

# ECE 331 - Homework #9

## DC Motors

### DC Shunt Motor

- 1) A 5hp, 120V, 1200 rpm shunt motor has an armature resistance of 0.2 Ohm and field resistance of 80 Ohms. When delivering 5hp, the motor draws 40A.
- Find the motor speed and power out when the motor develops a torque of 15 Nm
  - Find the motor speed and power out when the motor develops a torque of 15Nm if the field resistance is increases to 100 Ohms.
- 2) A 15hp 240V, 1800 rpm shunt motor draws 56A from the line at rated output (15hp). The resistance of the armature circuit is 0.16 Ohms, the field resistance is 150 Ohms.
- Find the no-load speed of the motor.
  - Determine how much the field resistance must be increased to keep the speed constant when the load is increased to 15hp.

### DC Series - Shunt Motor:

- 3) A 5hp, 120V, 1200 rpm shunt motor has an armature resistance of 0.2 Ohms and a field resistance of 80 Ohms. Plot the speed vs. load torque if a series-winding reduces the torque constant by:
- 0.1% / Amp
  - 1% / Amp
  - 10% / Amp
- 4) A 15hp 240V, 1800 rpm shunt motor draws 56A from the line at rated output (15hp). The resistance of the armature circuit is 0.16 Ohms, the field resistance is 150 Ohms.

Determine how much the field needs to be weakened with the armature current so that the motor maintains speed as the load goes from 0 to 15hp.

### DC Series Motor

- 5) A 200hp, 600V, 500 rpm DC series motor draws a line current of 300A at rated load. The resistance of the series winding is 0.11 Ohms. Determine both the speed and torque when th load is changed to that the motor draws 200A.
- 6) A 200-hp 600V, 500rpm DC series motor draws 300A at rated output. The resistance of the armature and series field windings are 0.7 Ohm and 0.4 Ohm respectively. The torque is reduced to 1/4th of rated value. Find the new operating speed.