Tutorial -3

1. The line constants of a three-phase long transmission line are: $A = D = 0.853 + j0.016, B = (31.4 + j137)\ \Omega, C = (-5 + j855) * 10^{-6}$ ℧. The load at the receiving end is 100MVA at 220kV line to line and 0.8pf lagging. Determine the voltage at sending-end of the line.

2. A three-phase, 50 Hz transmission line has resistance, inductance, and capacitance per phase of 1 Ω, 0.3 H and 0.01 μF, respectively and delivers a load of 25 MW at 110 kV and 0.8 lagging power factor. Using the nominal-π method, determine (a) ABCD constants, (b) sending-end voltage, current, and power factor, (c) percentage regulation, and (d) efficiency of the transmission line.

3. An 18 km, single-circuit, three-phase line having $Z = 8.57\angle 60.35°\ \Omega$ delivers 2500 kW at 11 kV to a balanced load. (a) What must be the sending-end voltage when the power factor is 0.8 lagging, unity, and 0.9 lagging? (b) Determine the percentage regulation of the line at the above power factors. (c) Draw phasor diagrams depicting the operation of the line in each case.