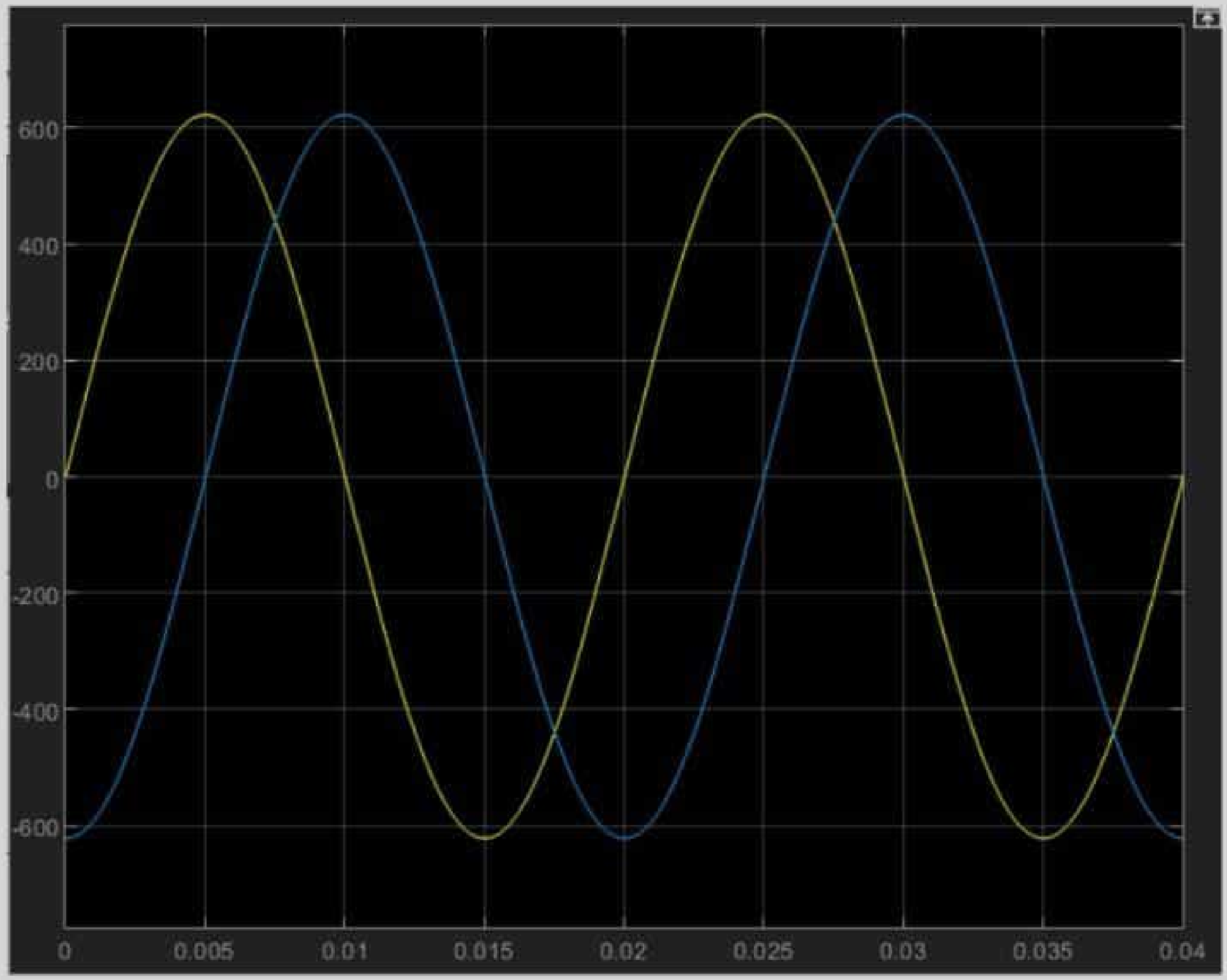
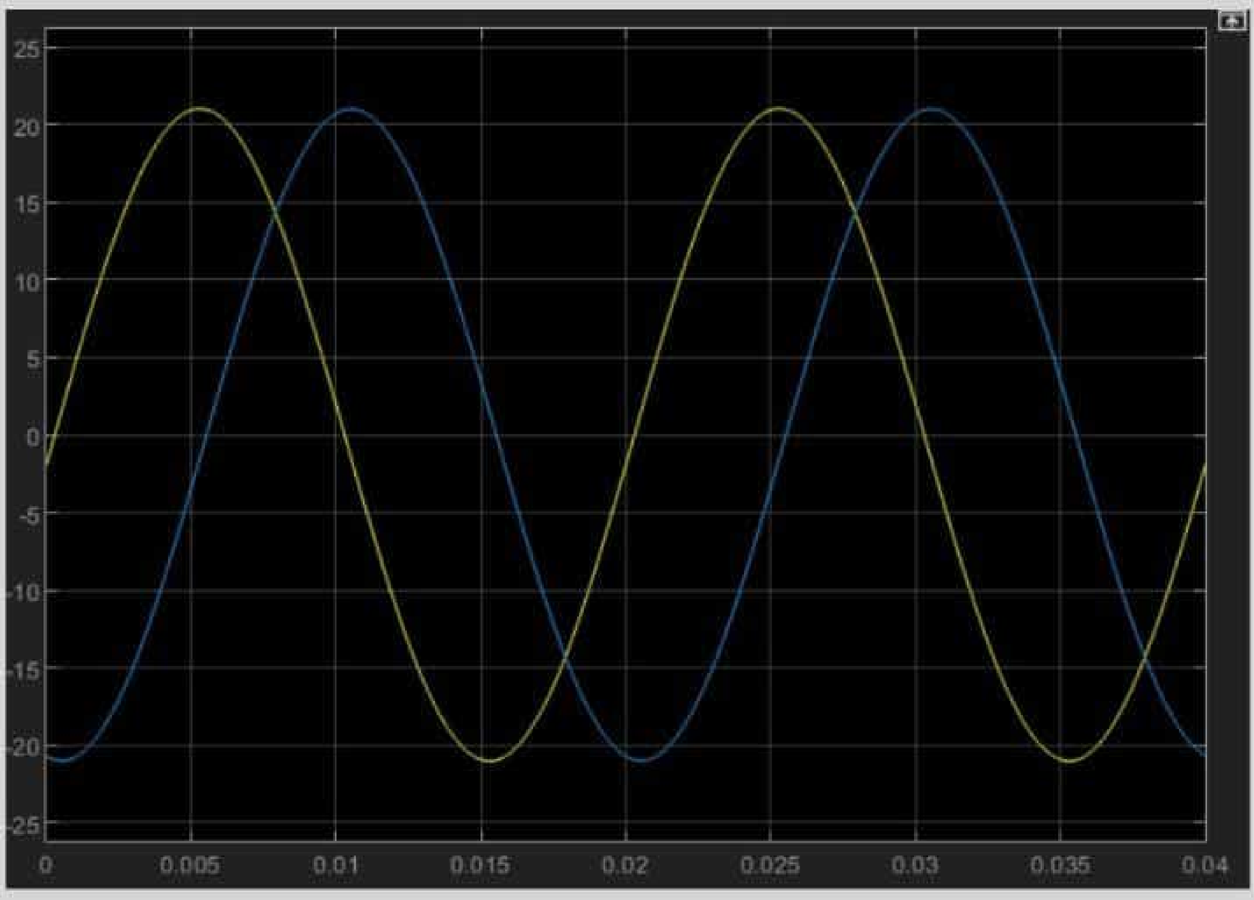
$Z_A(\Omega)$	$Z_B(\Omega)$	$Z_C(\Omega)$	$I_A(A)$	$I_B(A)$	$I_C(A)$	$V_{AB}(V)$	$V_{BC}(V)$	$V_{CA}(V)$	$I_R(A)$	$I_S(A)$
15	15	15	16.79	16.98	16.38	430.00	432.50	427.30	14.86	14.84
$10\angle 30$	$10\angle 30$	$10\angle 30$	7.68	7.57	7.537	432.3	423.9	430.4	7.62	7.89
$20\angle 45$	$20\angle 45$	$20\angle 45$	2.80	2.78	2.78	436.3	432.2	437.7	3.395	3.819

