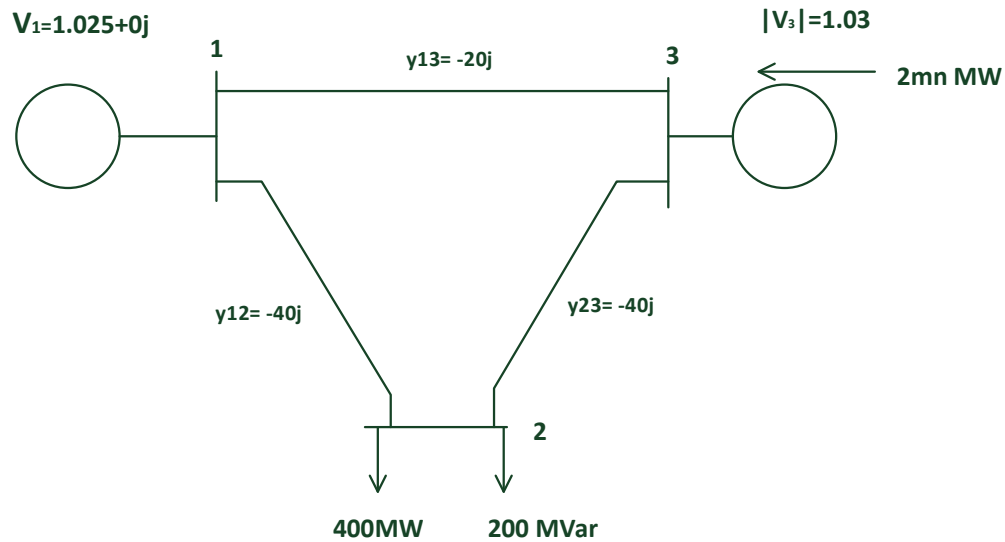


RENEWABLE ENERGY SYSTEMS

Midterm Project

1. The below given Figure shows the one-line diagram of a simple three-bus power system with generation at buses 1 and 3. The voltage at bus 1 is  $V_1 = 1.025 \angle 0^\circ$  per unit. Voltage magnitude at bus 3 is fixed at 1.03 pu with a real power generation of 2mn MW. A load consisting of 400 MW and 200 MVar is taken from bus 2. Line admittances are marked in per unit on a 100 MVA base. For the purpose of hand calculations, line resistances and line charging susceptances are neglected.  
Using Gauss-Seidel method and initial estimates of  $V_2^{(0)} = 1 + 0j$  pu and  $V_3^{(0)} = 1.03 + 0j$  and keeping  $|V_3| = 1.03$  pu, determine the phasor values of  $V_2$  and  $V_3$ . Perform two iterations. (50p)



2. Solve the same problem using the code you write as an m-file in MATLAB. (30p)
3. Solve the same problem using PowerWorld software. (20p)

**Hints:**

- mn is the last two digits of your student number. For example if the last two digits of your student number is 97, then  $m$  is equal to 9 and  $n$  is equal to 7. Therefore, the real power generation at Bus 3 becomes 297 MW.
- Each project depends on a single person, and if the last two digits of the student numbers of two separate students are the same, then their projects will be analyzed in further details in order to be sure about any copy issue!
- Solving Problem 1 correctly is **mandatory!** For the students who cannot solve Problem 1 correctly, the solutions of Problem 2 and 3 will be **neglected** in order to be fully sure about the copy of the code in Problem 2 and the simulation diagram in Problem 3!
- You should provide a report for the project. You can use this file as a cover page (**fulfilled with a pen that cannot be erased!**) or you can also provide a separate cover page including the course name, student name, group of the course and student number and a signature.
  - For Problem 1, it is mandatory to use the Equations format in Microsoft Word software. **No handwriting will be accepted!** You can also use LATEX in this manner. You should draw a separate table summarizing the results of each iteration at the end of Problem 1!
  - For Problem 2, it is mandatory to give all the code in the report.
  - For Problem 3, it is mandatory to give the screenshot of the simulation diagram within the report.
  - Each student will send a .rar or .zip folder including the Word (or LATEX) version of the report, the MATLAB m-file and the simulation file in the PowerWorld software. Any missing attachment will result in loss of project points. This whole .zip or .rar folder should be named as "StudentName-StudentSurname-StudentNumber-Gr-GroupNumber".
- The projects should be delivered to **res.ytu1911@gmail.com** till June 1, 2022 4pm. The projects delivered later with any reason will be neglected and will therefore be given zero points.

Good luck.

Asst. Prof. Ali Rifat BOYNUEĞRİ & Asst. Prof. Ali DURUSU