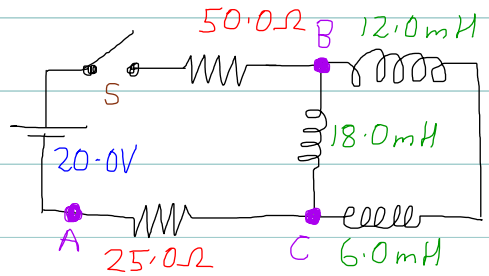


IN THE DEPICTED CIRCUIT, SWITCH S HAS BEEN OPEN FOR A LONG TIME. FIND THE CURRENT AT POINT A AND THE POTENTIAL DIFFERENCE BETWEEN POINTS B AND C:

(a) JUST AFTER SWITCH S IS CLOSED ($t=0$)

(b) AFTER SWITCH S HAS BEEN CLOSED FOR A LONG TIME ($t \to \infty$, OR "STEADY STATE")

(c) AFTER SWITCH S HAS BEEN CLOSED FOR 0.115 ms

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(a) (i) IMMEDIATELY AFTER A SWITCH IS CLOSED, HOW MUCH CURRENT FLOWS IN A CIRCUIT? (ii) WHEN THIS AMOUNT OF CURRENT FLOWS, DOES AN INDUCTOR LOOK LIKE A BREAK, A RESISTOR, OR A WIRE (A "SHORT CIRCUIT")? (iii) DRAW THE EQUIVALENT CIRCUIT WITH THE INDUCTORS REPRESENTED APPROPRIATELY (iv) HOW DOES CURRENT BEHAVE IN THE TYPE OF CIRCUIT YOU'VE DRAWN (SERIES, PARALLEL etc.)? (v) GIVEN YOUR ANSWERS TO (i) AND (iv) WHAT IS $i_A$ (THE CURRENT AT A)? (vi) GIVEN YOUR ANSWERS TO (i) AND (iv), WHAT IS THE DROP IN VOLTAGE ACROSS THE RESISTORS AND WHAT, THEN, IS $\Delta V_{BC} = |V_B - V_C|$?

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(b) REPEAT THE STEPS IN (a) FOR $i \to \infty$, WHEN $i = I$, AND CURRENT IS NO LONGER TIME-VARYING

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(c)(i) WHEN SOME CURRENT FLOWS IN AN INDUCTOR, DOES IT BEHAVE LIKE A BREAK, A RESISTOR, OR A WIRE? (ii) DRAW THE EQUIVALENT CIRCUIT WITH THE RESISTORS REPLACED BY AN EQUIVALENT RESISTOR AND THE INDUCTORS REPLACED BY AN EQUIVALENT INDUCTOR (A SIMPLE RL CIRCUIT) (iii) WHAT IS THE EQUATION FOR HOW CURRENT CHANGES WITH TIME IN AN RL CIRCUIT, SO WHAT IS $i$, AND WHAT IS $i_A$? (iv) GIVEN THE VOLTAGE DROP AROUND THE CIRCUIT IS $\Delta V = 20V$, AND GIVEN THE VOLTAGE DROP ACROSS THE EQUIVALENT RESISTOR, WHAT IS $\Delta V_{BC}$ (THE VOLTAGE DROP ACROSS THE INDUCTOR)?