$12\angle -60$	$12\angle -60$	$12\angle 6-0$	40.7	42.64	39.09	458.3	441.7	419.9	35.3	35.49
10	14	18	21.24	18.86	15.55	440.3	430.1	429.2	18.64	14.19
$20\angle 45$	$10\angle 30$	$10\angle 30$	3.52	6.58	6.89	434.6	423.9	432.5	4.05	7.89

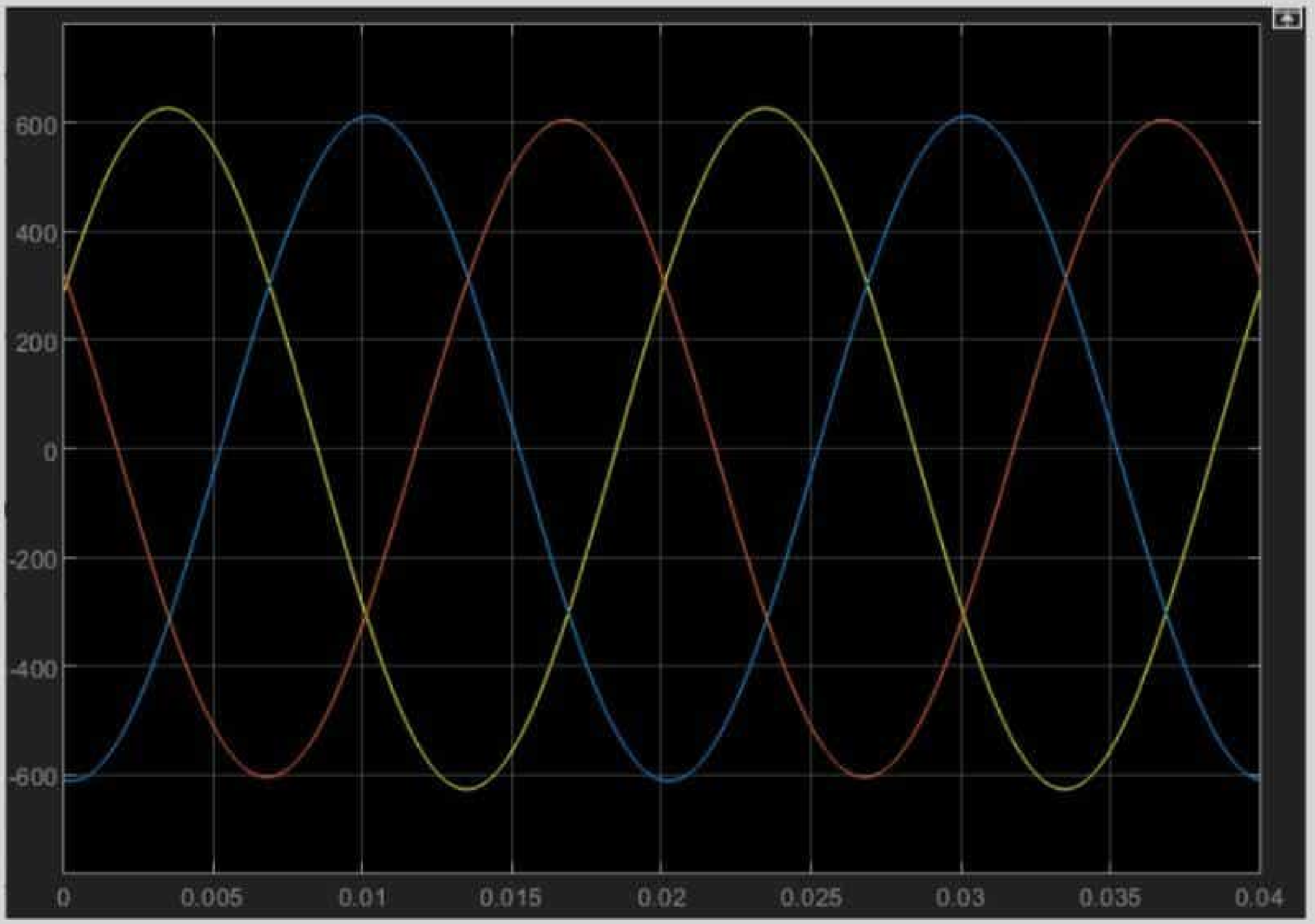
V_{RT}-V_{ST}


600
400
200
0
-200
-400
-600
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04

