

Question 1.**(100 pts)**

Code in Matlab AC power flow using Matpower case (MPC) format. Your function should take an MPC structure as input and return an MPC structure of the solution. You are not allowed to use Matpower functions. Your program should handle networks with a single generator and/or a single load on a bus or no generator and/or no load. Use 10^{-7} for convergence accuracy.

- (a) (50pts points) Plain vanilla AC power flow with no reactive power limits enforced. Provide demo case showing results with and without reactive power limit violations.
- (b) (30pt points) Enforce reactive power limits. Provide demo case showing results with and without reactive power limit violations.
- (c) (10pts points) Add transformers with fixed tap setting. Provide demo case showing results with different tap settings.
- (d) (10pts points) Add transformers with fixed phase shift. Provide demo case showing results with different phase shift setting.