EE228

Spring 2007

Problem Set #34

1. A prime mover is to be coupled to a synchronous generator shipboard to produce 3-phase 60 Hz, determine the required number of poles on the generator if the prime mover is a:

    a. gas turbine spinning at 1800rpm
    b. diesel engine spinning at 720rpm

2. You couple the prime mover to the synchronous machine shaft and spin the machine in the counter-clockwise (CCW) direction. By measurements, you determine that you are creating an ACB sequence of voltages. Suggest two ways of creating an ABC-sequence so you can safely connect the machine into the ABC-sequenced network.

3. Given a 4-pole, 60Hz, Y-connected, 3-phase synchronous generator with $\tilde{V}_{as} = 120Vrms\angle 0^\circ$, $\tilde{I}_{as} = 0.7Arms\angle -36.87^\circ$, $r_s = 10\Omega$, $X_S = 120\Omega$, and $L_{sf} = 0.8H$. Assume that the current is referenced *leaving the machine.*

    a. Find the speed of the machine in rpm
    b. Find the excitation voltage magnitude and power angle
    c. Calculate the required field current
    d. Find the real and reactive power delivered to the electrical network by the machine