ELEE 2790U: Electric Circuit

CRN: 73165 02:10 PM - 03:30 PM Tuesday - SIRC 2020
CRN: 73166 03:40 PM - 05:00 PM Friday - UP1502
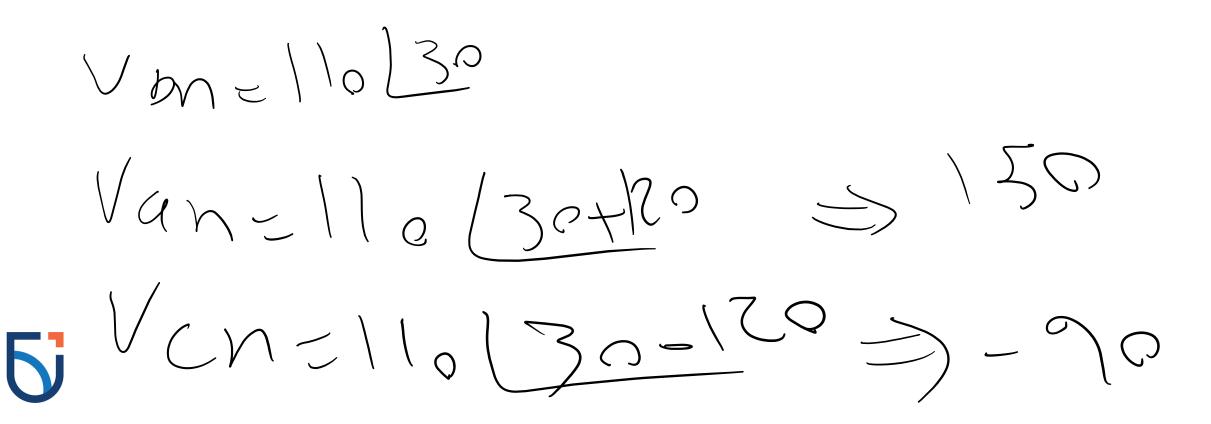
Tutorial 8 ELEE 2790U

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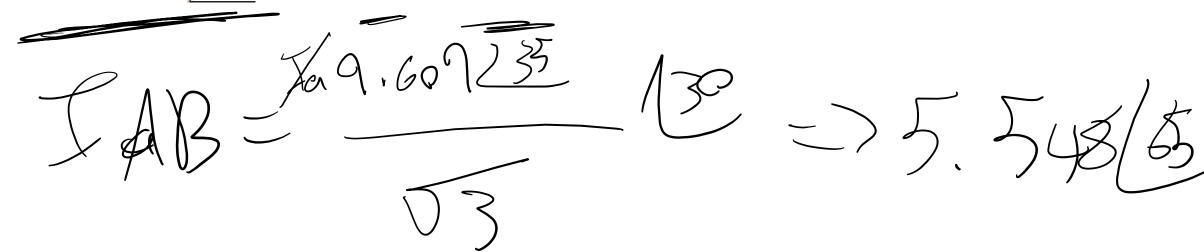**Email:** Ahmad.mousa@ontariotech.net & victor.ijeh@ontariotechu.ca

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Problem 1

Given that $V_{bn} = 110 \ /\underline{30°}$ V, find V_{an} and V_{cn}, assuming a positive (abc) sequence.

$$V_{bn} = 110 \ /\underline{30}$$

$$V_{an} = 110 \ /\underline{30+120} \quad \Rightarrow 150$$

$$V_{cn} = 110 \ /\underline{30-120} \quad \Rightarrow -90$$

$$I_{AB} = \frac{V_{AB}}{Z_A}$$

$$I_{L} = \sqrt{3} \, I_{AB} \underline{/30}$$

$$I_{BC} = I_{AB} \underline{/\phi - 120}$$

$$I_{CA} = I_{AB} \underline{/\phi + 120}$$

Problem 2

A positive-sequence, balanced Δ-connected source supplies a balanced Δ-connected load. If the impedance per phase of the load is $18 + j12 \, \Omega$ and $I_a = 9.609\underline{/35°}$ A, find I_{AB} and V_{AB}.

$$Z$$

$$I_{AB} = \frac{I_a\ 9.609\underline{/35}}{\sqrt{3}} \ \underline{/30} \Rightarrow 5.548\underline{/65}$$

$$I_{AB} = \frac{V_{AB}}{Z_A}$$

$$Z = 18 + j12 = 21.63\angle 33.69$$

$$V_{AB} = I_{AB}\, Z = 5.548\angle 65 \times 21.5\angle 33.69$$

$$V_{AB} = 120\angle 98.69$$

Problem 3

Calculate the line current required for a 30-kW three-phase motor having a power factor of 0.85 lagging if it is connected to a balanced source with a line voltage of 440 V.

$$\cos\phi$$

$$P = S\cos\phi \implies S = 35.29 \, KVA$$

$$\frac{30\times10^3}{0.85}$$

$$S = \sqrt{3}\, V_L I_L$$

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$$35.29 \, KVA = \sqrt{3} \, V_L I_L$$

$$35.29 \, KVA = \sqrt{3} \times 440 \times I_L$$

$$46.31 \, A$$