Experiential Learning Component

Subject Name: Elements of Electrical Engineering   **Subject Code: UE23EE141B**

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Aim: To verify active and reactive power in three phase star connected systems theoretically and practically using MATLAB Simulink.

Procedure: We require 3 phase AC voltage sources (V_1, V_2, V_3) with a frequency of 50 Hz. Select a load of series RLC branch Z_1, Z_2, Z_3 and now connect the 3 phase voltage source to the load of series. To calculate the current on each phase use the current measurement for each phase. Attach grounding to the AC voltages and the series RLC load too. Load and the phase current both are star connected. Current measurement attached to the each phase and voltage measurement to calculate the voltage. Also attach the power measurement to measure the power. Select a scope and make connections. Have the display to see the powers, one display is for real power and the other is for reactive power. Then simulate the circuit check real and reactive powers. Finally run the simulation and check the waveforms. Power measurement should be continuous. We get approximate 2.43kW of real power. After the simulation copy and paste using the snipping tool in the document.

Theoretical Calculations:

Finding Voltages & Currents:

V_L= 200 V , V_{ph} = V_L/sqrt(3)

V_{ph} = 200/sqrt(3) = 115.5 V

$I_L = I_{ph} = V_{ph}/Z = 115.5 / (10 + 8j) = 9.01$ A

Finding Real and Reactive Power:

