

## EE23BTECH11047 - Deepakreddy P

**44** The switch  $S_1$  was closed and  $S_2$  was open for a long time. At  $t=0$ , switch  $S_1$  is opened and  $S_2$  is closed, simultaneously. The value of  $i_c(0^+)$ , in amperes, is (GATE EC 44)

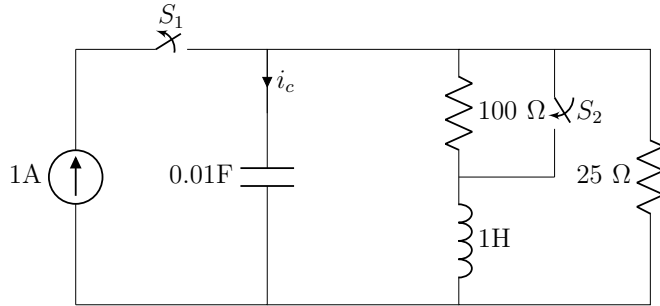


Fig. 1. Circuit 1

**Solution:**

1) Switch  $S_1$  was closed and  $S_2$  was open

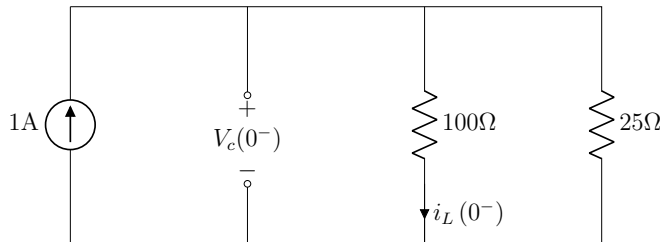


Fig. 2. Circuit 2

$$R_{eff} = 20\Omega$$

$$i_L(0^-) = \frac{25}{125} A = 0.2A$$

$$i_L(0^-) = i_L(0^+)$$

(1)

(2)

(3)

(4)

Apply KVL

$$-V_c(0^-) + 20(1) = 0$$

(5)

$$V_c(0^-) = 20V$$

(6)

2) Switch  $S_1$  is open and  $S_2$  was closed

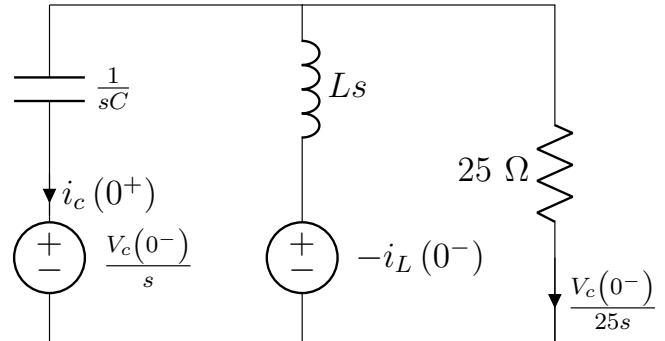


Fig. 3. Circuit 3

At  $t = 0^+$  The capacitor is charged. Thus, it acts as a voltage source. The inductor acts as the current source.

$$i_c(0^+) = -\left(i_L(0^-) + \frac{V_c(0^-)}{25s}\right) \quad (7)$$

$$i_c(0^+) = -\left(0.2 + \frac{0.8}{s}\right) \quad (8)$$

Taking Inverse Laplace Transform

$$i_c(0^+) = -0.2\delta(t) - 0.8u(t) \quad (9)$$

$$= -1A \quad (10)$$

Parameter	Description	Remarks
$V_c(0^-)$	Voltage across capacitor in case 1	20V
$i_L(0^-)$	current across inductor in case 1	0.2
$i_L(0^+)$	current across inductor in case 2	0.2
$C$	Capacitance	0.01F
$L$	Inductance	1H

TABLE I  
PARAMETERS

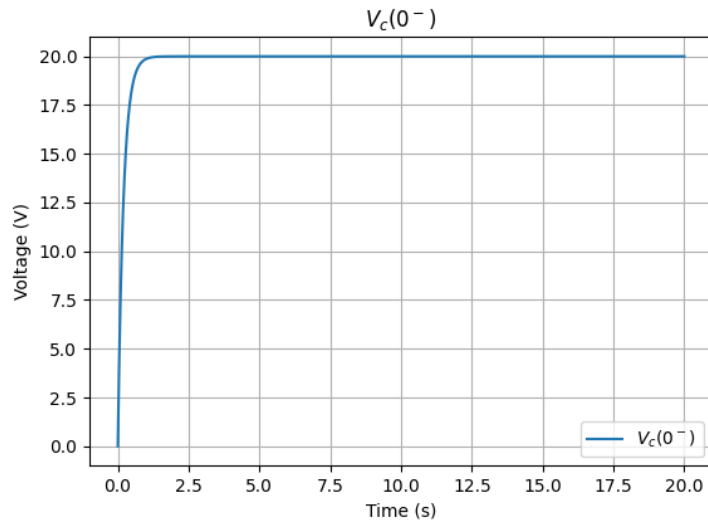


Fig. 4. Plot of  $V_c(0^-)$  vs time