Shunt field resistance = 250 Ohms

Determine:

(i) the developed power

(ii) the developed torque

(iii) the speed regulation, if the no-load armature current is 10-A.

Solution

$$I_L = I_a + I_f = 100 \text{ A}$$

$$I_f = \frac{250}{250} = \frac{V_t}{R_f} = 1 \text{ A}$$

$$= I_a = 99 \text{ A}$$

$$E_a = V_t - I_a R_a = 250 - 99(0.1) = 240.1 \text{ V}$$

$$\omega = 2\pi \text{ N/60} = \frac{125.66}{60}$$

$$\textcircled{i} P_{\text{develop}} = E I_a = 240.1 (99) = \underline{23,770 \text{ W}}$$

$$\textcircled{ii} \text{ Torque} = \frac{E I}{\omega} = \underline{189 \text{ N-m}}$$

$$\textcircled{iii} \text{ at No load } E_{a0} = 250 - 10(0.1) = 249 \text{ V}$$

$$I_{f1} = I_{f2}$$

$$\omega_0 = \frac{E_2}{E_1} \omega_1 = \frac{249}{240.1} \times 125.66 = 130.32$$

$$\text{Speed Reg} = \frac{130.32 - 125.66}{125.66} = \underline{\underline{3.7\%}}$$

