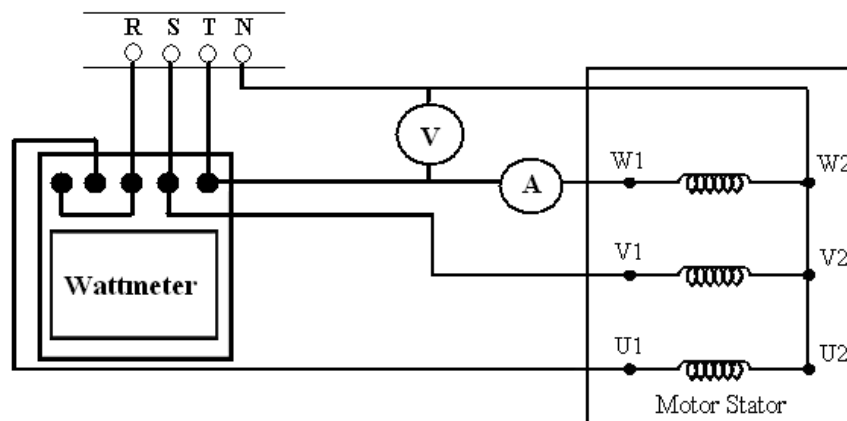


## Investigation of the equivalent circuit of an induction machine

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

### PROCEDURE:

1. Examine the machine set and record a detailed description of the induction motor including its nameplate data.
2. Connect the induction motor stator in star and connect it to a three-phase variac through a wattmeter as shown in **Figure 1**.



**Figure 1** Circuit for Induction Motor Stator

### No-load Test

3. With the rotor running free, switch on the supply and increase the stator voltage until it is at its maximum value.
4. Record the speed of the rotor and calculate the slip to verify that  $s \approx 0$ .
5. Vary the stator voltage from maximum down to zero in approximately 5 steps and record the stator phase voltage, current and total three-phase power.
6. Use these results to determine  $R_C$  and  $X_M$ , the core and magnetising losses of the machine.

### Locked Rotor Test

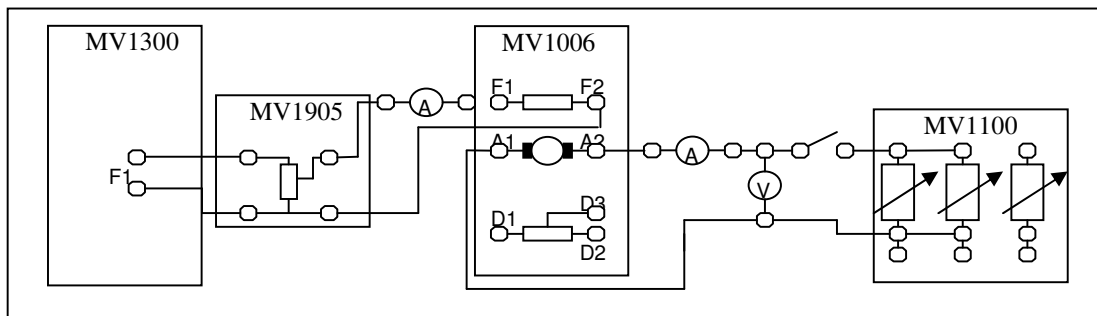
7. Lock the rotor of the motor using the rotor-locking device.
8. With the stator unchanged, switch on the supply and gradually increase the supply until rated current flows in the stator.

*Note: Be careful to take these readings quickly as the stator is carrying a high current without the benefit of movement to cool it down.*

9. Vary the stator current from maximum down to zero in approximately 5 steps and record the stator phase voltage, current and total three-phase power.
10. Disconnect the machine from the supply and measure the dc resistance of the stator winding using the ohmmeter.
11. Use the above results to determine  $R_S$ ,  $R_R$  and  $X_L$ .

### Verification of Equivalent Circuit

12. With induction motor circuit unchanged, couple the DC machine to the shaft and connect it as a generator, as shown in **Figure 2**. The DC machine acts as a load on the shaft.



**Figure 2** Circuit Diagram for DC Generator

13. With the DC generator's load switch open, start the induction motor as before and bring it up to maximum voltage.
14. Adjust the DC machine field current until rated voltage is generated at the armature.
15. Close the load switch and increase the load current until maximum current flows in the stator. Record the induction machine stator current, the total three-phase power, the torque and the speed.
16. Using the parameters of the induction motor equivalent derived from testing, calculate the induction machine stator current, total three-phase power and torque at rated voltage and at the speed of recorded.
17. Calculate the percentage errors and comment on the performance of the induction machine's equivalent circuit model in predicting actual performance.