Q1)

PART A:

A 39-hp, 440V, Permanent Magnet Motor operates at 1000 rpm on full load. The motor efficiency is 86.72 %, and armature resistance is 0.337 ohm. (The motor is at steady state)

1. Find electrical power of the motor.
2. Find armature current of the motor.
3. Find induced EMF of the motor.
4. Find mechanical power of the motor.
5. Find mechanical torque of the motor.
6. Find Rotational Loss and Armature Loss of the motor.
7. What are your suggestions to control speed of the motor? Please, comment each suggestion properly.

PART B:

The setup Figure 1 is established to make speed control of DC motor and İt is called that Ward-Leonard System.

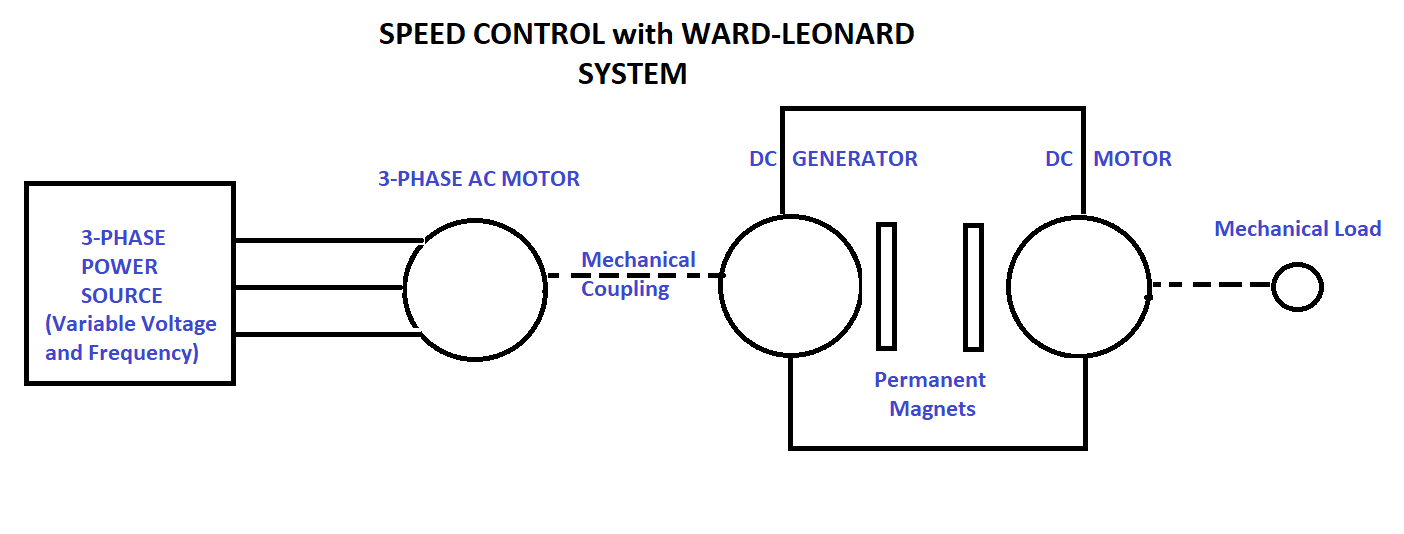


Figure 1 Ward-Leonard System

In short, DC motor are driven by the DC generator and The DC generator are rotated by 3-phase AC motor by mechanical coupling.

For the DC generator, armature resistance is 0.336 ohm. Assume that both motor and generator are operating in linear region, and rotational loss is constant.

1. Determine the induced emf of generator at full load.
2. Determine the no-load speed of the motor. (The field circuits for generator and motor are the same)
3. If the DC generator is separately excited with constant field current. What must be percent of reduction in the field current of the generator to obtain no-load speed of 1025 rpm?
4. What must be induced emf in the generator if the motor supplies the same torque as in Part A but at speed of 750 rpm?
5. What is the percent change in the field current of the generator?
6. What will the motor speed under no load?

Part C

1. Plot the speed vs time graphic if the armature inductance of the Dc motor is 6.6 mH. Comment the transient behaviour of the Dc motor. The motor

1. If the inductance of the are bigger or lower than 6.6mH, how do the transient and steady- state behaviour of the Dc motor change? Plot speed vs time graphics of the three different inductance value that are 1mH, 6.6mH and 30mH at same figure.