

ECE 333

First Exam - Spring 2002 - Closed book, (standard class sheet allowed), 55 min.

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

Problem #1 (30 points)

Given: A balanced, 3-phase, 60 HZ, 3-wire, impedance load is served by a balanced, 3-phase, 3-wire, ABC sequence source. A voltmeter between two lines reads 206 Volts. An ammeter in one line reads 10 Amps. A wattmeter connected to read the power "into" the A-B lines reads 800 Watts.

Find:

- (a) The total 3-phase real power absorbed by the load.
- (b) The total 3-phase reactive power absorbed by the load.
- (c) The line current if a balanced 3-phase capacitor bank was used to correct the power factor of the load to 0.9 lagging?
- (d) The wattmeter reading under condition (c) (The wattmeter is connected on the source side of the capacitors)

Problem #2 (30 points)

Given: A 3-phase transformer bank is to handle 600 KVA (3-phase) and have a 34.5 KV (line-line) to 12.5 KV (line-line) voltage ratio.

Find: The rating of each individual transformer in the bank (high voltage, low voltage, turns ratio, and apparent power) if the transformer bank is connected as:

- (a) Wye-Delta
- (b) Delta-Wye
- (c) Open Delta

(OVER)

Problem #3 (40 points)

Given: The following test results were found for a balanced, symmetrical, Wye-connected, 3-phase, 60 HZ, 6 pole, 230 V (line-line), 3 HP induction motor:

No-load test: $V(\text{line-line}) = 230 \text{ V}$, $I(\text{line}) = 3 \text{ A}$

Full-load test: $V(\text{line-line}) = 230 \text{ V}$, $I(\text{line}) = 7 \text{ A}$

- Find:**
- (a) Estimate the full-load torque to the shaft (induced torque)
 - (b) Do you think the real answer to (a) is higher or lower than your estimate - explain
 - (c) Estimate the full-load speed in RPM
 - (d) Do you think the real answer to (c) is higher or lower than your estimate - explain.