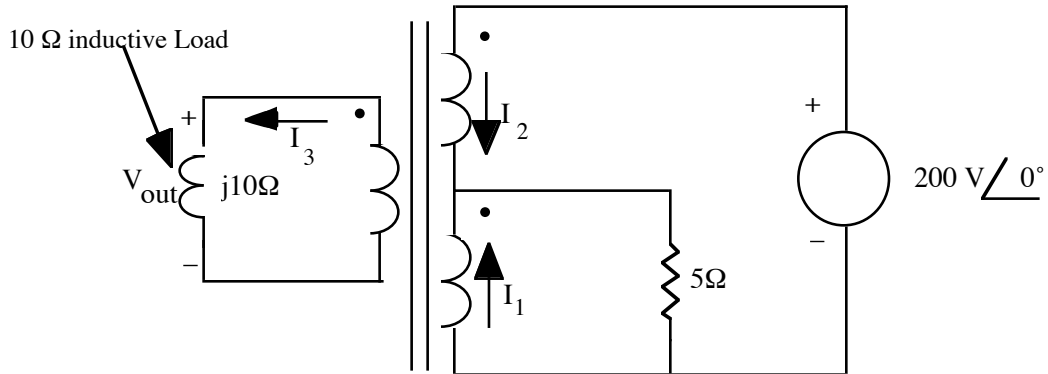


Required Homework Problem 5

Ideal Transformers & Transformer Equivalent Circuit

a) For a 3-winding ideal transformer with 3 identical windings, find the indicated quantities if the transformer is connected as shown in the figure below (40 points).



$$V_{\text{out}} = \underline{\hspace{2cm}} \text{ V} \quad \text{angle} = \underline{\hspace{2cm}} ^\circ$$

$$I_1 = \underline{\hspace{2cm}} \text{ A} \quad \text{angle} = \underline{\hspace{2cm}} ^\circ$$

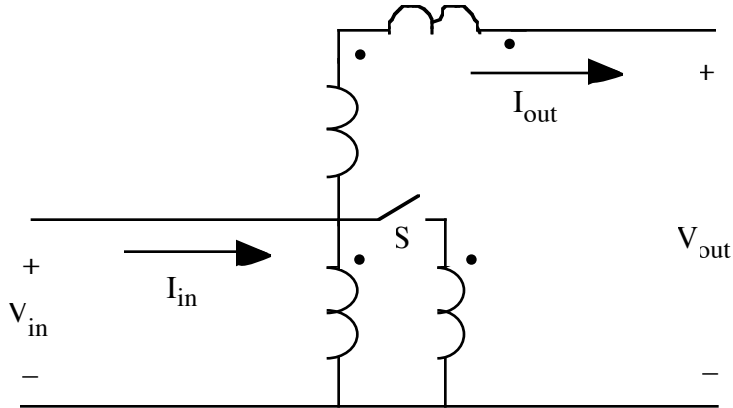
$$I_2 = \underline{\hspace{2cm}} \text{ A} \quad \text{angle} = \underline{\hspace{2cm}} ^\circ$$

$$I_3 = \underline{\hspace{2cm}} \text{ A} \quad \text{angle} = \underline{\hspace{2cm}} ^\circ$$

$P_{in} = \underline{\hspace{2cm}}$ watts $Q_{in} = \underline{\hspace{2cm}}$ vars

b) In the autotransformer circuit below, if each of the windings is rated 100 V, 5.0 A, find the largest value of I_{out} which does not overload any winding if: (20 points)

b1) the switch S is open

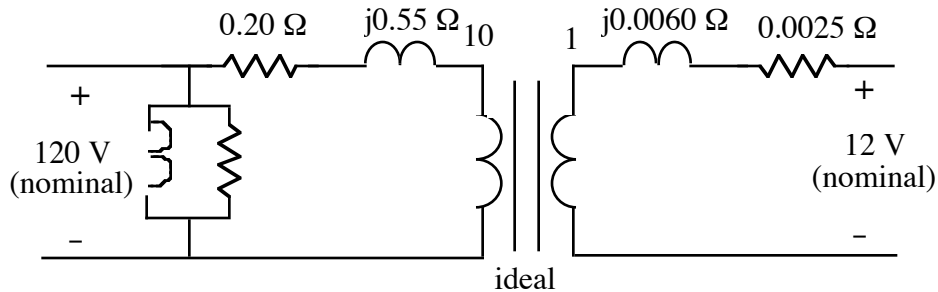


$I_{out\ open} = \underline{\hspace{2cm}}$ A

b2) the switch S is closed

$I_{out\ closed} = \underline{\hspace{2cm}}$ A

c) A 120/12 volt, 10/100 amp, 60 hz, two winding transformer has the approximate equivalent circuit shown in the figure below.



Magnetizing current @ 120 V = 0.50 A rms

Core loss @ 120 V = 12 w

c1) Find the secondary short circuit current if the primary voltage is 120 V angle 0°

$I_{sec\ short} = \underline{\hspace{2cm}}$ A rms Angle $\underline{\hspace{2cm}}$ $^\circ$

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c2) Find the input voltage required if the output voltage is to be 12.0 V while supplying 100 A to a resistive load. Take the load voltage as reference. Also find the transformer efficiency for this condition

$$V_{in} = \underline{\hspace{2cm}} \text{ V rms angle } \underline{\hspace{2cm}} ^\circ$$

$$\text{Efficiency} = \underline{\hspace{2cm}} \text{ pu}$$