ECE 3600   homework # 18   etc...

Correct your Exam 2 for up to 10 more exam points

For each question or problem part you missed, (say 3e) work out the correct solution. Don't change or add to the writing on your exam-- work out the corrections on separate paper. Be sure to clearly label the problems and parts. This is exam work. You **MUST** do it **ON YOUR OWN!**

Hand in your correct questions and solutions along with your exam Thursday 12/2 in class for up to 10 more exam points. They will be returned Tuesday, 12/7.

Field Trip, Mon, 11/29/10

Our last field trip is to a Rocky Mountain Power substation. Come Monday 11/29 or Monday 12/6 on the day you're not in the lab. We will meet at 3:10 pm at the Rocky Mountain Power building on North Temple, north-west entrance. The same place as last time. Wear long pants, long-sleeved shirts + steel-toed boots and hard hats if you have them.

Check your email the day before to see if there are any last-minute changes.

ECE 3600   homework # 18   Due: Thur, 12/2/10

1. 17.13. A shunt-connected dc motor operates from 24 V and has an armature resistance of 0.30. The rotational losses are 5% of the output power. The armature current is 10 A and the speed is 1200 rpm.
   a) Find the input power. Ignore field losses.
   b) Find the output power in horsepower.
   c) Find the machine constant Kϕ.
   d) Approximate the no-load speed in rpm.

2. 17.17. A dc motor has the following nameplate information: 1.5 hp, 1750 rpm, 180 V in the armature, 7.3 A in the armature, l.05-Ω armature resistance, 180 V for the field, and 0.55 A for the field. The motor is shunt-connected. Assume constant rotational losses in this problem.
   a) Find the rotational losses at 1750 rpm.
   b) Find the developed torque at 1750 rpm.
   c) Determine the no-load speed.

3. 17.11 A 1.5-hp dc motor has the following nameplate information: 180 V, 2500 rpm, 7.5 A, R_A = 0.563 Ω, L_A = 12 mH, I_F = 0.56 A, and R_F = 282 2. Assume rotational losses are constant. Consider the field current constant throughout the entire problem.
   a) Find the total losses of the motor at nameplate operation. These are losses in the physical motor and do not include losses associated with external circuitry.
   b) Find the rotational losses at nameplate operation
   c) Find the required current for a developed power of 1.2 hp with V_T = 180 V.
   d) Find the output power if the developed power is 1.2 hp with V_T = 180 V.
   e) Find the required Input voltage for a no-load speed of 2800 rpm.

4. 17.21. A 5-hp, shunt-connected, 180-V dc motor has 0.25-Ω armature resistance and 50-W rotational loss at the nameplate speed of 600 rpm. The field 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) What is the no-load speed? Assume the same rotational losses.

Answers

1. a) $240{\cdot}W$ b) $200{\cdot}W$ = $0.268{\cdot}hp$ c) $0.167{\cdot}V{\cdot}sec$ d) $1371{\cdot}rpm$ ($1364{\cdot}rpm$)closer

2. a) $139{\cdot}W$ b) $6.86{\cdot}N{\cdot}m$ c) $1820{\cdot}rpm$

3. a) $320{\cdot}W$ b) $199{\cdot}W$ c) $5.05{\cdot}A$ d) $695{\cdot}W$ e) $197{\cdot}V$

4. a) $60.1{\cdot}N{\cdot}m$ b) $93.5{\cdot}\%$ c) $618{\cdot}rpm$ **ECE 3600   homework # 18**