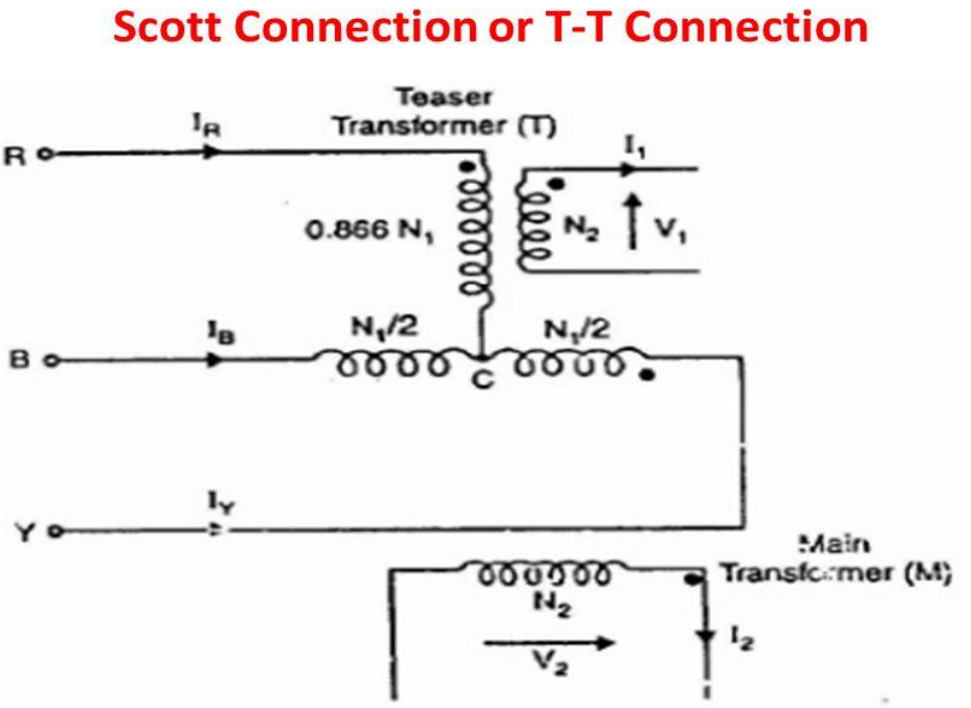
Title of the Exercise: Scott Connection of Transformer

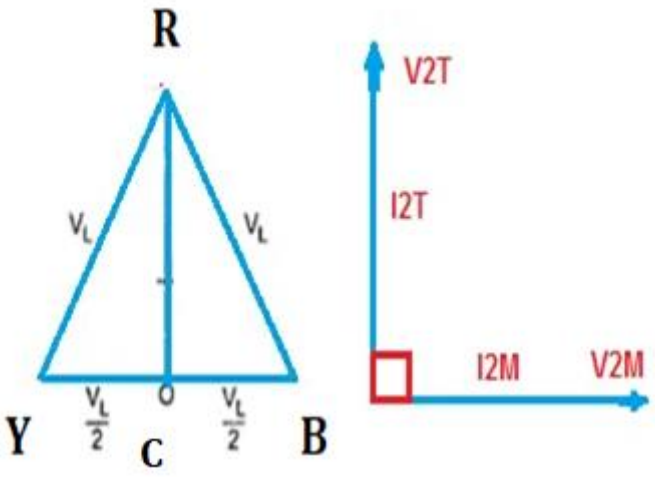
Date: 10/11/2020

Aim: To obtain balanced two-phase supply from three-phase supply by Scott arrangement of two single phase transformers

Tool used : MATLAB and SIMULINK

Electrical Circuit:





Parameters used for the study:

Transformer rating = 25KVA

$V_{RB}= V_{BY}= V_{YR}$ =400V (primary voltage in Rms)

Frequency f=50 Hz

Transformer ratio=2

$R_1 = 0.7488$ ohm (Primary winding resistance)

$X_{11} = 1.00224$ ohm (Primary winding reactance)

$R_2 = 0.007488$ ohm (Secondary winding resistance)

$X_{12} = 0.0100224$ ohm (Secondary winding reactance)

$X_M = 5{,}008$ ohm (Magnetizing reactance

$R_c = 33{,}391$ ohm (Resistance for core losses)

Theoretical Analysis:

$V_{2T}= V_{RC}\frac{N_2}{0.866N_1}$

$V_{RC}=0.866\ V_L$

$V_{2T}= V_L\frac{N_2}{N_1}$

$V_{2M}= V_{BY}\frac{N_2}{N_1}$

$V_{BY}= V_L$

$V_{2M}= V_L\frac{N_2}{N_1}$

$I_{BY}*N_1= I_{2M}*N_2$

$I_{BY}= I_{2M}\frac{N_2}{N_1}$

$I_R*0.866*\ N_1= I_{2T}*N_2$

$I_R= 1.15*I_{2T}\frac{N_2}{N_1}$

Calculations (predetermination):

