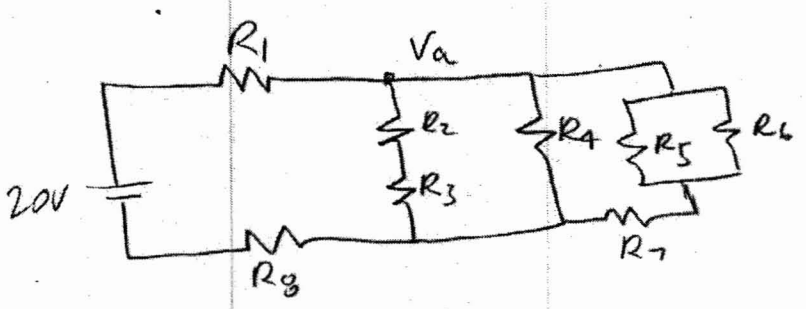
DC Series Parallel CKTs

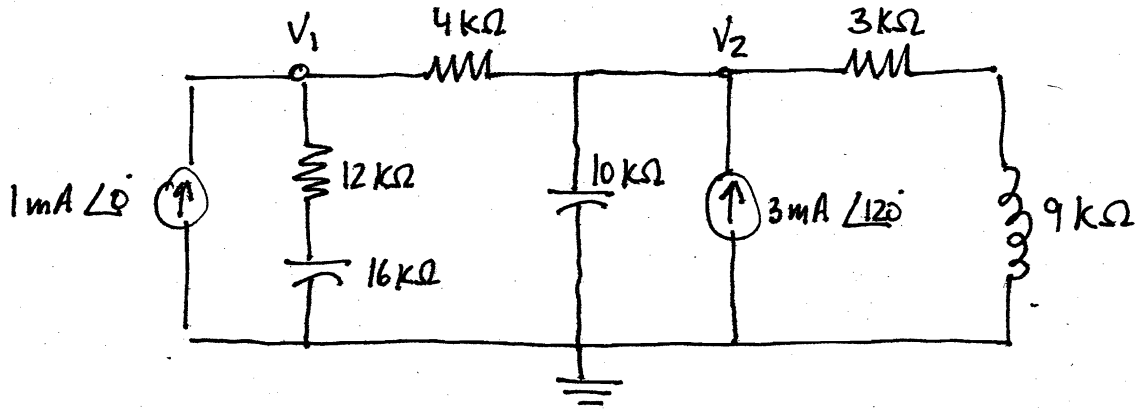


all resistors = 100 Ω

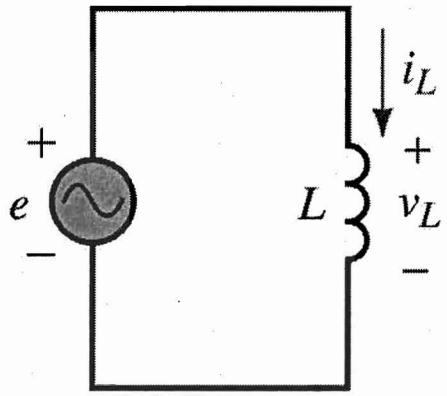
find Va

NODAL ANALYSIS

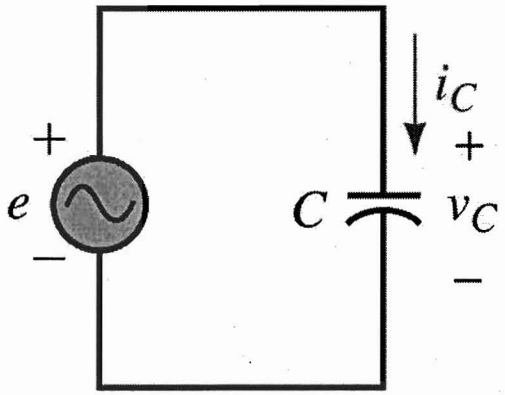
Use nodal analysis to determine V_1 and V_2.



