Name: _____ ECE 3600 homework DC2 d2xt

1. A separately excited, dc motor has the following nameplate information: 1.5-hp, 2500 rpm, Armature: 150 V, 9 A, $R_A = 0.8\ \Omega$, $L_A = 12$ mH; Field: $V_F = 150$ V , and $R_F = 250\ \Omega$. Assume rotational losses are constant. Consider the motor to be shunt connected to 150 V for parts a) through e).
   a) Find the total losses of the motor at nameplate operation.

   c) Find the the developed power if the load drops to 1.2 hp.

   d) Find the required current if output power is 1.2 hp.

   e) Find the shaft speed if output power is 1.2 hp.

f) Find the required Input voltage for a no-load speed of 2800 rpm. V_T = ?? **ECE 3600 homework DC2 p2**

g) Can you attain a no load speed of 2800 rpm by some other method with $V_T = 150$ V.
(Note: You may assume that the field flux is proportional to the field current.) V_F = ??

The field current could be decreased to decrease the field flux and Kϕ.

2. A 5-hp, separately excited, 160-V dc motor has 0.25-Ω armature resistance and 90-W rotational loss at the nameplate speed of 600 rpm. The field is also connected to 160 V and its current is 0.5 A.

a) What is the developed torque at the nameplate output power of 5 hp?

b) What is the efficiency at 5 hp out, including field losses?

c) If the load torque and rotational loss torque are both constant (not dependent on speed), find the shaft speed when the motor armature is hooked to half the rated voltage, 80V. (Field is left connected to 160V.)

d) If the load torque and rotational loss torque are both proportional to speed, find the shaft speed when the motor armature is hooked to half the rated voltage, 80V. (Field is left connected to 160V.)

Answers

1. a) 321·W b) 167·W c) 1.06·kW d) 7.37·A e) 2523·rpm f) 161·V g) Reduce V_F to 140 V
2. a) 60.8·N·m b) 92·% c) 288·rpm d) 300·rpm