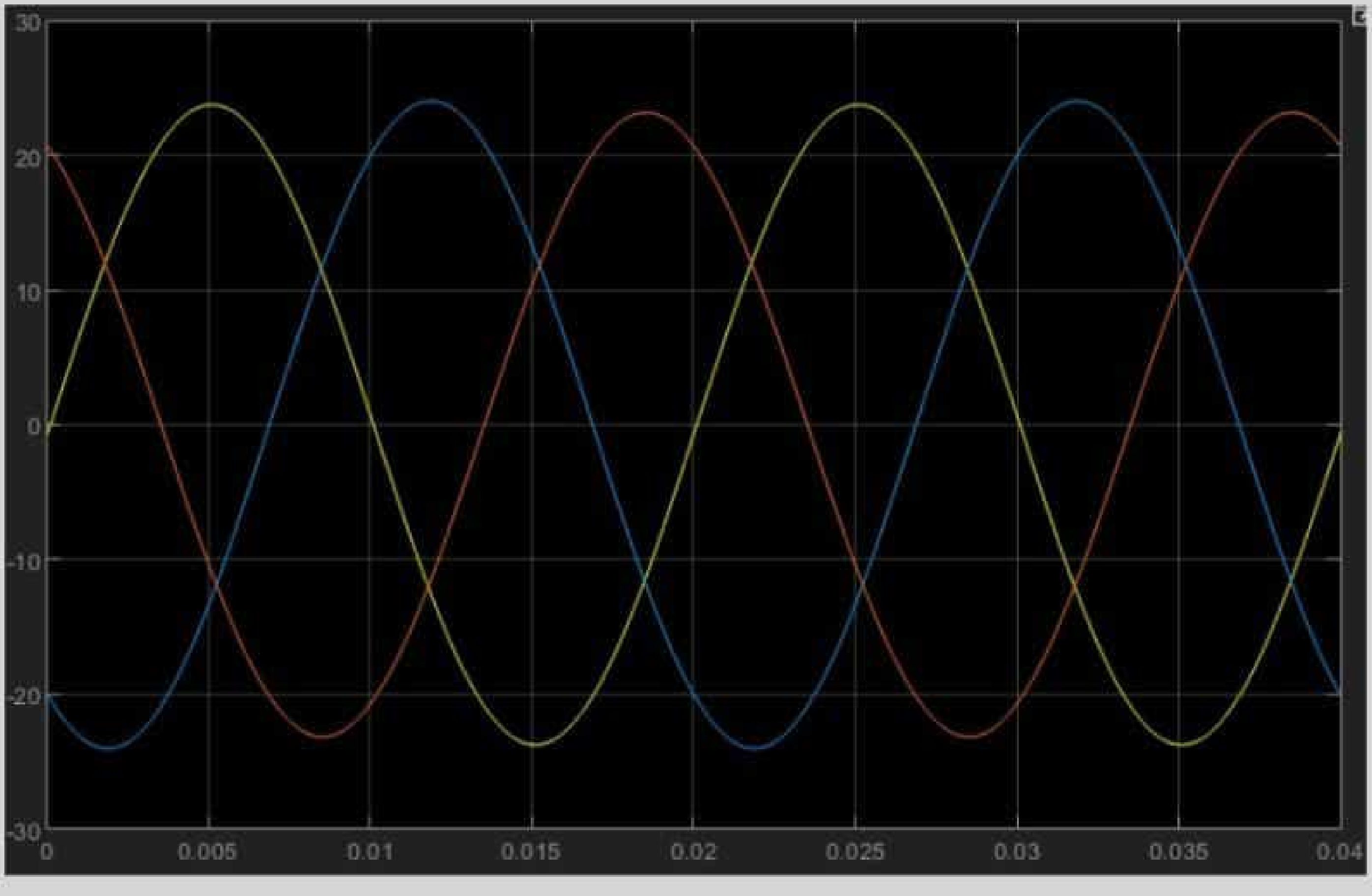
I_r-I_s


25
20
15
10
5
0
-5
-10
-15
-20
-25
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04

V_{ab}-V_{bc}-V_{ca}



I_A-I_B-I_C



B) Study of vector groups of transformer

1)

i) $Yy0 = \dfrac{(V_{Line})_{HV}}{(V_{Line})_{LV}} = 2.005$

ii) $Dd6 = \dfrac{(V_L)_{HV}}{(V_L)_{LV}} = 2.005$

iii) $Yd1 = \dfrac{(V_L)_{HV}}{(V_L)_{LV}} = 3.4734$

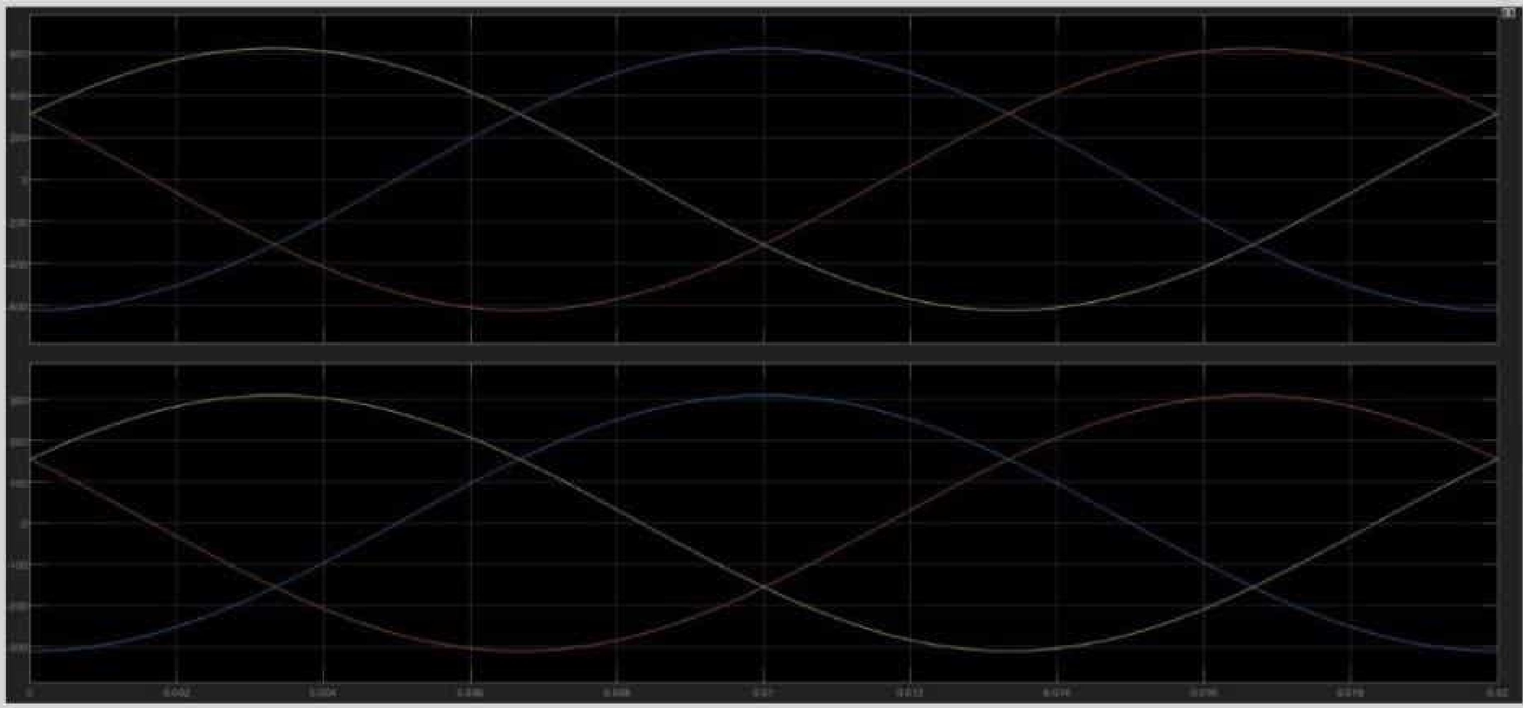
iv) $Dy11 = \dfrac{(V_L)_{HV}}{(V_L)_{LV}} = 1.157$