IMPEDANCE REVIEW PROBLEM #1



CIRCUIT A



CIRCUIT B

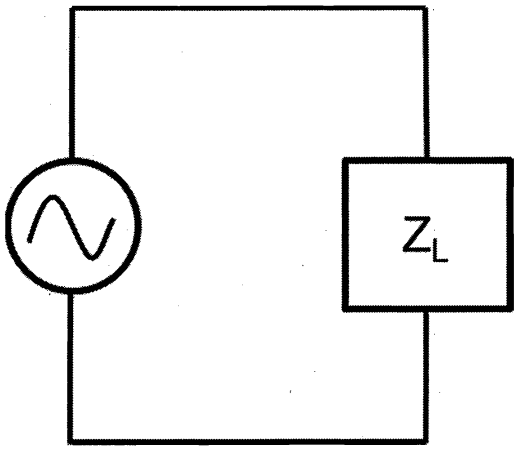
Question 1:

For circuit A above. Find the frequency given $e = 100V\angle 0, I_L = 2A\angle -90°, L = 0.2H$

Question 2:

For circuit B above, find the value of the capacitor given $e = 100V\angle 0, I_C = 0.4A\angle 90°, f = 100Hz$.

IMPEDANCE REVIEW PROBLEM #2



What is in the mystery box given the following:

A. $v(t) = 75V \sin(\omega t + 25°)$
$i(t) = 5A \sin(\omega t + 25°)$

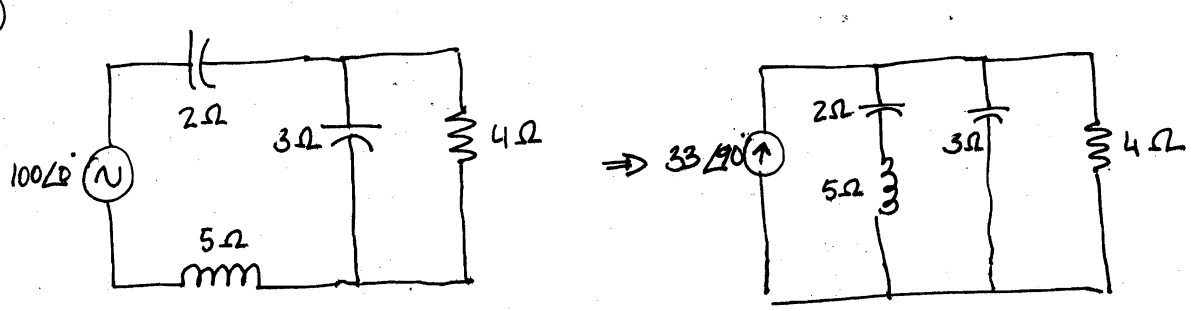
B. $v(t) = 500V \sin(377t + 20°)$
$i(t) = 2.5A \sin(377t - 70°)$

