EE 333

EXAM #1 — SPRING 1990 — P. W. Sauer

1. Closed book, closed notes, 50 minutes
2. Work all problems on exam booklets

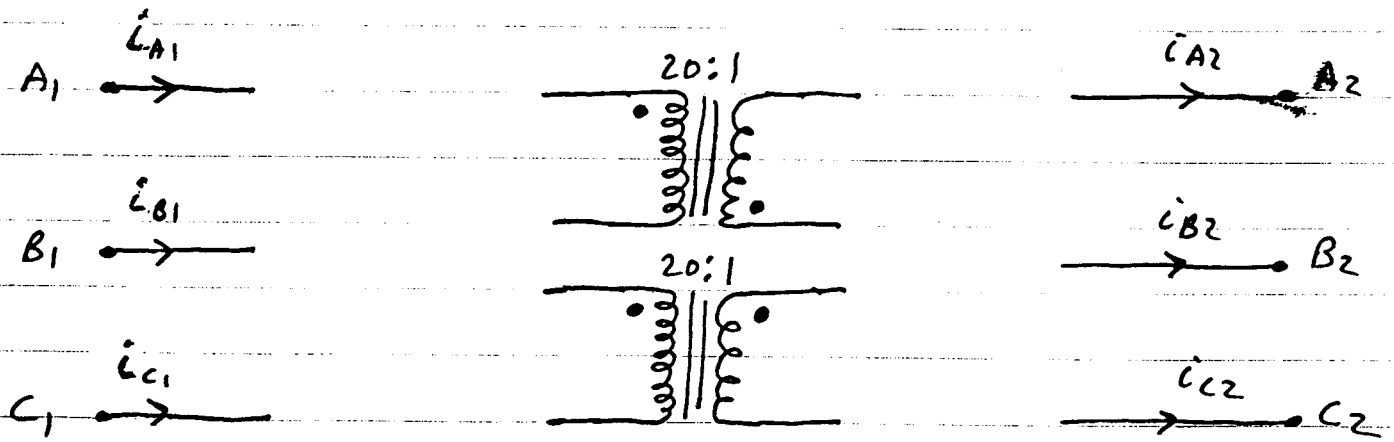
Problem #1
25 points

A balanced, symmetrical 3ϕ, ABC sequence source serves a balanced, symmetrical 3ϕ load of total power equal to 1500 watts plus 1500 vars. A wattmeter is wires such that the voltage input measures $\bar{V}_{AB}$ and the current input measures $\bar{I}_C$ (current into load). What will the wattmeter read?

(HINT: $P = |\bar{V}||\bar{I}|\cos(\measuredangle \bar{V} - \measuredangle \bar{I})$)

Problem #2
25 points

(a) Hook up the following two transformers such that if $\bar{V}_{A_1B_1} = 2400\angle 30°$ and $\bar{V}_{B_1C_1} = 2400\angle -90°$, then $\bar{V}_{A_2B_2} = 120\angle 30°$ and $\bar{V}_{B_2C_2} = 120\angle -90°$



(b) If $\bar{V}_{A_1B_1}$ and $\bar{V}_{B_1C_1}$ are pure fundamental frequency, and if the transformers are saturates, what are i_{A1}, i_{B1}, i_{C1} like if $i_{A2} = i_{B2} = i_{C2} = 0$?

Problem #3
25 points

A 208v (l-l), 3ϕ, 60 Hz, 4pole induction motor running at no load draws 8 amps line current. Compute the value of capacitance which must be added between each line (Δ connection) to reduce the source line current to essentially zero.

Problem #4
25 points

A 208v (l-l), 3ϕ, 60Hz, 6 pole induction motor rated at 2 HP has a full load speed of 1120 RPM. What is the full load speed if the supply voltage magnitude is reduced by 20% and the supply frequency is reduced by 20%?

(You may neglect stator resistance, stator and rotor leakage reactance, core loss and windage/friction)

NOTE: $T = \frac{P}{\omega}$ $746w = 1HP$ $Slip = \frac{\omega_s - \omega_m}{\omega_s}$