v) $Yz11 = \dfrac{(V_L)_{HV}}{(V_L)_{LV}} = 2.0044$

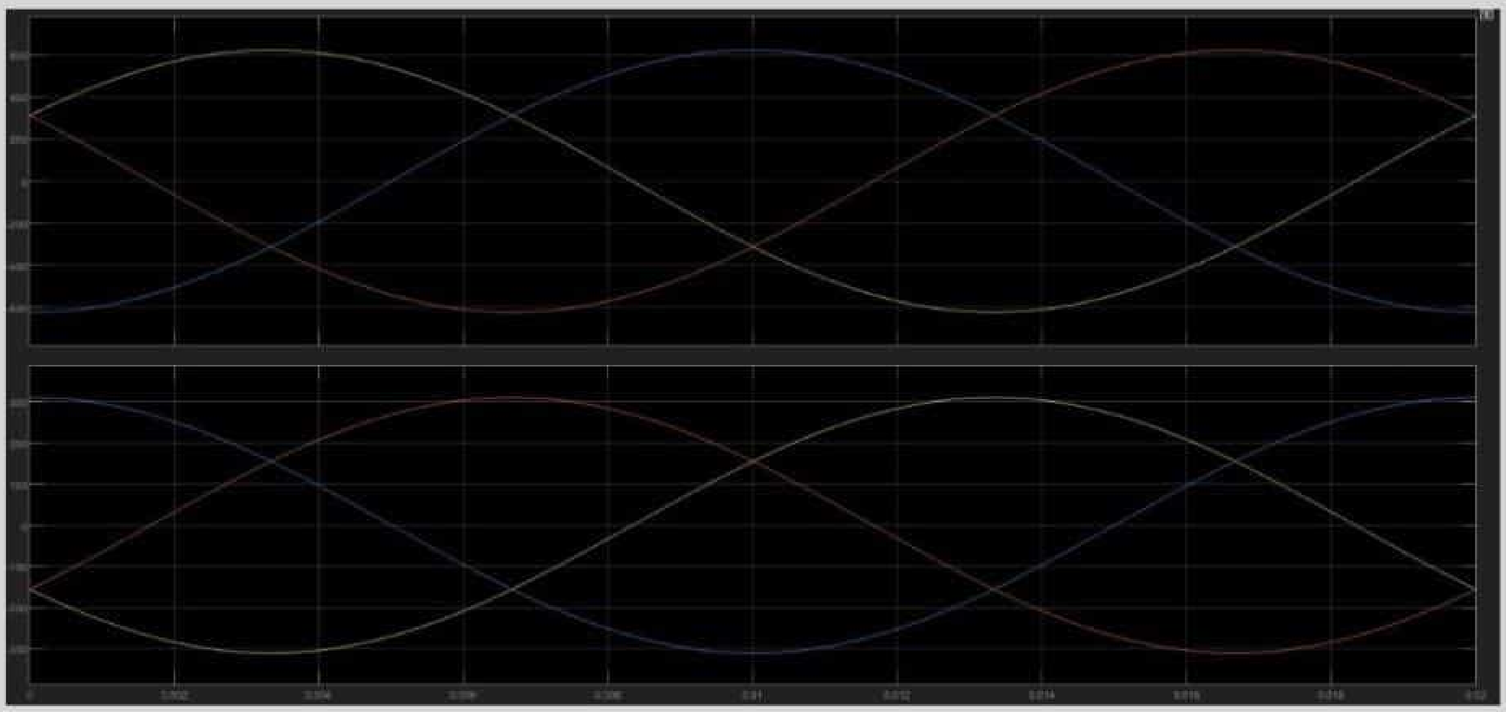
vi) $Dz6 = \dfrac{(V_L)_{HV}}{(V_L)_{LV}} = 1.157$

plot a line voltage of the HV side, and the corresponding line voltage on the LV sidefor any 3 configurations

