

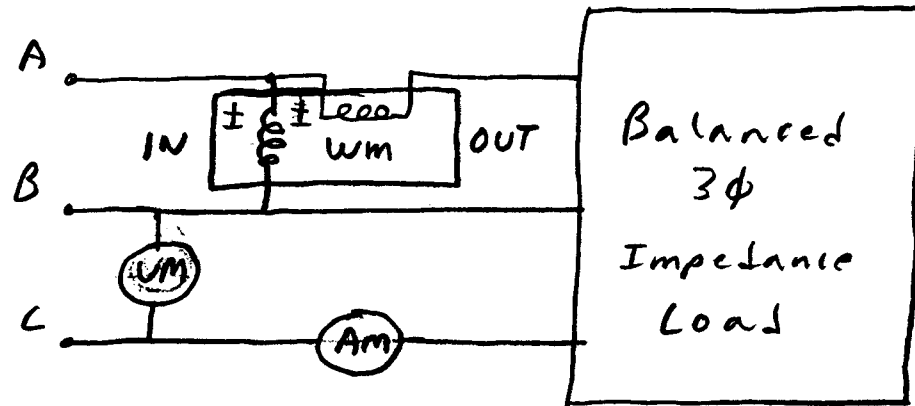
Exam I

closed book/closed notes

March 18, 1996

Problem #1  
25 points

ABC  
sequence  
Balanced  
3 $\phi$  source



$V_m$  = Voltmeter reading = 230 volts Rms

$A_m$  = Ammeter reading = 15 Amps Rms

$W_m$  = Wattmeter reading = -200 Watts

Find: The total 3 $\phi$  real and reactive 3 $\phi$  power absorbed by the load

Problem #2  
20 points

A single phase transformer has the following nameplate information:  
25 kVA, 7200/240 V, 7% Z

- (a) If you perform a short-circuit test, what voltage would you apply to the 7200 volt side to obtain rated current?
- (b) If two of these are used for an open delta three-phase bank, what is the proper 3 $\phi$  rating?

**Problem #3**  
35 points

A balanced, 3 $\phi$ , 4 pole (2 pole pair), 60 Hz, 230 V (l-l) induction motor has  $r_1 = x_1 = 1 \Omega$ ,  $r_c = 400 \Omega$ ,  $x_\phi = 20 \Omega$ ,  $r_2' = x_2' = 1 \Omega$  (all per phase, Y equivalent)

- Estimate the RPM when it is connected to a mechanical load with a torque/speed characteristic of  $T_{load} = 0.15 \omega$  ( $\omega$  in m.r./sec)
- Repeat (a) if the frequency is changed to 40 Hz and the voltage is changed to 153 V (l-l)
- Estimate the line current magnitudes for (a) & (b)

**Problem #4**  
20 points

What values of capacitance should be used to correct the power factor to 1.0 in cases (a) and (b) in Problem #3 if they are connected in a delta?

(If you are unsure of your answers to Problem #3, then compute at least the amount of capacitance needed to correct for  $x_\phi$ )