C. $v(t) = 400V \sin(314t + 55°)$
$i(t) = 503mA \sin(314t + 145°)$

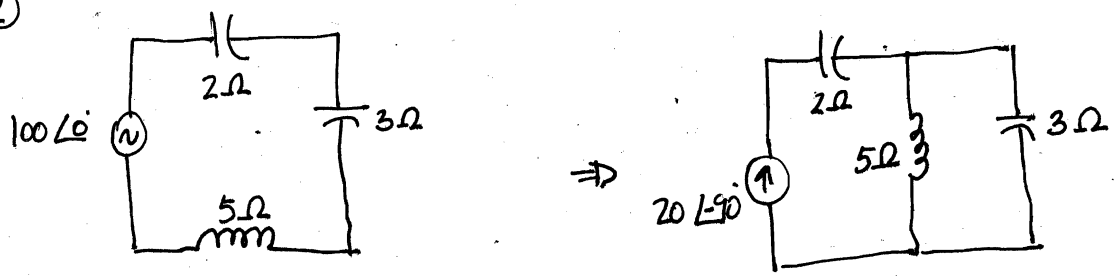
SOURCE TRANSFORMATION

Identify which source transformations are valid

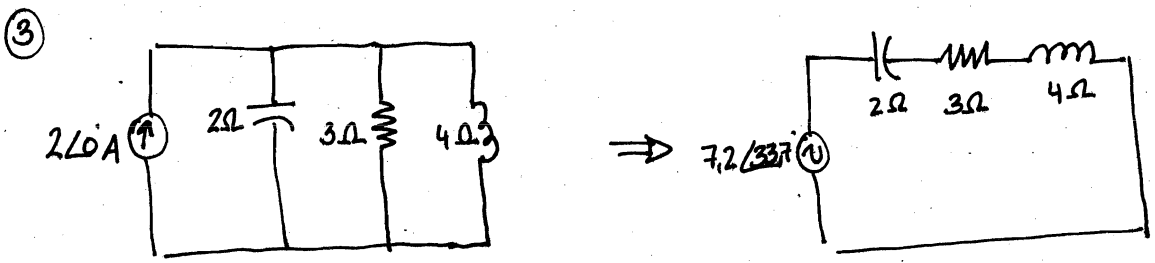
①



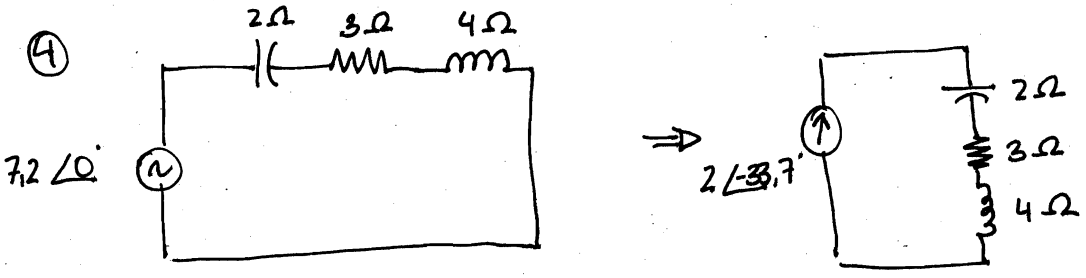
②



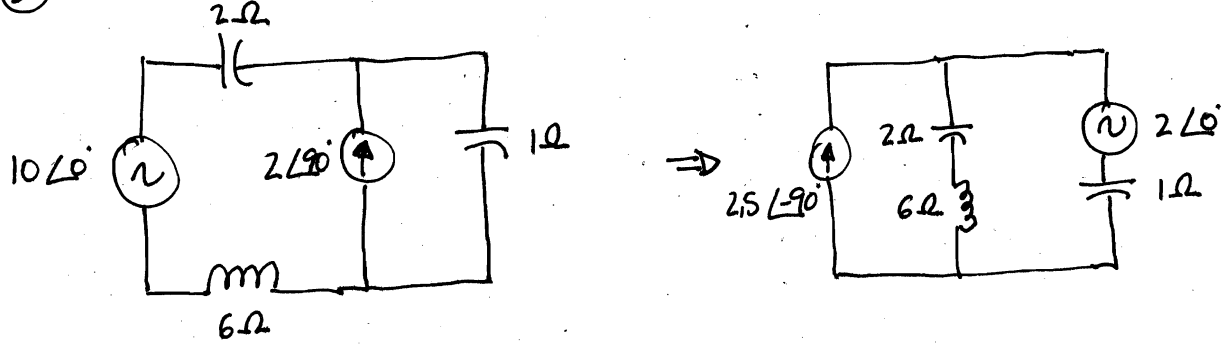
③



④



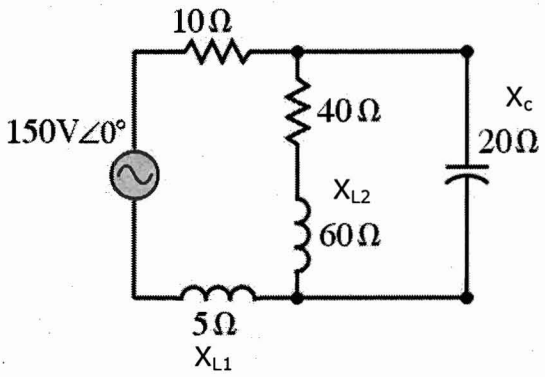
⑤



AC Power

1. For the circuit depicted below, determine the following quantities delivered by the generator:

a. P_T
b. Q_T
c. S_T
d. **S**
e. F_p

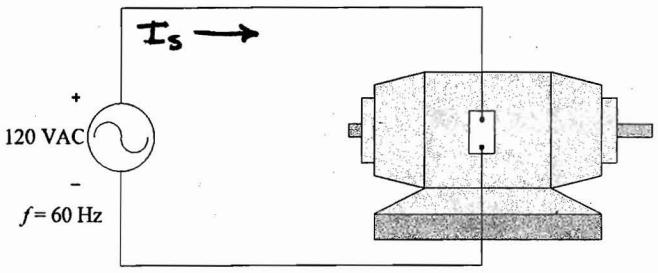


2. Draw the power triangle.

Power Factor & Power Factor Correction

For the motor, $S_m = 1500 + j800$ VA. You are required to reduce source current by improving the power factor at the load.

a) Sketch in a power correction capacitor.
