Advanced MATLAB Simulink Scripting Practical Lab with Detailed Instructions and Hints

Lab Objective:
Master advanced Simulink Scripting skills through dynamic block creation, parameter manipulation, automated simulation setup, and more complex tasks.

Lab Tasks:
Dynamic Block Creation:

Details:
Use the add_block function to dynamically create a subsystem block named 'DynamicSubsystem'.
Within the subsystem, add a Gain block and a Scope block programmatically.
Customize the Gain block's parameters, such as the gain value.

Hints:
Utilize the add_block function with appropriate arguments for each block type.
Employ a loop for iterative block creation and customization.
Parameter Sweep:

Details:
Implement a loop to vary the gain value of the previously created Gain block in increments.
Run simulations for each gain value, capturing relevant information (e.g., simulation time, peak output).

Hints:
Use a loop to iterate through different gain values, adjusting the block parameter with set_param.
Leverage the sim function within the loop to run simulations.
Automated Simulation Setup:

Details:
Create a script to set up simulation parameters:
Set the solver type to 'ode45'.
Configure the stop time to 10 seconds.
Enable data logging for critical signals.
Use these parameters to run simulations automatically.

Hints:
Utilize the set_param function for configuring simulation parameters.
Implement the sim function to start simulations.

Data Logging:

Details:
Implement data logging for the Gain block's output and the Scope block's input.
Store the logged data in MATLAB variables for further analysis.
Hints:

Utilize the logsout object to log simulation data.
Explore methods to access and manipulate data from the logged results.
Advanced Connection Handling:

Details:
Extend the script to dynamically manage multiple connection lines between blocks.
Experiment with various connection patterns, including feedback loops.

Hints:
Use loops and conditional statements to manage different connection scenarios.
Explore the add_line and delete_line functions for connection handling.
Script Documentation:

Details:
Add comprehensive comments and documentation to your script, explaining each section's purpose and functionality.
Include comments explaining the rationale behind parameter choices and simulation setups.

Hints:
Comment not only on what each line does but also on the overall logic and flow.
Use section headers and inline comments for clarity.

Submission Guidelines:
Save your script file (e.g., Advanced_Simulink_Scripting_Lab.m) after completing the tasks.
Provide a clear and well-documented script that showcases your proficiency in advanced Simulink Scripting.
Include relevant comments and documentation for clarity.

Additional Challenges (Optional):
For those seeking additional challenges:

Investigate parallel computing techniques to optimize parameter sweeps.
Explore methods for exporting simulation results to external files.
Implement robust error handling and reporting mechanisms in your script.
Note:
This advanced lab is designed to stretch your Simulink Scripting capabilities. Feel free to explore additional functionalities and experiment with more intricate scenarios based on your interests and goals.