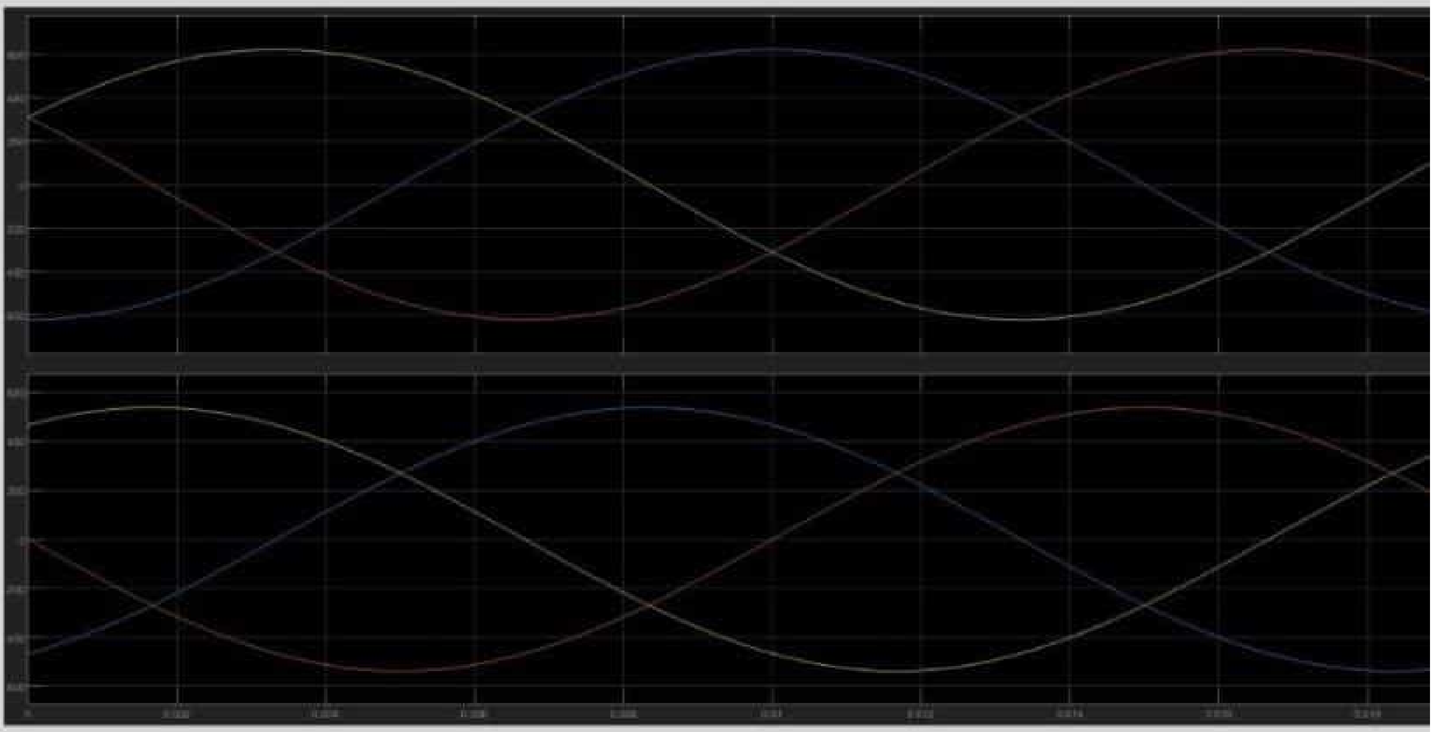
1. For Yy0:



2. For Dd6:

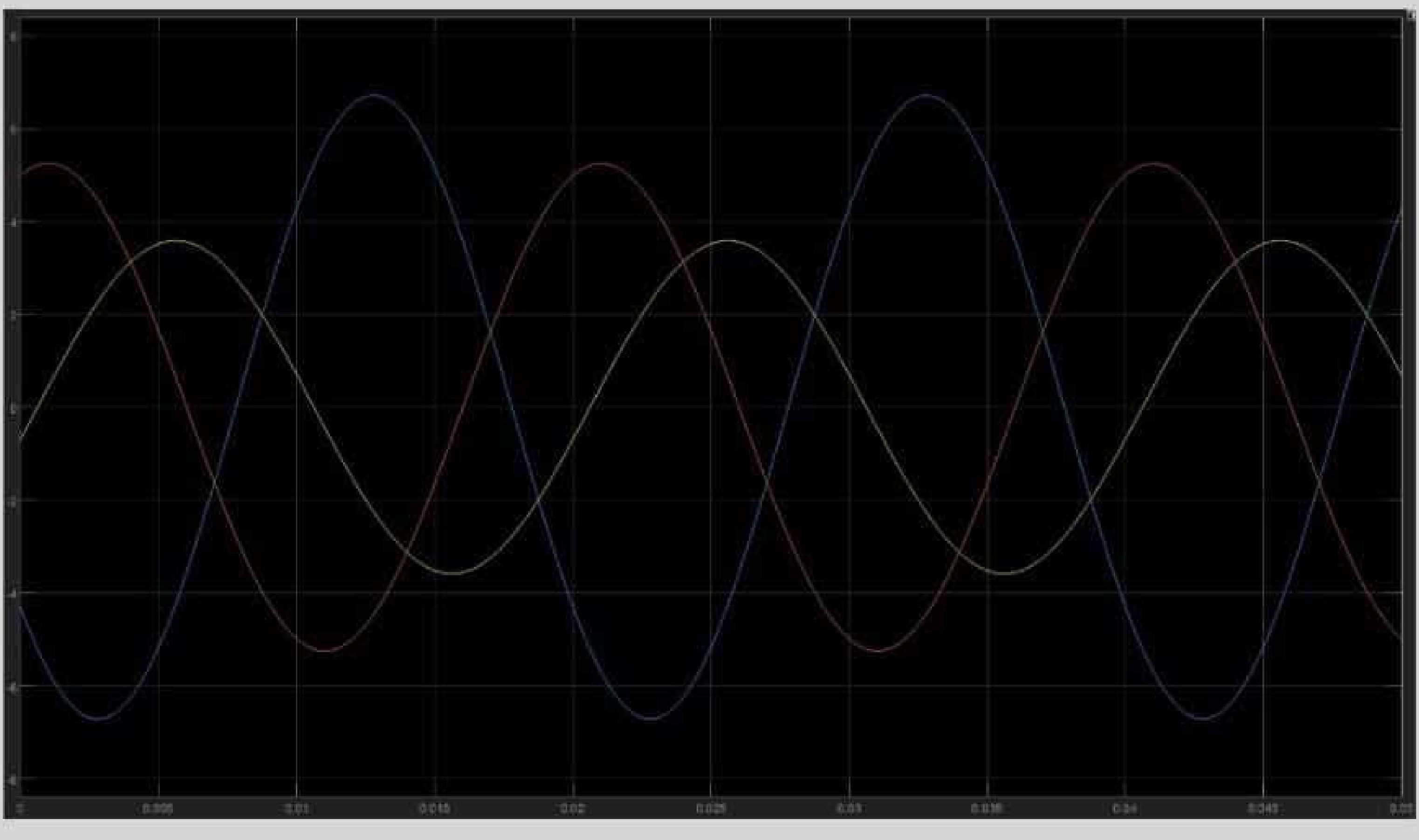


3. For Dy11:

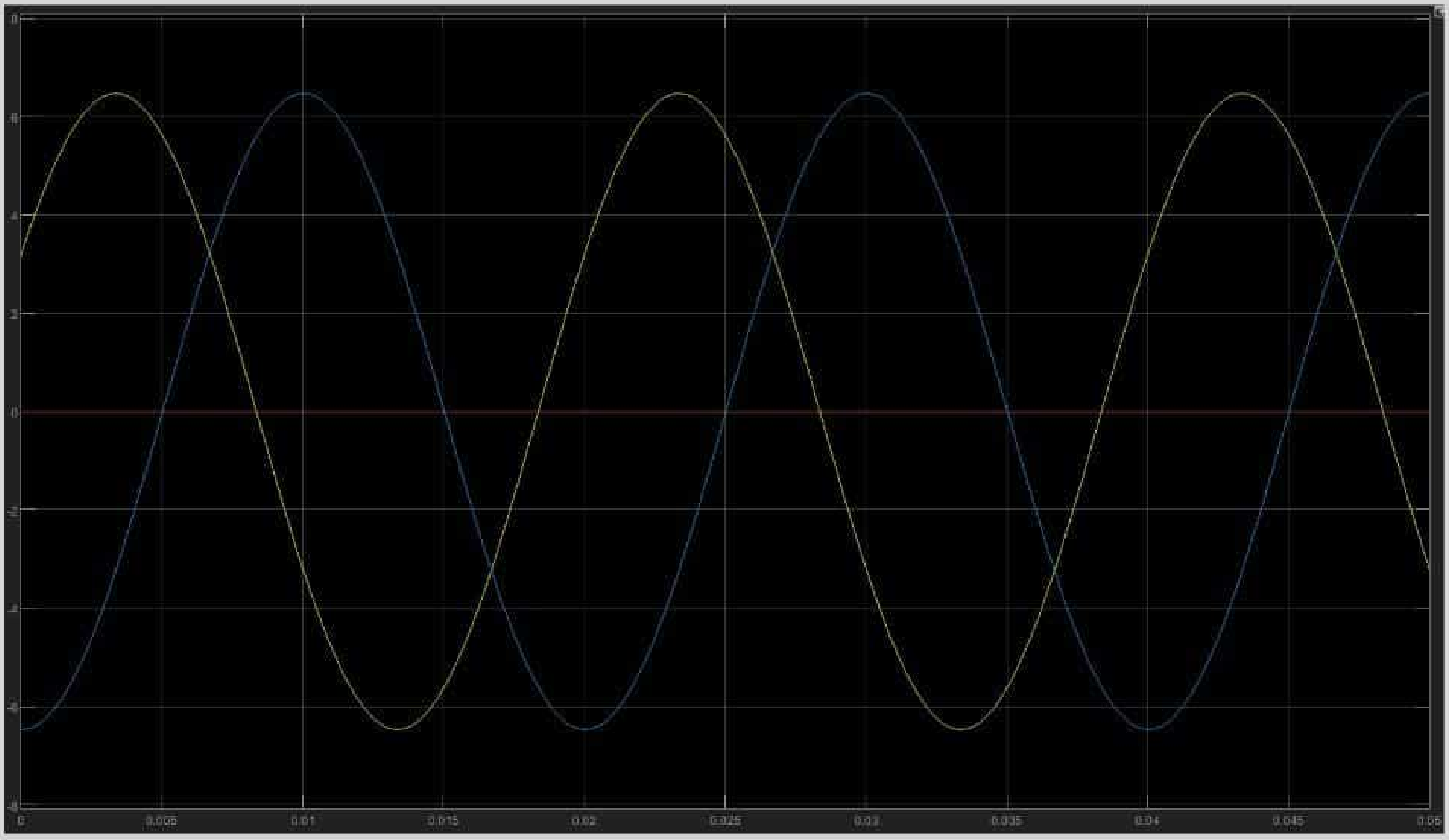


3. For Dy11, with a one phase of load disconnected from the transformer (3 kW load):

a. Line current on primary side (same as phase current due to Delta connection on primary) :



