EE 340 – Spring 2017 – Last Assignment

Consider a 6-mile long 12.47 kV distribution feeder that serves a load of 9 MVA with 0.8 power factor. Assume the feeder is balanced and has a series impedance of 0.5 +j1 Ω/mile. The voltage at the substation is supplied by a stiff source at 1.0 p.u. Further assume that the load is of constant power type and it is distributed equally at 3 concentration points located at 2 mi, 4 mi, and 6 mi from the substation. Use Powerworld to answer the following questions:

a) Determine the voltage at the 3 load points, and power loss in the feeder.

b) It is desired to keep the voltage levels within ±5% of the nominal value by placing a capacitor bank at the middle node. Determine the minimum size of such capacitor bank, and the new power loss (use increments of 0.3 MVAR).

c) If capacitor banks are placed at each of the 3 load points and provide 100% of the local load reactive power demand, determine the new voltage at the three node points, and new power loss.