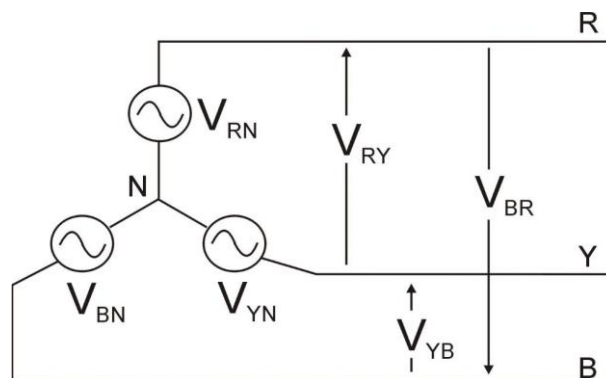


# Example Sheet: Three Phase AC (1)

1. Consider Figure 1. If  $V_{RN} = 200\angle 0^\circ$  V what are the values of:

- $V_{YN}$
- $V_{BN}$
- $V_{RY}$
- $V_{YB}$
- $V_{BR}$



2. In Figure Q2 there is a balanced star connected load. If  $Z_{RS}=12\ \Omega$  calculate the line currents and the total power.

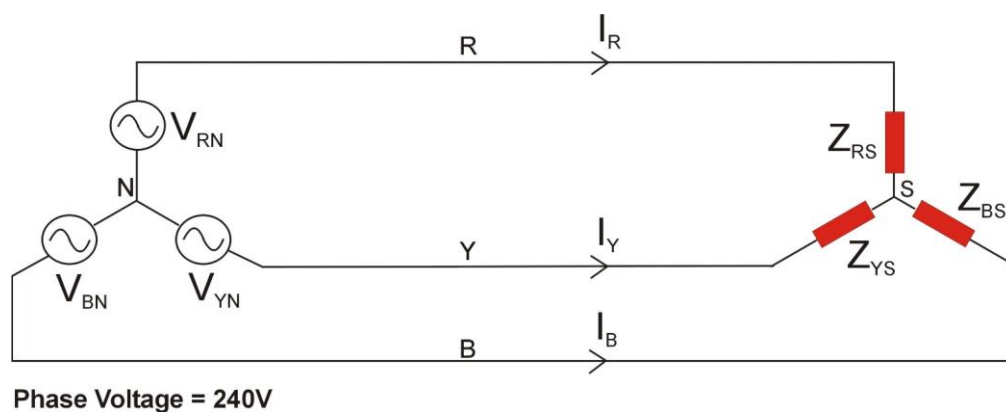


Figure Q2

3. In Figure Q3  $V_{RN}=10$  kV and the load,  $Z_{RS}$ , is  $10 + j20\ \Omega$ . Calculate the line currents and the total power if the load is balanced.

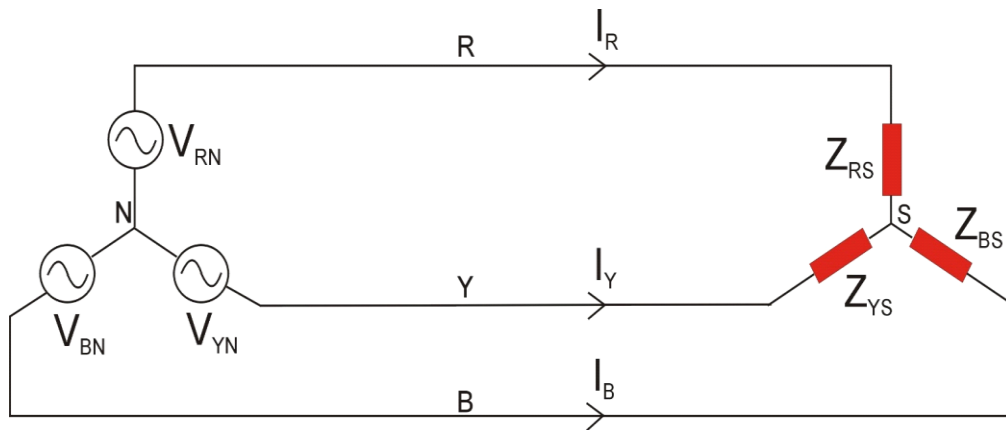


Figure Q3

4. If the impedance,  $Z_{RS}$ , in Figure Q3 consists of a  $12\ \Omega$  resistor and a  $63.7\text{ mH}$  inductance. If the supply voltage is  $10\text{ kV}$  at  $60\text{ Hz}$  and the load is balanced evaluate:
  - a. The line voltages.
  - b. The line currents.
  - c. The total power.
  
5. A balanced 3-phase Y connected generator has an impedance of  $0.2+j0.5\ \Omega$  per phase and an internal voltage of  $120\text{ V}$  per phase. The generator is used to feed a balanced 3-Phase Y connected load of impedance  $39+j28\ \Omega$  per phase. If the impedance of the line connecting the generator to the load is  $0.8+j1.5\ \Omega$  per phase:
  - a. Construct the single-phase equivalent circuit.
  - b. Calculate the line currents.
  - c. Calculate the 3 phase voltages at the load
  - d. Calculate the line voltages at the terminals of the load.
  
6. Calculate the amount of current passing through each of the phase windings of this  $100$  horsepower electric motor (Figure Q6) while operating at full load, assuming a line voltage of  $460\text{ volts}$ ,  $100\%$  motor efficiency, and a power factor of  $1$ . [Note  $1\text{ horsepower} = 746\text{ Watts}$ ].

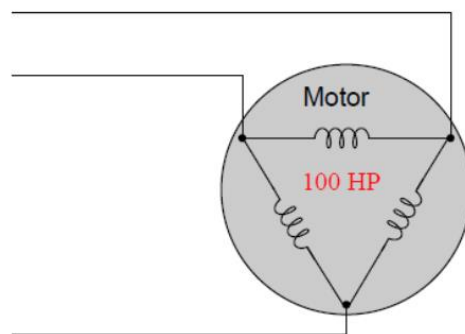


Figure Q6

7. Suppose you need to design a three-phase electric heater to dissipate 15 kW of heat when powered by 480 V (Line Voltage). Your options are to build a delta-connected heater array or a wye-connected heater array. Calculate the proper resistance value for each array, to achieve the desired heat output.