b) Determine the capacitance required to reduce the power factor to unity.
c) By how many amps does this power factor correction reduce the source current?



C = _____

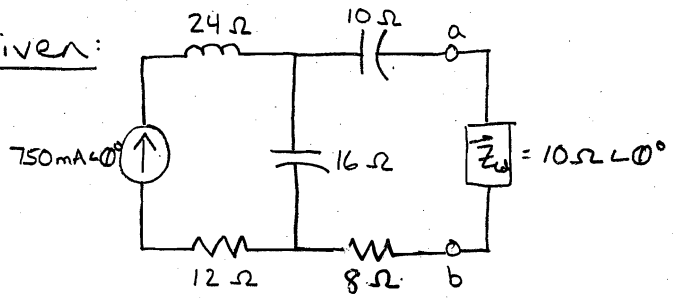
(corrected) I_s = _____

(uncorrected) I_s = _____

change in I_s = _____

AC THÉVENIN + MAX POWER

Given:

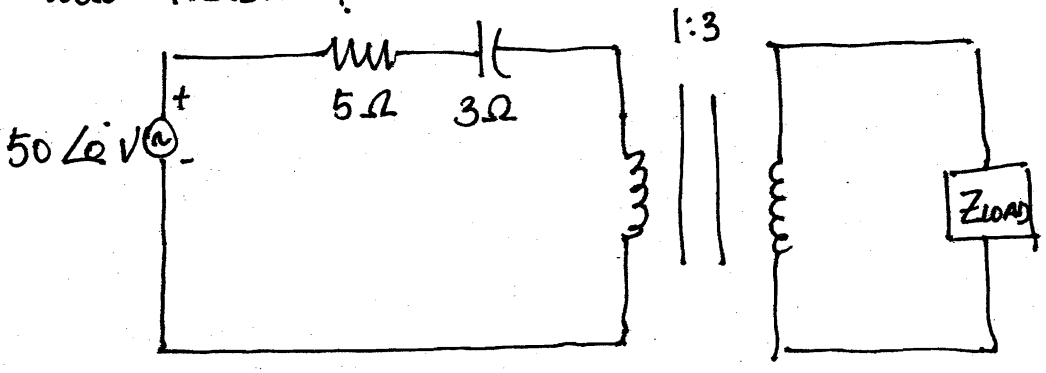


Find: a) the Thévenin equivalent circuit external to the load impedance

b) Determine load impedance that would be required to ensure load receives maximum power + find the max power to that load.

TRANSFORMERS

An amplifier is modeled with a Thevenin Equivalent circuit as seen below. It is connected through a transformer to a load. What value of load impedance should be chosen to ensure maximum power is dissipated in the load resistance? How much power will be dissipated in this load resistor?



