

## ECE 333

First Exam - Spring 1999 - Closed book, closed notes, 55 minutes

Problem points (out of 100) are indicated. Work all problems in exam booklets.

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Problem #1 (25 points)

A balanced, 3-phase, lagging-power-factor load has a delta-connected capacitor bank connected across it. The source voltage is 230 V (line to line) and the source line current is 8 Amps when the capacitors are sized at 800 VARS each to make the total power factor unity (1.0). What will the line current be when the capacitors are removed?

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Problem #2 (25 points)

Given: A single-phase transformer nameplate shows: 2400/120 Volts, 10KVA, 4% impedance. Assume that the % impedance is pure reactance.

Find: (a) What is the load voltage when a 2400 Volt source is applied to the high voltage side and the low voltage side is loaded to rated current at unity power factor?

(b) What is the short-circuit current on the low-voltage side if the low-voltage side is shorted while the 2400 Volts is applied to the high-voltage side?

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Problem #3 (25 points)

Given: A balanced, symmetrical, 3-phase, 60 HZ, 6 pole, 230 V (line - line) induction motor has negligible stator resistance, negligible stator and rotor leakage reactance. The magnetizing reactance referred to the stator is 40 Ohms/phase (assume Y connection). The rotor resistance referred to the stator is 2 Ohms/phase.

Find: What is the shaft speed (RPM) and magnitude of the line current if it delivers a load torque of 15NM?

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Problem #4 (25 points) - See old homework problem on the back

(OVER)

Consider a 50-kVA 2,400/240-V 60-Hz distribution transformer. Assume that the open-circuit and short-circuit tests were performed on the primary side of the transformer and that the following data were obtained:

	Open-Circuit Test (on Primary)	Short-Circuit Test (on Primary)
Voltmeter	$V_{oc} = 2400 \text{ V}$	$V_{sc} = 52 \text{ V}$
Ammeter	$I_{oc} = 0.2083 \text{ A}$	$I_{sc} = 20.8333 \text{ A}$
Wattmeter	$P_{oc} = 185 \text{ W}$	$P_{sc} = 615 \text{ W}$

Determine the impedances of the approximate equivalent circuit referred to the primary side.