ECE 3600 homework # 18 etc...

Answer the following for up to 4 more exam points

1. Why does the secondary of a current sensing transformer have to be shorted (or nearly shorted)?
2. Name at least 6 things that you saw on the Rocky Mountain Field trip that dealt with information and not directly with power.

Correct your exam 2 for 5 more exam points

For each problem part you missed, (say 1f) 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.

Hand in your correct solutions along with your exam Tuesday 12/1 in class for up to 5 more exam points. They will be returned Thursday, 12/3.

Field Trip, Mon, 11/30/09

Our Next Field trip is to visit the Cogeneration plant here on campus. It is scheduled for Monday 11/30/09 starting at 3:00 at building 303 on the south side of the U of U campus. This is the High Temperature Plant.

Optional Field Trip, Sat, 12/5/09

Our Field trip to visit the Jordanelle hydropower plant will leave SLC by 9:00 to be there by 10:00.

ECE 3600 homework # 18 Due: Tue, 12/1/09

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 $K\phi$.
   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·W b) 200·W = 0.268·hp c) 0.167·V·sec d) 1371·rpm (1364·rpm)closer
2. a) 139·W b) 6.86·N·m c) 1820·rpm
3. a) 320·W b) 199·W c) 5.05·A d) 695·W e) 197·V
4. a) 60.1·N·m b) 93.5·% c) 618·rpm