3. A $500V/200V$, 30-kVA, 60-Hz transformer is subjected to a SC test. The secondary is short-circuited and the primary voltage is raised until rated current is flowing. This occurs when the applied voltage equals 8.2% of rated winding voltage. The transformer consumes 600 W during the test.

   a) Compute the series impedance $\mathbf{Z_s} = R_s + jX_s$ of the transformer.

   b) Compute the core flux during the SC test. (Express its magnitude in percent of normal operating flux.)

   c) Why is it permissible to assume that all of the 600 W constitute ohmic losses in R, and no part of it is core loss?

4. The same 30-kVA transformer is subjected to an OC test. The transformer consumes 500 W and draws 1.8 A.

   a) Find R_m and X_m .

   b) The open-circuit voltage measured on the secondary is $206V$. Find the actual turns ratio.

5. Same transformer, but now the following impedance is hooked to the secondary: $Z_L := (1.3 + 0.2 \cdot j) \cdot \Omega$

a) Find the currents in both windings and the secondary voltage by use of the ideal (IT) model. $V_P := 500 \cdot V$

b) Same as in part a) but now include the transformer impedances and actual turns ratio in your analysis. Take note of the change in your answers.

c) Find the efficiency.

d) Is the transformer current-overloaded?

Answers   **Problem 6 is on the next page ------>**

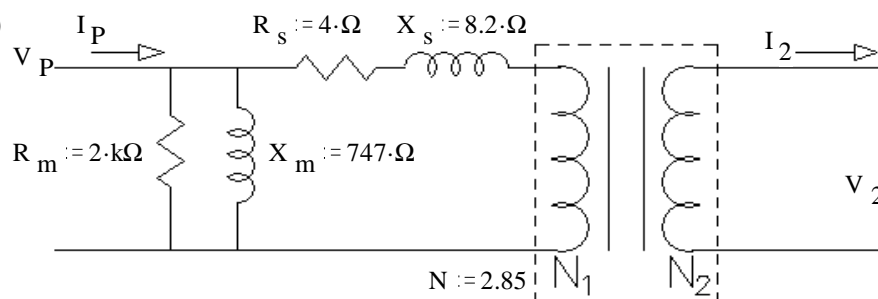3. a) $0.167 + 0.663j \cdot \Omega$ b) 8.2% of normal rated value.
   c) Because the core flux is 8.2% of normal rated value, the core losses (which are approximately
      proportional to the square of the flux) are negligible.
4. a) $500 \cdot \Omega$ & $334 \cdot \Omega$ b) 2.427   5. a) 60.8·A   152.1·A   200·V
   b) 62.2·A a little more   151·A a little less   198.6·V   c) 96.3·%   d) yes, barely.

6. a)

$N := 2.85$ N_1 N_2
2.85:1 Ideal Transformer

b) 22.05·W   0.3A
   73.68·V

c) 16·W   18.25·V

6. A transformer is rated at $210\text{V} / 70\text{V}$, 420VA.
   The following values were found by making the standard OC and SC tests.
   R_m and X_m were neglected when finding the other two components.

   $R_m := 2 \cdot k\Omega$ $X_m := 747 \cdot \Omega$

   $R_s := 4 \cdot \Omega$ $X_s := 8.2 \cdot \Omega$ $N := 2.85$

   a) Draw the standard non-ideal transformer model and label the parts.

   b) What were the measurements that were taken in the standard open-circuit test? (Give me numbers)

   c) What were the measurements that were taken in the standard short-circuit test? (Give me numbers)