$\frac{N_2}{N_1}$ **= 2; I_R=0.06963A**

V_L=V_{BY}=400V

V_{RC}=0.866*400=364.4V

V_{2T}=400*(2)=800V

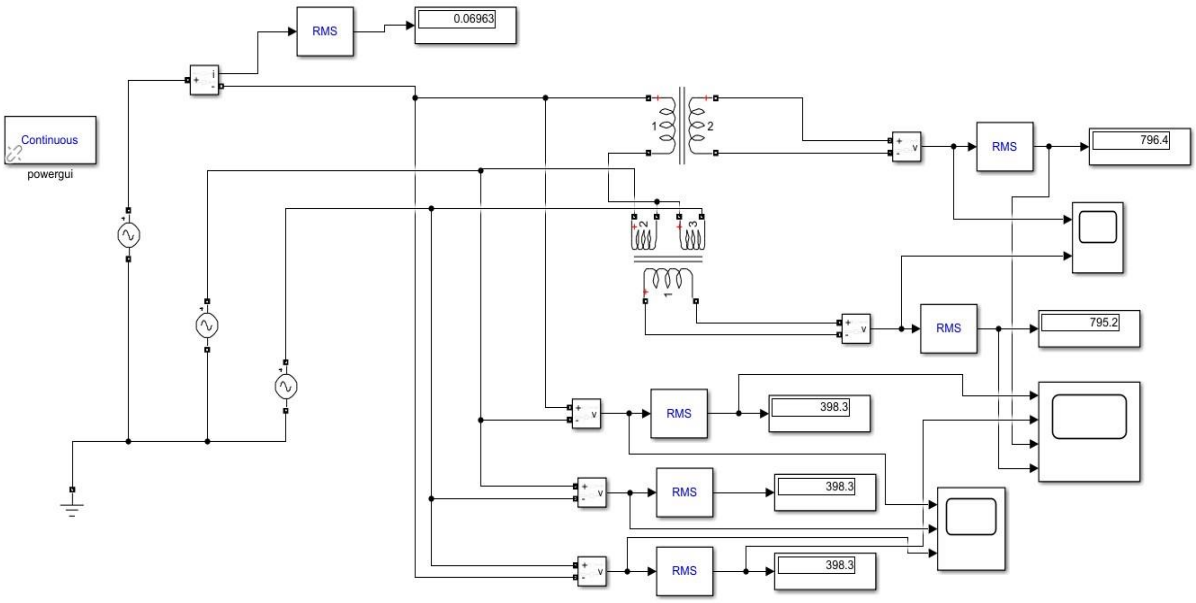
V_{2M}=400*2=800V

I_{2T}=0.06963*0.866*0.5=0.3015A

Procedure:

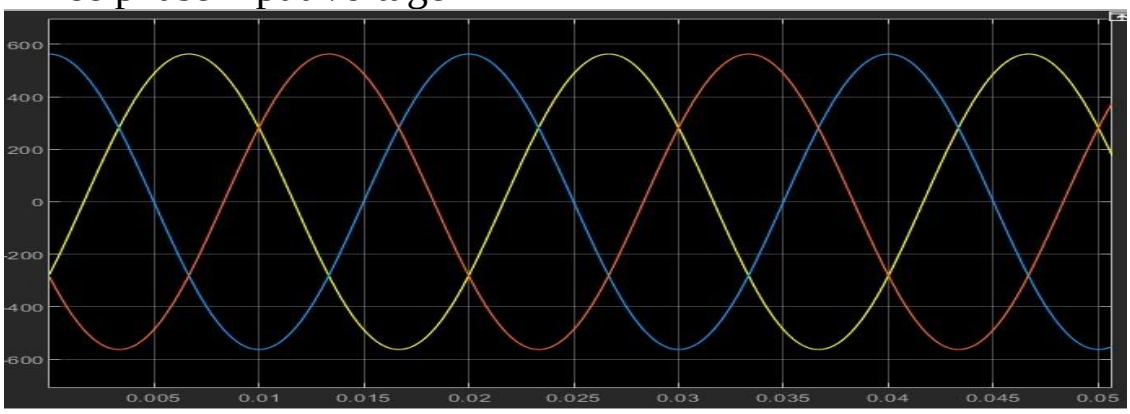
- Step1-Initialize the input parameters and write coding for the as per requirement of plots in m file and save it.
- Step 2-open new Simulink and make mathematical modelling as per circuit diagram and save it
- Step 3-Run the Simulink file.
- Step 4- Get the plots from the corresponding scopes.

