Computer Assignment I: Transmission and Distribution of Electric Power
**Due: Wednesday, Nov. 29, 2006**

As an introduction to this project, read the practical prospective at the end of Chapter 11 of your text book pp. 568-571. Make sure you understand all the details in the example.

Let D1, D2 be your serial numbers with D1<D2. (If you do not have a serial number, contact your instructor)

The circuit shown in the figure below represents a 60Hz generator in "Jeddah" which feeds a balanced three phase load in "Bahrah" through a distribution line with an impedance of (D1+j D2)/10 Ω/Ø. We will assume that the system is balanced, and the open circuit line-to-line voltage at the Y-connected generator plant is 13.8kV. The internal impedance of the source is 0.2+j 0.1 Ω/Ø. The load is Y-connected and has a lagging power factor of 0.85. The acceptable level for the voltage at the load side is 13.8kV ±5.8 %.

3Ø Line
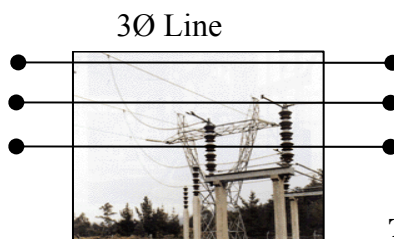
Generator Plant **Three Phase Load**
(Jeddah) **(Bahrah)**

PART I (Hand Calculation): What are the possible values for the impedance?. *i.e.* Find the impedance per phase of the Y-connected load that will achieve 13.8kV ±5.8 % with 0.85 lagging power factor.

PART II (Computer Aided Circuit Analysis): Our objective here is to verify our hand calculation and learn some other concepts.

1. Prove your answer in part a by simulating **the three-phase** circuit and measuring the line-to-line voltage at the substation (Hint: you will need to find the equivalent impedance of the load).
2. In a single plot and using computer circuit analysis, generate four curves (V_{AB}, V_{BC}, V_{CA}, V_{CN}, $V_{AB}+V_{BC}+V_{CA}$), comment on the phase difference and the sum.
3. Using computer circuit analysis, in a single plot generate two curves I_{aA} and I_{AB}. Comment on the magnitude and phase.
4. In a single plot and using computer circuit analysis generate four curves (P_{AB}, P_{BC}, P_{CA}, $P_{AB}+P_{BC}+P_{CA}$), comment on the variation with time.
5. What is the efficiency of the system? (You might need to do some hand calculations)

Hints:
1. Writing style and organization are very important (Quality not Quantity!)
2. **Your serial numbers should be clearly presented on the first page.**
3. A group of two students work together and submit one report (change partner every computer assignment).
4. This assignment accounts for **8%** of your total grade.
5. **It will take sometime. Allow yourself enough time. Do not work close to the due date.**
6. Projects are to be submitted during class time. Any late submission will result in zero or low grade.
7. You can use the discussion group in the Course WebCT to discuss general ideas and questions.
8. Copying is the easiest way to loose points.
9. You can ask questions related to the project before three days of the submission date.
10. You may use any circuit simulation software (Multisim, PSPICE)
11. A diagram showing the simulated circuit with component values should be submitted.

Good luck, **Dr. AbdelMalek Zidouri** and **Dr. Ali Muqaibel**