Name: ID:

1) [6 marks] A single phase source delivers 100kW to a load operating at 0.85 lagging power factor. If a power factor correction capacitor is added in parallel to the load to improve the power factor to 0.95 lagging, what is the reactive power delivered by the capacitor? Also, draw the power triangle for the load before and after the capacitor addition. Label all sides in the power triangle. You can assume the voltage is constant at the load side.

2) [9 marks] A balanced Δ-connected load with impedance of 6+j12 Ω per phase is connected in parallel with a balanced Y-connected load with impedance of 2-j4 Ω per phase. A line with impedance of 1 Ω per phase connects these loads to a 208V source. Find:

    a) Magnitude of the current drawn from the source in Amps [3 marks]
    b) Magnitude of the line-to-line voltage at the load side [2 marks]
    c) Total real and reactive power consumed by the combined load [2 marks]
    d) Power factor of the combined load [2 marks]

Additional workspace

Single Phase $\overline{S}$: $\overline{S} = \overline{V} \cdot \overline{I}^*$

Q for L and C: $Q_L = \frac{V^2}{X_L}$ $Q_C = \frac{V^2}{X_C}$

Y Connection: $\overline{V_{ll}} = \sqrt{3}\angle 30° \cdot \overline{V_\phi}$

Δ Connection: $\overline{I_l} = \sqrt{3}\angle{-30°} \cdot \overline{I_\phi}$

3 Phase Power: $\overline{S_{3\phi}} = 3 \cdot \overline{V_\phi} \cdot \overline{I_\phi^*}$

$S = \sqrt{3} \cdot V_{ll} \cdot I_l$

$P = S \cdot pf$ $S^2 = P^2 + Q^2$