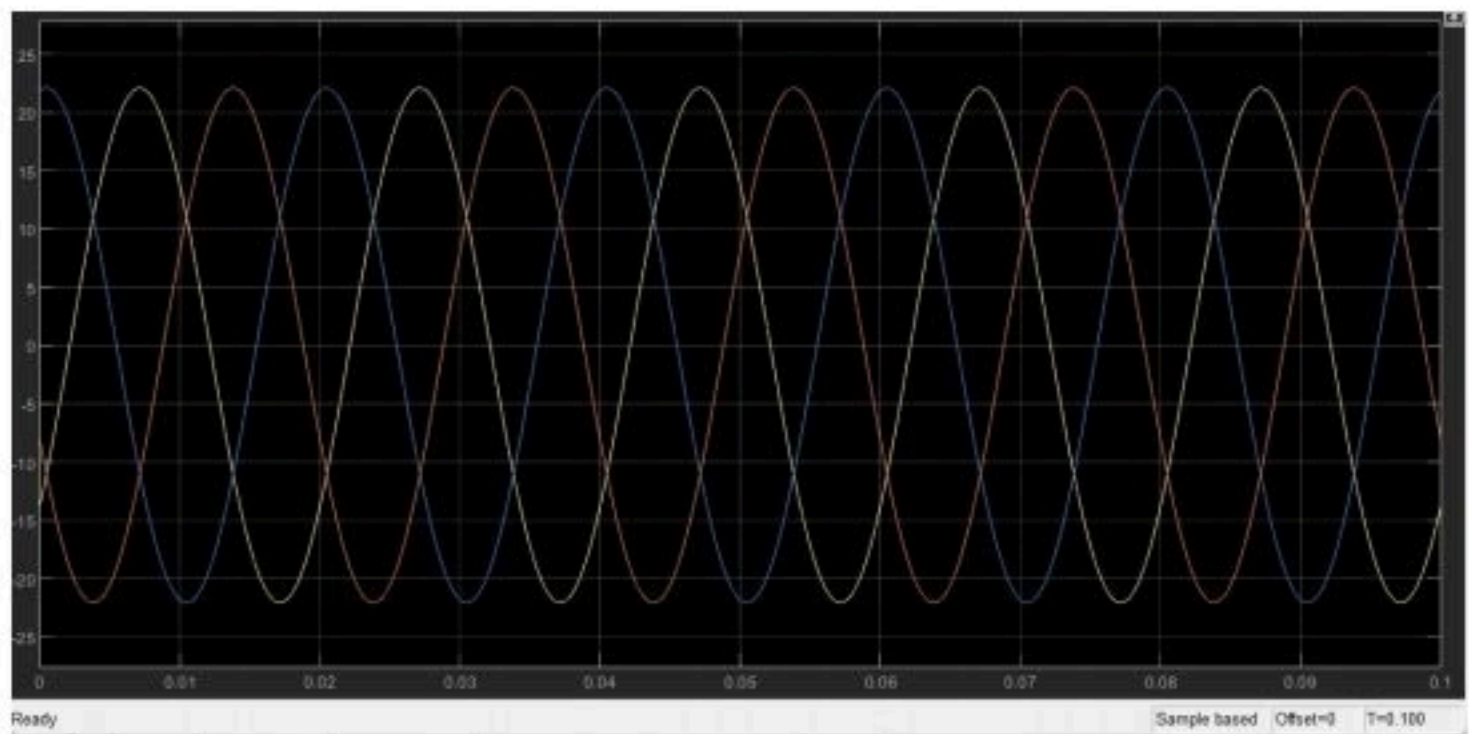$I_{ph} = 9.01$ A

$V_{ph} = 115.5$ V

$P = 3*(I_{ph})^2*R = 2435.4$ Watts

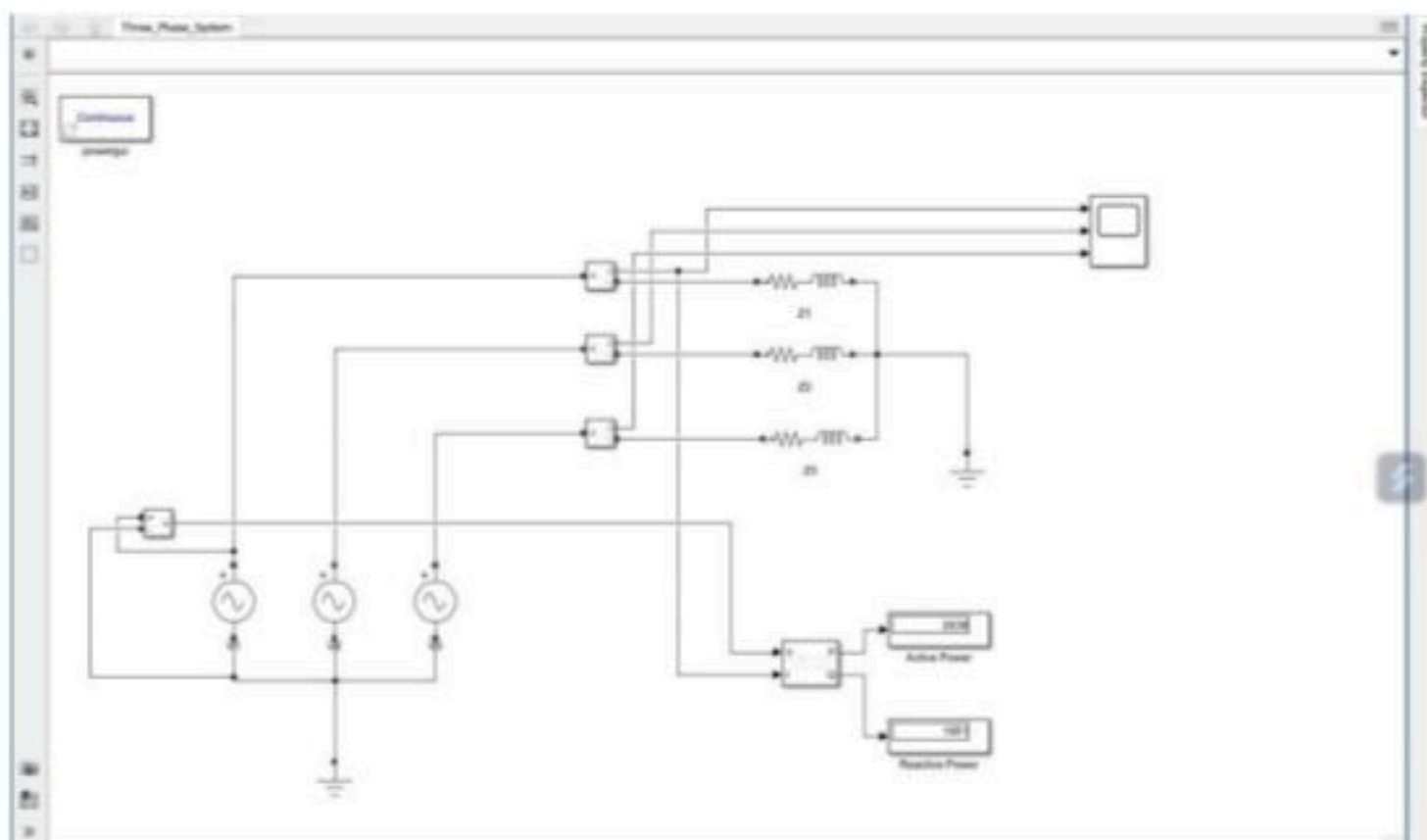$Q = 3*(I_{ph})^2*X_L = 1948.3$ VAR

Finding Power factor ($cos\ \varphi$):

$S = sqrt(P^2 + Q^2) = sqrt(2435.4^2 + 1948.3^2) = 3118.8$ VA

Power factor = P/S = 2435.4 / 3118.8 = 0.7808

Simulation Circuits:

Experiment Circuit:

Theoretical and Simulated Values:

Parameters	Theoretical Value	Simulated Value
Real power (in Watt)	2435.4	2438
Reactive power (in VAR)	1948.3	1951
Power factor	0.7808	0.7807

Conclusion/Inference: Real and Reactive power in three phase star connected systems has been verified theoretically and practically using MATLAB Simulink.