Problem Set - 3
Performance of Transmission Lines

1. A short 3-phase transmission line has a series line impedance per phase of $(0.5 + j0.7)$ Ω. The line delivers a load of 50 MW at 33 kV and 0.7 pf lagging. Determine the regulation of the line. If the same load is delivered at 0.7 pf leading, determine the regulation of the line.**(Ans: 5.58 % , -0.83 %)**

2. A 230 kV, three-phase transmission line has a per phase series impedance of $z = 0.05 + j0.45$ Ω per km and a per phase shunt admittance of $y = j3.4 \times 10^{-6}$ Ʊ per km. The line is 80 km long. Using the nominal-π model, find the sending end voltage and current, voltage regulation, the sending end power and the transmission efficiency when the line delivers 200 MVA, 0.8 pf lagging at 220 kV. **(Ans:242.67 kV, 502.38$\angle - 33.69°$,10.47 %, 163.18 MW, 134.02 MVAr, 98.052 %)**

3. A 3-phase 50 Hz transmission line has resistance, inductance, and capacitance per phase of 10 Ω, 0.1 H and 0.9 μF respectively and delivers a load of 35 MW at 132 kV and 0.8 pf lagging. Determine the efficiency and regulation of the line using nominal -T method. **(Ans: 97.15 %, 6.83 %)**