KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE 306
Semester 181

Design of DC Motor Starter

In order for a dc motor to function properly, it must be protected from physical damage during the starting period. At starting conditions, the motor is not rotating, and armature generated voltage $E_A = 0$ V. Since the internal resistance of a normal DC motor is very low, a very high current flows. It is possible for a motor to be severely damaged by such currents, even if they last for only a moment.

A solution to the problem of excess current during starting condition is to insert a *starting resistor* in series with the armature to limit the current flow until E_A can build up to its rating value. This starting resistor must not be in the circuit permanently, because it would result in excessive losses and would cause the motor's torque-speed characteristic to drop off excessively with an increase in load.

In modern practice, a starting resistor is made up of a series of pieces, each of which is removed from the motor circuit in succession as the motor speeds up, in order to limit the current in the motor to a safe value.

In this design problem, an automatic starter circuit is to be designed for a 4-point shunt motor rated at 20-hp, 240-V, and 60-A. The armature resistance of the motor is (0.5 + 0.XX) Ohm, and the shunt field resistance is (120 + Y) Ohm. The motor is to start with no more than (150 + Y) percent of its rated armature current, and as soon as the current falls to its rated value, the starting resistor stage must be cut out.

Draw a neat diagram of a 4-point dc shunt motor starter.

Determine the number of steps required in the starter and the value of the resistors in each step?

Note that

"XX" is your two-digits serial number, e.g., 01, 02, 10, 12, 20, ..etc.

"Y" is your section number, e.g., 1, 2, or 3.

Each student has his own design case, and should submit formal report explaining all the necessary steps, drawings, and calculations needed.

Due Date: UT-Classes, December 2nd, 2018; MW-Classes, December 3rd, 2018