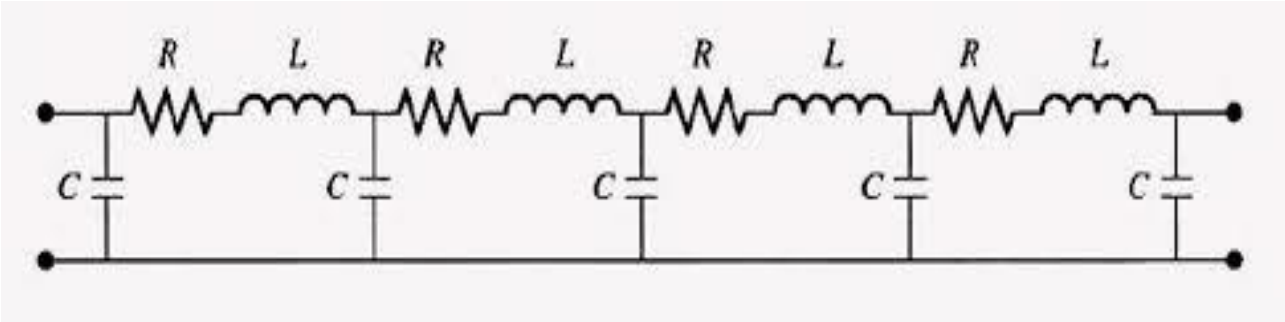
MATLAB Simulation Project

Ferranti Effect can be defined as the effect in which the voltage at the receiving end of the transmission line is greater than the voltage value at sending end when the transmission line is operating at light load and no-load. This phenomenon is occurring with long transmission lines. The main cause of this is due to the charging current, known as capacitive current as well, of the transmission line which induces reactive charging into the line causing the voltage at the receiving end to increase. In this simulation task, we would like to investigate and study this phenomenon.



Create a simple MATLAB Simulink model to investigate and simulate the ***Ferranti Effect*** for the transmission line as per the long transmission line circuit model shown above. Apply the following parameters for the model.

Vs = 380 kV	Case1	Case2	Case3
R (Ω)	20	20	20
L (mH)	350	350	350
C (µF)	0.02	0.04	0.06

Step 1:

It is required to operate the line with no-load and tabulate the values for each case:

- Sending end voltage in (kV)
- Receiving end voltage in (kV)
- Current through the transmission line (A)
- Active Power in (MW)
- Reactive power in (MVAR)
- Receiving end power factor (Cos Ø)

Step 2: Consider case 3 values only from **Step 1** and connect a resistive load of 100 Ω. Reduce the value of the resistive load gradually in step of 10 Ω and fill up the following table accordingly.

R (Ω)	V_S (kV)	V_R (kV)	P (MW)	Q (MVAR)	I (A)	Cos Ø
100						
90						
80						
70						
60						
50						
40						
30						
20						
10						
5						

Based on your simulation answer the following questions.

1. Plot the values of reactive power **Q**, sending end voltage $\mathbf{V_R}$, power factor and charging current with respect to the resistive load.
2. At what points the load is considered inductive? Justify your answer?
3. At what points the load is considered capacitive? Justify your answer?
4. What are the problems caused because of ***Ferranti Effect*** in power system?
5. How practically we can resolve the issue of ***Ferranti Effect*** in power system operation?

- You are required to provide a report carrying out your experiment which investigates the performance of a long transmission line under no-load, lightly loaded and heavily loaded.
- The report should not exceed 4 pages with an introduction covering the theoretical part of Ferranti Effect, explanation of the ***Ferranti Effect*** phasor diagrams, and detailing the experiments you conduced in MATLAB with all generated readings, plots as required.
- The submitted report should be a **pdf file**, with your first name followed by your ID number (like for example Basem397888). Along with the report you should upload your MATLAB **Simulink file** in your submission which should be compatible with **MATLAB 2016** version and above.