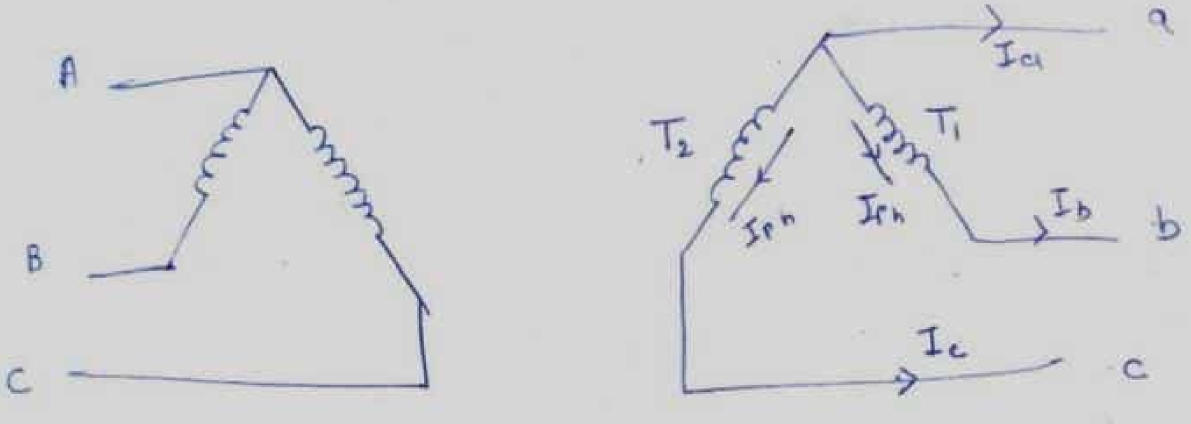
b. Line current on secondary side:

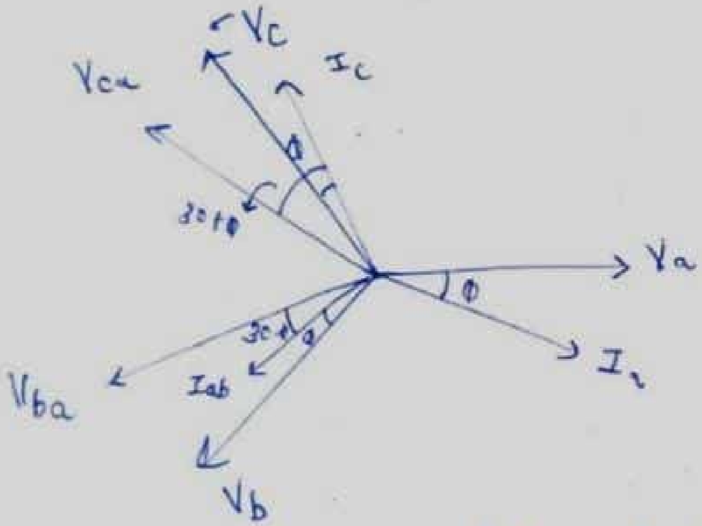


C.)

Discussion questions —

1.) If one of the transformer is disconnected then it becomes open-delta connection





Power output of T_1 = $P_1 = VI_{ph}\cos(30-\phi)$

Power output of T_2 = $P_2 = VI_{ph}\cos(30+\phi)$

Total power = $P = P_1 + P_2 = VI_{ph}\left(\cos(30-\phi) + \cos(30+\phi)\right)$

$$P = \sqrt{3}\, V I_{ph} \cos\phi$$

for normal Δ - Δ connection

$$P_{\Delta-\Delta} = 3 V I_{ph} \cos\phi$$

$$P = \frac{P_{\Delta-\Delta}}{\sqrt{3}} = 0.577\, P_{\Delta-\Delta}$$

57.7 % of normal delta - delta power can be provided without overloading.

2)

-) If supply neutral is isolated from the transformer neutral, then neutral point of star connected primary of the transformer is floating, This won't affect the phase voltage of the transformer as it will be constant at the value that is provided from the supply, The current drawn by the transformer will depend on the type of load for balanced load, the 3phase currents in primary is balanced and result in 0 at neutral point. so even it is floating current will not change, but for unbalanced load, the 3 phase primary currents ~~[illegible]~~ will not add up to 0 at neutral. so the current drawn from transformed will change from ideal case.

-) The current in the primary will not get affected as any non-zero current at the neutral now has a path to flow through supply neutral.

3)

i) It is comparitively less costly than Y-Δ or scoott connection tr.

ii) provide better sol for ground current isolation purposes because it has less internal winding impedance going to the ground than when using star type transformers

iii) Y-Δ, Δ-Y connection carry 3rd harmonics through phase voltage which distorts the actual voltage from sinusoid. zigzag eliminates 3rd harmonic.

iv) there is no phase shift between primary and secondary circuits.

4) we can measure resistance across each of the 6 windings using multimeter , 3 windings will have lower resistance than other 3

Taking small resistance winding as secondary side and high resistance windings as primary side we can make 2 groups with 3 winding each.

After supplying to primary and secondary having ballanced load we take any one winding from primary group name it $A_1 - A_2$ we measure voltage across this winding terminals and then across all 3 secondary windings terminals , the one with same ($0°$ phase difference with $A_1 - A_2$ will be $a_1 - a_2$, similarly $B_1 - B_2$ and $b_1 - b_2$ and $c_1 - c_2$. $C_1 - C_2$ can be identified.