



Faculty of Electrical & Electronics Engineering  
DEE3143 Basic Electrical Machine & Power Systems

**ASSIGNMENT #3: TRANSFORMER**

- The three phase transformers are widely used in generation, transmission and distribution system. Discuss the application, construction and connections of three phase transformer, which include:
  - Wye-wye (Y-Y)
  - Wye-delta (Y- $\Delta$ )
  - Delta-Wye ( $\Delta$ -Y)
  - Delta-Delta ( $\Delta$ - $\Delta$ )
- A simple power system is shown in Figure 1 below. Find the current at the generator,  $I_G$ , transmission line,  $I_{line}$  and load,  $I_{load}$ . Analyze the power loss,  $P_{loss}$  in the transmission line.

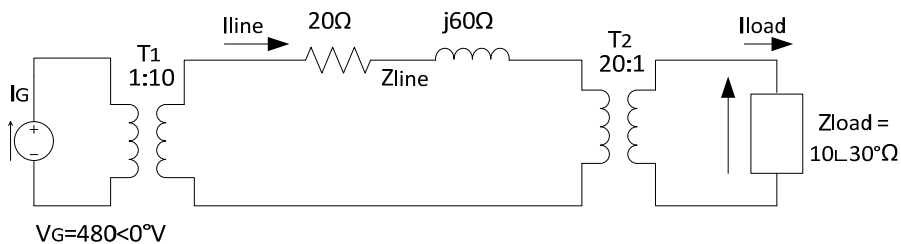


Figure 1

- For determine the transformer equivalent circuit, a single phase 10 kVA, 480/120V transformer have been tested with open-circuit and short-circuit tests. The results of test are shown below:

Open-circuit test	Short-circuit test
$V_{oc} = 480V$	$V_{sc} = 10V$
$I_{oc} = 0.41A$	$I_{sc} = 10.6A$
$P_{oc} = 38W$	$P_{sc} = 26W$

The data were taken from primary side of transformer. Find:

- (i) The equivalent circuit from primary side of transformer.
- (ii) The equivalent circuit from secondary side of transformer.
- (iii) Voltage regulation at full load with power factor of 0.8 lagging for 120 V of secondary voltage.
- (iv) The efficiency of the transformer under the condition in part (iii).

4. State the:

- (i) Ampere's Law
- (ii) Faraday's Law

5. A 200 kVA, 2400/240 V, 50 Hz, single phase transformer has 80 turns on the secondary winding. Assuming ideal transformer; determine:

- (i) The number of primary turns
- (ii) Transformer turn ratio,  $a$
- (iii) Primary and secondary currents
- (iv) The maximum value of the flux

6. A 10 kVA 2200/220V single phase transformer parameters (referred to primary side of transformer);  $R_{ep} = 5.4\Omega$  and  $X_{ep} = 16.3\Omega$ . The shunt magnetizing impedance is very large and can be neglected. At the full load, the transformer delivers rated kVA at 0.8 pf lagging and the secondary voltage is 220V. Calculate

- (i) Voltage regulation
- (ii) Efficiency assuming core losses amount to 150W

7. A 20 kVA single phase transformer 4800/480V has primary resistance and reactance of  $5\Omega$  and  $15\Omega$  respectively, while the resistance and reactance of secondary winding is  $0.1\Omega$  and  $0.15\Omega$  respectively. Calculate:

- (i) The parameter referred to primary side of transformer and draw the equivalent circuit
- (ii) The approximate value of secondary voltage at full load power factor of 0.8 lagging if 4.8kV primary supply