DC Motors

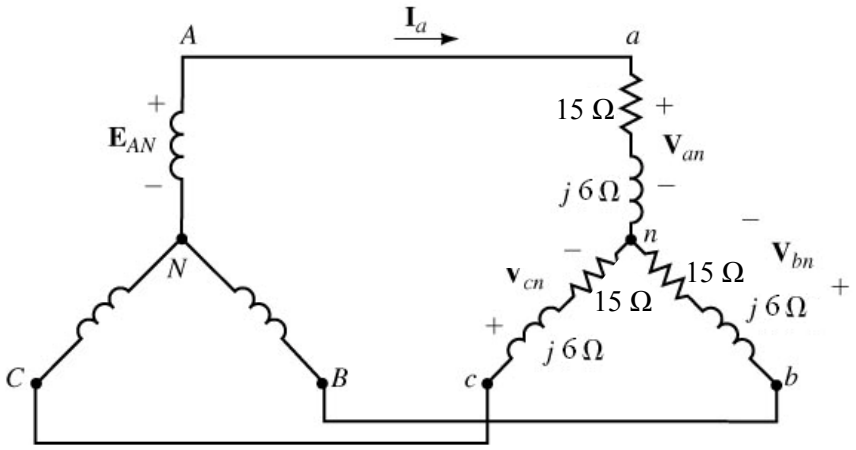
Given

A DC motor is rated for 30V, 2A, and 1500 RPM, 90% efficiency and $T_m = 0.03$ N-m.

Find Ra & Kv

3-Phase Circuits

1. <u>Given:</u> $\mathbf{E}_{BC} = 600\angle -120°$ V

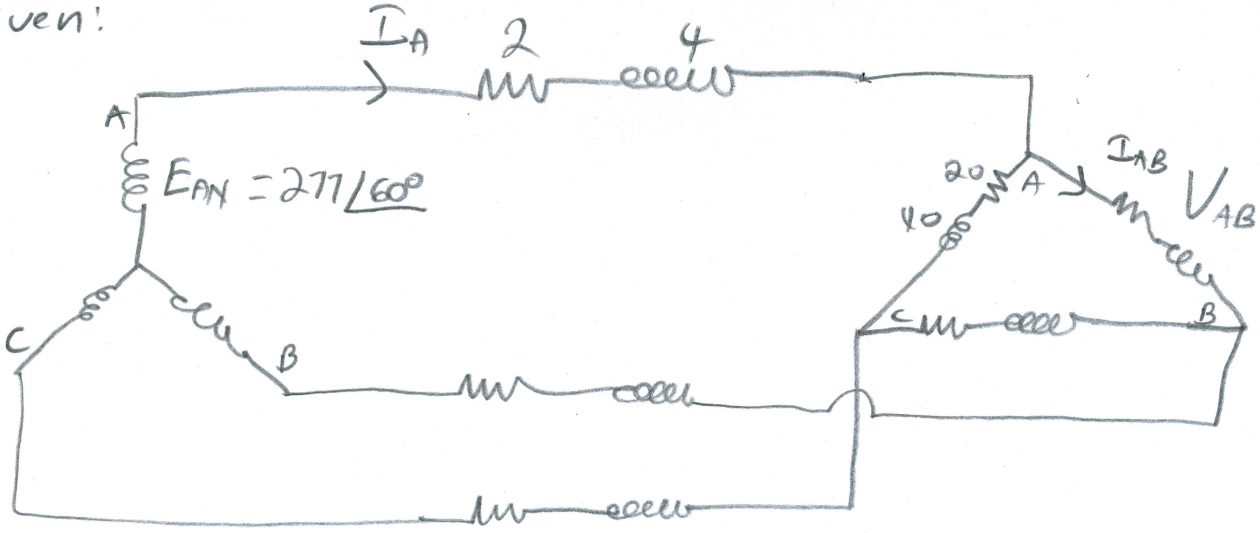


<u>Req'd:</u>

a. Determine the phase voltage $\mathbf{V}_{an}$.
b. Determine the phase current $\mathbf{I}_{an.}$
c. Determine the line current $\mathbf{I}_{a.}$
d. Draw a Wye-Delta equivalent for this circuit.
e. Will the phase current $\mathbf{I}_{ab}$ in this new equivalent circuit be the same as the phase current $\mathbf{I}_{an}$ in the original?
f. What quantities will be the same in these two equivalent circuits?

