ECE 333

Exam. #1 March 21, 1994

Closed book, closed notes, open mind, 55 min.

Problem #1
25 points

A balanced, 3ϕ, 3 wire, impedance load is served by a balanced, 3ϕ, 3 wire ABC sequence source. A voltmeter between two lines reads 230V. An ammeter in one line reads 15 A. A wattmeter connected to read the power "in to" the A-B lines reads 400 W. Find the total 3ϕ real and reactive power absorbed by the load.

Problem #2
25 points

A single phase transformer has the following nameplate data:
12,470 V / 240 V, 100 KVA, 60 Hz, 5% Impedance.

If rated voltage is applied to the high voltage side, what is the low voltage side current when the low voltage side is shorted?

(OVER)

Problem #3
25 points

A no-load test on a 3ϕ, 60 Hz induction motor gives:
$|\bar{I}| = 4A$, $|\bar{V}_{ll}| = 230\,V$,
$P_{1\phi} = 50\,W$, $Rpm = 1799$

a) How many poles is this machine?
(2, 4, 6, 8 . . .)

b) How big should each capacitor be to correct the power factor to unity?
(3 Y connected capacitors across the motor)

Problem #4
25 points

A 208 V, 6 pole, 3ϕ, 4 wire, Y connected, 60 Hz induction motor has, $r_1 = 0$, $r_c = \infty$, $X_\phi = 30\,\Omega$, $X_1 = X_2 = 0$, $r_2' = 1\,\Omega$. It is supplying $T_{TO\ shaft} = 15\,NM$

a) what is the frequency of the rotor current?

b) what is the line current?

c) what is the output horsepower?

(1 HP = 746 W)