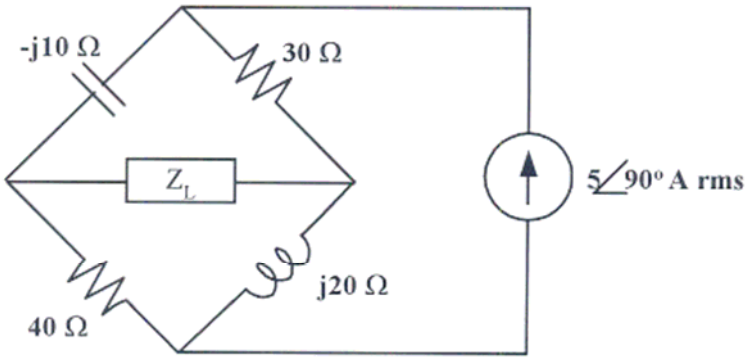
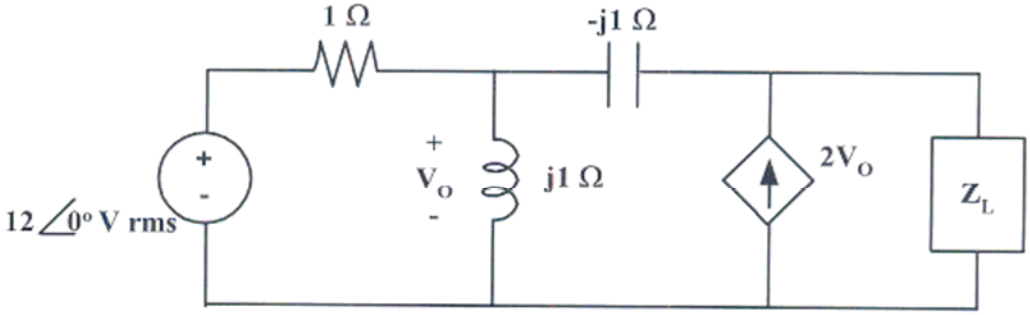
Extra Problems for Exam II
EE 313
Not to be turned in.

1. For the following circuits, determine the loads required to get maximum power transfer. Find the Thevenin equivalent circuit and attach the load. What is the maximum real power transferred?





2. A system consists of a single 60 Hz source with a voltage of 100 V rms connected to 3 loads, where: Z_1 absorbs 3kW at 0.45 lagging, Z_2 absorbs $12\angle 80^\circ$ kVA, and Z_3 absorbs 10kVAR at 0.4 lagging.

a) What are the load impedances and the load currents?
b) What is the total source current, $\mathbf{I_S}$?
c) What is the real power delivered by the source?
d) What is the complex power absorbed by the 3 loads combined?
e) What is the power factor of the three loads combined?
f) To increase the power factor to 0.95 lagging, without changing the real power delivered or the source voltage, what must the component of the load be?
g) What is the maximum reduction in source current allowed using a single compensating load?

3. You are given a balanced 3-phase, balanced Y connected source connected to a balanced 3-phase load. The line voltage is 208 V rms.

   a) If the load is connected in a delta configuration, what are the per phase impedance, the line-to-neutral voltages, the line-to-line voltages, the line currents, the phase current and voltage and the 3-phase power delivered by the source to the load.

   b) If the load is connected in a Y configuration, what are the per phase impedance, the line-to-neutral voltages, the line-to-line voltages, the line currents, the phase current and voltage and the 3-phase power delivered by the source to the load.

4. A balanced 3-phase, balanced Y connected source is connected to three balanced, 3-phase loads. The line voltage is 450 V rms.

   Load 1 – (Y) Absorbs 24 kW at PF=0.650 lagging

   Load 2 – (Δ) Absorbs $15\angle 60^\circ$ kVA

   Load 3 – (Δ) Absorbs 21kW and 33kVAR

   a) What are the line-to-neutral voltages and the line-to-line voltages?
   b) What are the phasor line currents?
   c) What are the phase variables, V_P and I_P?
   d) What is the total three phase complex power delivered by the source to the loads?
   e) Add a load to the system to reduce the line current by 50%, without changing the line voltage or average power delivered by the source. What is the per phase load impedance in the Y and delta configurations?

5. A balanced three phase Y-connected source supplies power to the following three loads:
   Load 1: 18 kW at PF=0.800 lagging
   Load 2: 10 kVA at PF=0.600 lagging
   Load 3: unknown

The line voltage is 208 V rms and the line current is 116.39 A rms, and the power factor of the 3 loads combined is is 0.9 lagging.

   a) Find the unknown load in the delta configuration.
   b) Find the unknown load in the Y configuration.
   c) How much real power does the unknown load absorb?

6. A balanced three phase Y-connected source supplies power to a balanced 3-phase delta load. The load absorbs a total 3-phase reactive power 6 kVAR per phase at a PF=0.5. The line current is 25 A rms.

a) Is the power factor of the source leading or lagging?
b) What are the line-to-neutral voltages?
c) What are the line-to-line voltages?
d) What is the magnitude of the current seen by the load?
e) What is the total three phase complex power delivered by the source to the load?
f) Add a load to the system to reduce the line current to 20 A rms, without changing the source voltage or real power delivered by the source. What is the per phase load impedance in the Y configuration?