Simulink file:

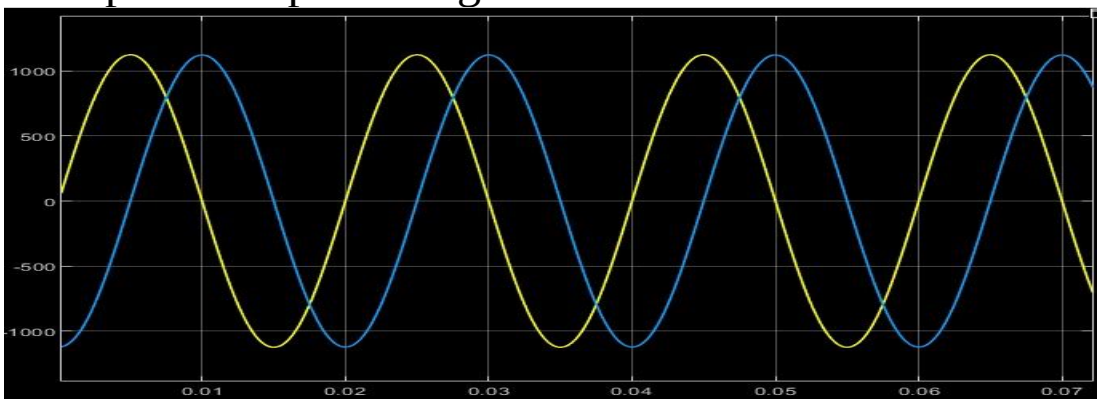


Result:

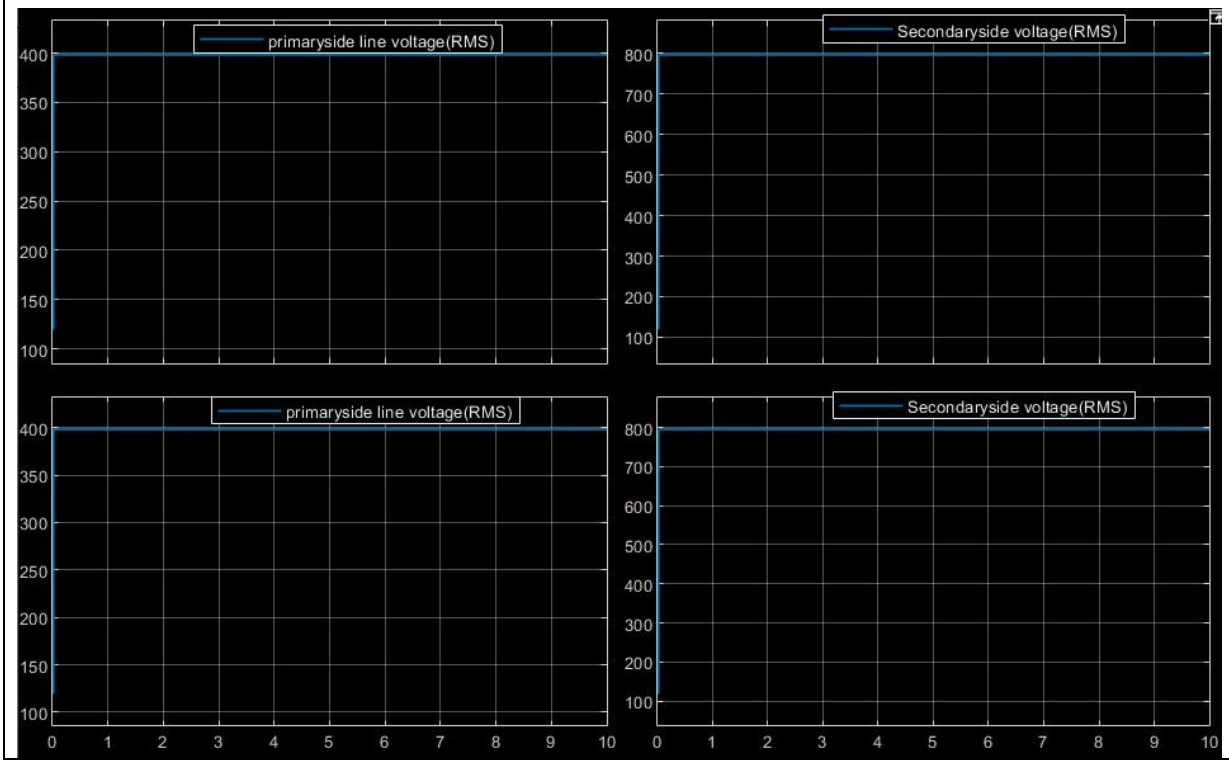
Three phase input voltage



Two phase output voltage



Primary side and secondary side line voltage(rms)



Observations:

Parameters	Theoretical values(V)	Simulation values(V)
V_L	400	398.3
V_{2T}	800	796.4
V_{2R}	800	795.9

Conclusion:

Hence, two-phase supply is obtained from three phase supply using Scott arrangement of two single phase transformers.

Inference:

Therefore, the theoretical values of line voltage nearly matches with simulation ones.

References:

- https://in.mathworks.com/
- Analysis and design of control systems using MATLAB – By Rao V.Dukkipati