Synchronous Generators

Name_____ ECE 3600 Homework SG2 Due: Wed, 10/16/24

1. A 60 Hz, 4-pole, Y-connected, 3-phase synchronous generator supplies 60 kW of power to a 3.6-kV bus. The synchronous reactance is 40 Ω/phase. The generator emf is 2.2 kV. Find the following.
   a) The power angle, δ.

   b) The total reactive power generated.

   c) Find a new magnitude of the generator emf so that $Q := 18 \cdot kVAR$

ECE 3600 homework SG2 p2

2. A 3-phase synchronous generator operates onto a grid bus of voltage $12\ \text{kV}$ (line value). The synchronous reactance is $5\ \Omega$/phase. The magnitude of the generator emf equals the magnitude of the bus voltage. The machine delivers $18\ \text{MW}$ to the grid. Find:
   a) The power angle, δ.

   b) The complex phase current, (Assume the bus voltage phase angle is 0^o).

   c) The magnitude and direction of reactive power.

3. A $60\ \text{Hz}$, 2-pole, 3-phase synchronous generator supplies power to a $12.5\ \text{kV}$ bus. The synchronous reactance is $4\ \Omega$/phase. The generator emf is $7\ \text{kV}\ \underline{/20^o}$ (the angle is referenced to the terminal voltage). Find the following.
   a) The total power generated.

   b) The total reactive power generated.