

Investigation of the torque-speed characteristic of an induction motor

EQUIPMENT: Squirrel Cage Induction Motor (MV1009)
DC Machine (MV 1005-225)
Shunt Regulator (MV1905)
Load Resistor (MV1100)
Torque Measuring Unit (MV1051)
Three-phase variable supply
DC and AC ammeters
DC and AC voltmeters

THEORY:

The torque-speed characteristic of a three-phase induction motor is shown in **Figure 1**:

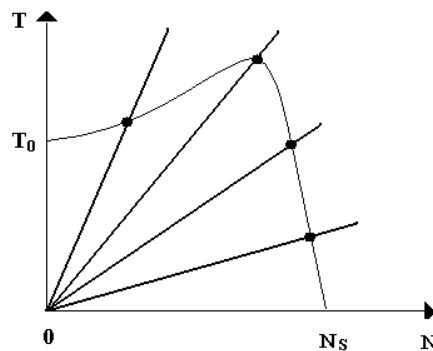


Figure 1 Torque-Speed curve and load lines.

PROCEDURE:

Induction motor output torque/speed characteristic

1. Examine the machine set note done the ratings of each machine.
2. Connect the induction motor as shown in **Figure 2**. The stator is delta connected. The three-phase variable AC supply is connected to the induction motor stator.
3. Connect the DC generator as separately excited as shown in **Figure 3**.
4. Start the induction motor by raising the stator supply voltage to half its rated value.
5. Adjust the DC generator field current to its rated value.
6. Switch in the load box and adjust the resistance until the speed reduces to half its rated value and record the torque T and speed N . Leave the load resistance at this value for the remainder of the experiment.

Note: The induction motor stator current will be very high when the DC generator load current is high. Be careful to take readings quickly at high currents and switch out the load between readings.

7. Vary the generator field current from zero to rated in approximately ten steps and note the torque and speed at each step. Note the induction motor stator voltage drops slightly as

the machine is loaded. Check this voltage at each step before any readings are taken and if necessary re-adjust it to half its rated value.

8. From the tabulated results plot the induction motor output torque/speed curve.

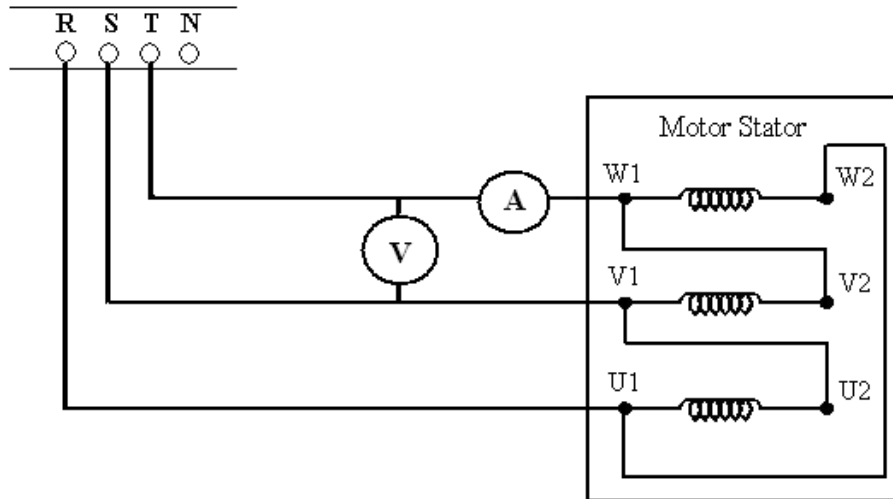


Figure 2 Induction Motor Stator

DC generator input torque/speed characteristic.

9. With the induction machine stator voltage at half rated as before, adjust the DC generator field current to half its rated value and switch in the load resistance.
10. Record the torque T and the speed N (The values should be the same as those obtained previously).
11. Increase the induction motor input voltage to approximately 70% of its rated value with the DC generator load switched in record the torque and speed.
12. Reduce the induction motor input voltage to approximately 30% of its rated value and with the DC generator load switched in record the torque and speed.
13. Tabulate the above three points and use them to plot the DC generator torque/speed characteristic at rated field current (this should be a straight line through the origin) on the same axes as the induction machine curve.

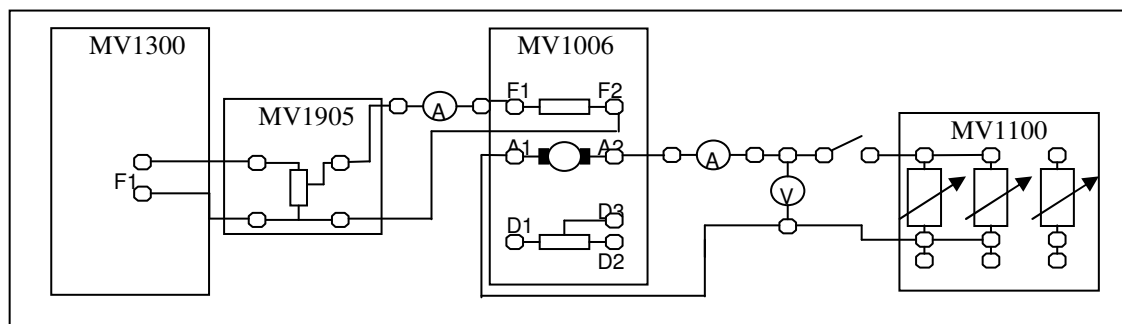


Figure 3 Circuit Diagram for DC Generator