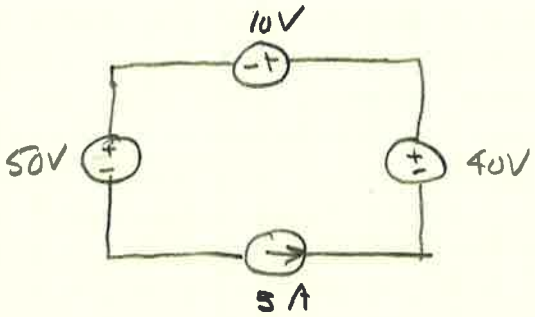
Is the interconnected circuit valid?

Yes

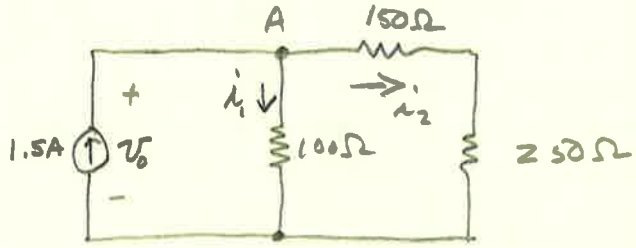


Find total power developed in the circuit.

5A flows through every element.

50V	:	$P = (50)(5) = 250\,W$
10V	:	$P = (10)(5) = 50\,W$
40V	:	$P = (40)(-5) = -200\,W$
5A	:	$P = (50+10-40)(-5) = -100\,W$

total = 0 ✓



a) Find $i_1 + i_2$

KCL at node A: $1.5 = i_1 + i_2$
KVL around right loop: $150 i_2 + 250 i_2 = 100 i_1$

$i_1 + i_2 = 1.5$
$100 i_1 - 400 i_2 = 0$

Solving, $\boxed{i_1 = 1.2\ A \quad i_2 = 0.3\ A}$

b) Find V_o

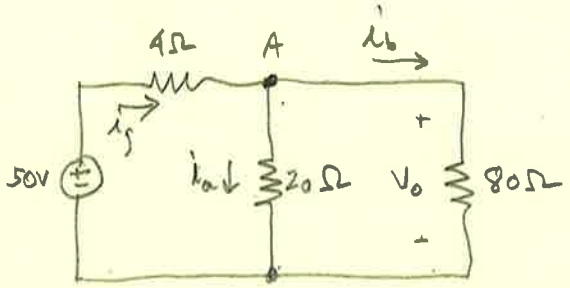
$V_o = i_1 (100) = \boxed{120V = V_o}$

c) Show $P_{gen} = P_{abs}$

1.5A source: $P = -1.5(120) = -180\ W$
100Ω resistor: $P = i^2 R = (1.2)^2 100 = 144\ W$
150Ω " : $P = i^2 R = (.3)^2 150 = 13.5\ W$
250Ω " : $P = i^2 R = (.3)^2 250 = 22.5\ W$

$\Sigma P = 0$ ✓

FIND i_a, i_b, v_o & the power of each element.



applying KCL @ node A:

$$i_g = i_a + i_b$$

SINCE V_o is common to the 20Ω + 80Ω resistors,

$$i_A 20 = i_b 80 \Rightarrow i_a = 4 i_b$$

writing a KVL around the outer loop:

$$\Sigma V_{loop} = 0$$

$$-50 + i_g(4) + i_b(80) = 0$$

but $i_g = i_a + i_b$ AND $i_a = 4 i_b$ SO

$$-50 + 4(4i_b + i_b) + i_b(80)$$

$$i_b = \frac{50}{100} = \underline{0.5A}$$

$$i_a = 4 i_b = \underline{2.0\ A}$$

$$i_g = i_a + i_b = \underline{2.5A}$$

$$V_o = i_b(80) = \underline{40.0V}$$

$$P_{4\Omega} = iv = i^2R = \frac{v^2}{R} = 2.5^2(4) = \underline{25W}$$] dissipated

$$P_{20\Omega} = i_a V_o = \underline{80W}$$

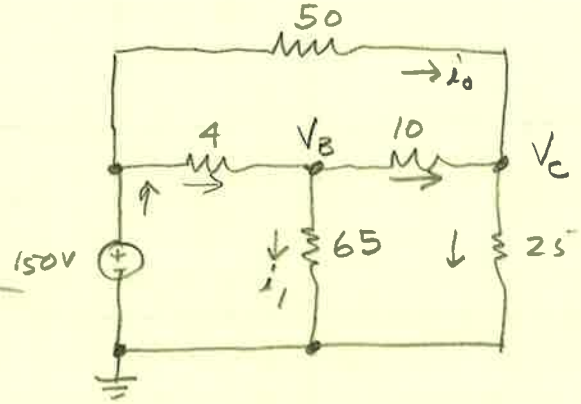
$$P_{80\Omega} = i_b V_o = \underline{20W}$$

$$P_{50V} = -i_g(50) = -\underline{125W}$$] generated

$$\Sigma \text{power} = \underline{0}$$

$i_0 = 1A$

a) Find i_1
b) Find Power for all R's
3) verify $P_{DEV} = P_{ABS}$



a) $V_C = 150 - 50(1) = 100V$
$i_{25} = V_C/25 = 4A$
$i_{10} = i_{25} - i_0 = 3A$

$V_B = V_C + i_{10}(10) = 100 + 30 = 130V$
$i_4 = \frac{150 - V_B}{4} = 5A$
$i_{65} = \frac{V_B}{65} = \boxed{2A = i_1}$

b) $P_{50} = i^2R = (1)^2 50 = 50W$
$P_4 = i^2R = (5)^2 4 = 100W$
$P_{65} = i^2R = (2)^2 65 = 260W$
$P_{10} = i^2R = (3)^2 10 = 90W$
$P_{25} = i^2R = (4)^2 25 = 400W$

$P_{ABSORBED} = 900W$

c) $i_{150} = i_{50} + i_4 = 1 + 5 = 6A$

$P_{150} = (-6)(150) = 900W$ DELIVERED ✓