

Exam I

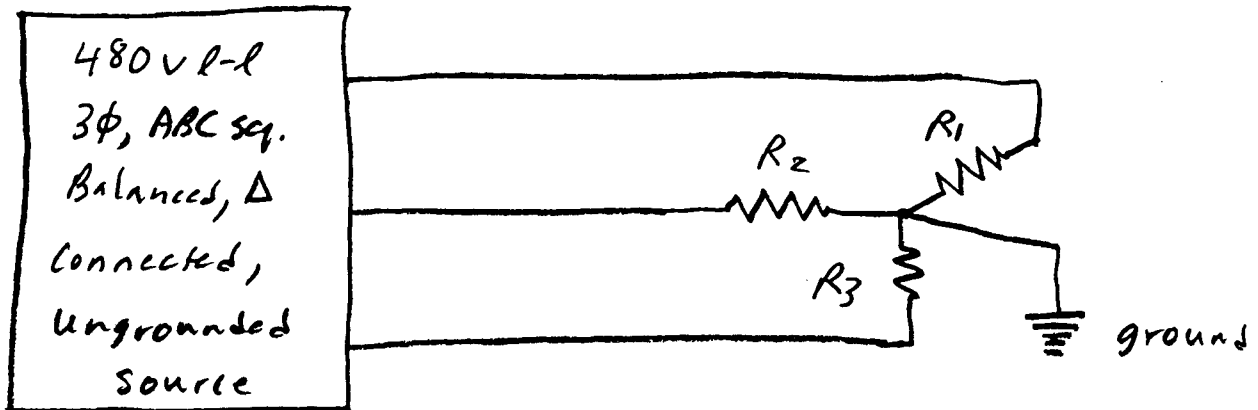
March 8, 1995

50 minutes, closed book, closed notes, no sheet

Problem #1

15 points

Given the circuit below:



- (7) (a) Find the power consumed by each resistor if $R_1 = R_2 = R_3 = 100\Omega$
- (8) (b) Find the power consumed by each resistor if: $R_1 = R_2 = 100\Omega$, $R_3 = 0\Omega$

Problem #2

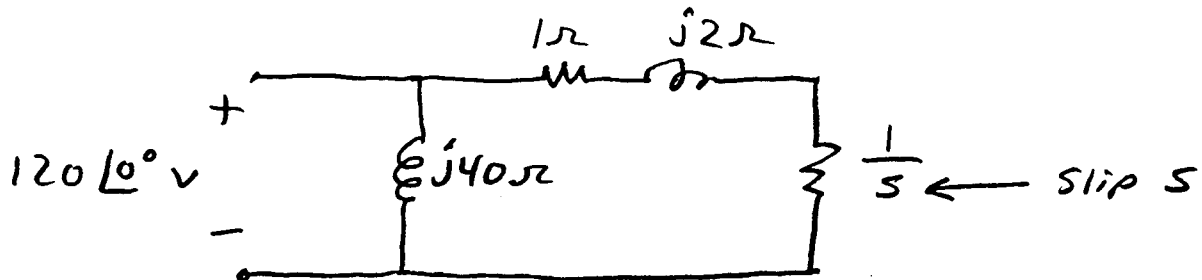
25 points

A single phase transformer has the following ratings: 2400V/240V, 50kVA, 6%Z

- (a) What is the high-side voltage needed to obtain rated low-side voltage when it is loaded to rated current with a pure resistive load on the low side? Assume the %Z is all X (reactance).
- (b) How much current will there be on the high side if the low side is shorted with the source from (a) applied?

Problem #3
30 points

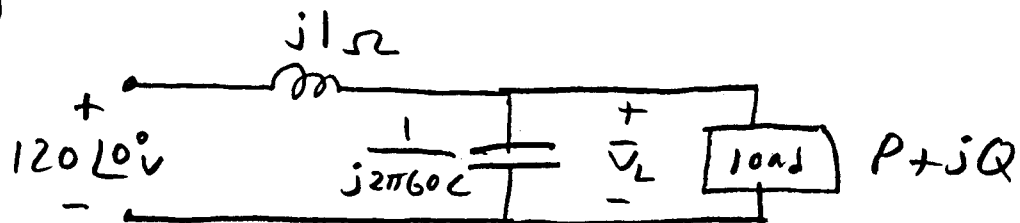
Given the following approximate per-phase circuit of a balanced, symmetrical, 3 ϕ , 60 Hz, 4 pole induction motor:



- 12 (a) Derive an expression for the T_{ro_shaft} in terms of slip s
- 12 (b) Find the slip which gives max/min T_{ro_shaft} (Hint: use max. power transfer)
- 6 (c) what are $T_{ro_shaft_max\ motor}$ and $T_{ro_shaft_max\ gen}$?

Problem #4
30 points

Given the following per-phase circuit:



- 10 (a) when $P=3000\text{W}$, $Q=2000\text{var}$, estimate the C needed to correct the load power factor to be 1.0
- 10 (b) using your C from (a), what is $|V_L|$ when $P=Q=0$?
- 10 (c) Repeat (a) for the case where you want to connect the 3 ϕ capacitors in a Δ connection.