

## EE-472 Power System Analysis II Spring 2024 Project–1

**Aim:** To implement a function in PYTHON 3.12 environment that can perform Newton-Raphson Load Flow Analysis with Generator Reactive Power Limit Considerations. The functions should be generic, meaning that they should be capable of solving the problem for different systems (e.g. IEEE 30-bus system, IEEE 118-bus system, etc.) given with the same input format.

You must submit the final version of your codes and your reports via ODTUClass. You are also asked to upload your codes to a GitHub repository during the semester to check your progress. More information about GitHub will be given on Laboratory Session 1. The report should **NOT** include explanation of your code; rather it should include the following.

- a) Outputs of the code.
- b) Test results.
- c) Convergence threshold.
- d) Any computational method you used to improve computational performance.
- e) Flow charts,
- f) Solution time and computer details,
- g) Explanation of the solution
- h) Any additional reasoning and comments

Provide your results based on IEEE 300-bus system provided in the supplementary files.

- You should write a Python function, which takes some arguments as inputs and returns some results as output.
- Include a 'requirements.txt' file for any dependencies your project has.
- Include a 'read\_me.txt' file with brief explanation of how to run your code.
- Submit your .py file via ODTUClass link 'Project 1 Code'.
- Submit your report to the ODTUClass link 'Project 1 Report'.

**Inputs:** The only input argument required is the CDF file path. If you use any other input argument provide details, reasoning, and the file itself (if applicable).

1. CDF file path

**Outputs:** Include the following outputs. Do not dump all results one after another. Label and print with proper titles.

1. Sparsity pattern plot of  $Y_{BUS}$ ,
2. Voltage magnitude values at each bus in per unit,
3. Voltage angle values at each bus in degrees,
4. Solution time,
5. Number of iterations,
6. Real and reactive power losses in the system,
7. Bus ID numbers (as given in CDF file) of PV buses that are stuck to Q-limits.

**Note 1:** You are responsible whether your project is running or not. You will have only 1 chance to submit your codes and reports. Test cases will not be provided. Use PSS/e for testing and validation purposes.

**Note 2:** The fastest implementation (average of 10 runs) will be awarded with 10 Bonus points.