

\* Final exam, 5p 2018, phys. 2100 \*

Solution for the complex dc circuit (P. 3)

$$I_1 - I_2 - I_3 = 0 \quad \dots (1)$$

$$-20I_3 + 10 + 10I_2 = 0$$

$$\rightarrow I_2 - 2I_3 = -1 \quad \dots (2)$$

$$-10I_2 - 10 - 40I_1 + 20 = 0$$

$$\rightarrow 4I_1 + I_2 = 1 \quad \dots (3)$$

$$(1) \rightarrow (3) \Rightarrow 4(I_2 + I_3) + I_2 = 1$$

$$5I_2 + 4I_3 = 1 \quad \dots (3')$$

$$(2) \times 2 \Rightarrow 2I_2 - 4I_3 = -2 \quad \dots (2')$$

$$(3') + (2') \text{ to eliminate } I_3 =$$

$$7I_2 = -1 \Rightarrow I_2 = -\frac{1}{7} \text{ A}$$

$$I_2 = -\frac{1}{7} \rightarrow (2) \quad 2I_3 = -\frac{1}{7} + 1 \Rightarrow I_3 = \frac{3}{7} \text{ A}$$

$$(I_2)(I_3) \Rightarrow (1) \Rightarrow I_1 = I_3 + I_2 \Rightarrow I_1 = \frac{2}{7} \text{ A}$$

You can verify the answers by putting  $I_1, I_2 + I_3$  into eq. 1 or 2 or 3!