

Easy

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An RL circuit is excited by a DC step voltage. Then 1. Initial current through inductor is zero. 2. Final current depends only on resistance. 3. Time constant depends

A

1 and 4 only

B

1 and 3 only

C

1, 2 and 4 only

Correct

D

All of the above

## Correct Answer: C

### Full Detailed Explanation

Correct Answer: C - 1, 2 and 4 only Quick Concept Explanation In a first-order RL circuit driven by a DC step, inductor current cannot change instantaneously. The time constant depends on both inductance and resistance, so changing either alters the transient speed. Key relation:

$i(t) = \frac{V}{R} (1 - e^{-t/\tau})$ ;  $\tau = L/R$ . Exam focus: Initial inductor current is continuous; final DC

inductor acts as a short circuit. Common trap: Do not write  $\tau = L$  alone; resistance is part of

the time constant. Statement-wise Verification Statement 1 - Correct. Initial current through

inductor is zero. Initial inductor current is continuous; final DC inductor acts as a short

circuit. Statement 2 - Correct. Final current depends only on resistance. Initial inductor current

is continuous; final DC inductor acts as a short circuit. Statement 3 - Incorrect. Time constant

depends only on inductance. For a simple RL circuit  $\tau = L/R$ , so resistance and inductance both

matter Statement 4 - Correct. Current rises exponentially with time. Starting from zero current,

it rises exponentially toward the steady value  $V/R$ . Core Concept In a first-order RL circuit

driven by a DC step, inductor current cannot change instantaneously. Starting from zero current,

it rises exponentially toward the steady value  $V/R$ . The time constant depends on both inductance

and resistance, so changing either alters the transient speed. Formula / Key Relationship