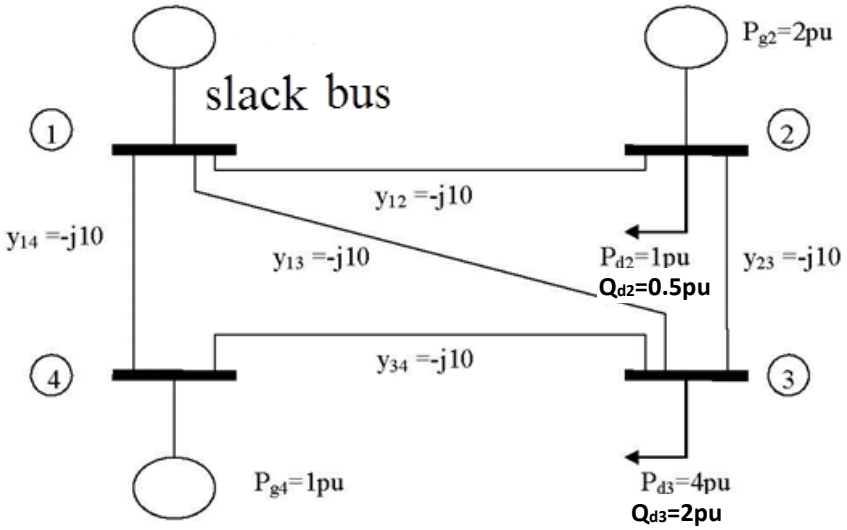
ELL363

Assignment #1

(Deadline: August 13th midnight)

1. A 4-bus system is given below. Consider S_{d2} =1+j0.5, S_{d3}=4+j2, where S_d denotes the demand or load. Assume |V|=1 for Bus 1 and Bus 2 and Bus 4. For this system, find all voltages, angles, reactive power generation and all line flows from each of the 4 methods:
    a. Full NR AC power flow (2 iterations) – 3 marks
    b. Decoupled Power Flow (2 iterations) – 2 marks

        Hint: Is the 1st iteration same as in part (a)?
    c. Fast Decouple Power Flow (2 iterations) – 2 marks
    d. DC power flow – 2 mark
    e. Compare the line flows from each of the 4 methods and comment on the accuracy and computational time aspects of these methods – 1 mark



2. In qu. 1, suppose the generator's maximum reactive power generation at bus 2 is limited to 1 pu. In such case, will there be any change in the 2nd iteration of full NR method? If yes, just make the Jacobian for the 2nd iteration (no need to solve the iteration). – 5 marks

3. While deriving Fast Decoupled Power Flow method in class, we assumed

$$|Q_i| \ll |B_{ii}|V_i|^2|$$

Where $|Q_i|$ is net reactive power injection magnitude at i^{th} bus, V_i is voltage magnitude at ith bus, and B_{ii} is diagonal element of imaginary part of Y bus (admittance) matrix corresponding to i^{th} bus. Please prove this assumption. (hint: use other assumptions of Fast Decoupled Power Flow while proving this) – 5 marks