<u>Soln:</u>

Given:



Req;

(A) what is I_A?

(B) what is I_{AB}?

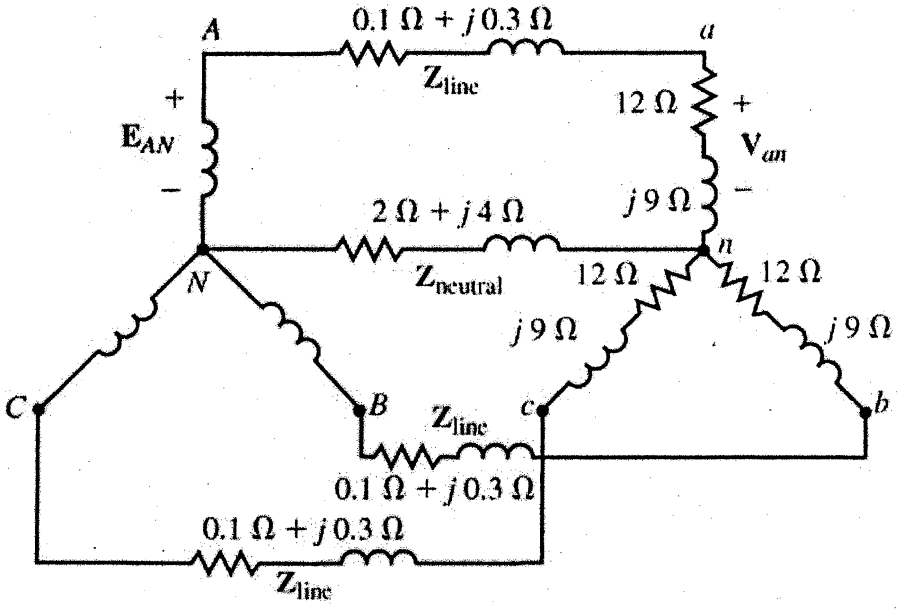
(C) what is V_{AB}

THREE-PHASE CIRCUITS

FOR THE CIRCUIT DEPICTED BELOW, THE GENERATOR ON THE LEFT SIDE HAS A PHASE-VOLTAGE $E_{AN} = 120\text{V} \angle 20°$. DRAW THE SINGLE-PHASE EQUIVALENT, AND:

a) FIND THE PHASE VOLTAGE IN THE Y-LOAD, $\vec{V}_{an}$, MAGNITUDE AND ANGLE

b) FIND THE LINE VOLTAGE IN THE Y-LOAD, $\vec{V}_{ab}$, MAGNITUDE AND ANGLE



$\vec{V}_{an}$ _____ ∠ _____

$\vec{V}_{ab}$ _____ ∠ _____

AC GENERATOR

Given:

- 3 PHASE, Y-CONNECTED, 6-POLE, 60HZ SYNCHRONOUS GENERATOR
- RATED AT 2MW @ A POWER FACTOR OF 0.9 LAGGING WITH A PHASE VOLTAGE OF 260 V.
- STATOR RESISTANCE IS $R_S = 0.008\,\Omega$
- MECHANICAL LOSSES ARE 200 KW

REQ'D

- A LOAD IS CONNECTED TO THE GENERATOR THAT DRAWS 1.3MW @ 0.75 LAGGING POWER FACTOR. DETERMINE:

  A) APPARENT POWER DELIVERED BY THE GENERATOR

  B) REACTIVE POWER DELIVERED BY THE GENERATOR

  C) REAL POWER DELIVERED BY THE GENERATOR

  D) LINE CURRENT (AS A PHASOR)

  E) THE OVERALL EFFICIENCY

  F) RPM OF THE GENERATOR

  G) TORQUE ON THE PRIME MOVER.

  H) DRAW THE POWER FLOW DIAGRAM