

Solutions

2.1 C $V_C/V_s = 1 - \exp(-1) \approx 0.632$; $\exp(-1)$ is the remaining difference.

Compare the rejected options: 36.8% of final voltage; 50% of final voltage; 86.5% of final voltage; 100% of final voltage. Use the stated model and conditions.

2.2 B Z has a positive phase; $I = V/Z$ has a negative phase relative to voltage.

Compare the rejected options: Current leading voltage; Voltage and current necessarily in phase; Zero resistor dissipation; Impedance magnitude $R+X$. Use the stated model and conditions.

2.3 0.2. $\tau = L/R = 0.6/3 = 0.2$ s.

2.4 True. Its ideal voltage/current phase is a quarter cycle; average power is zero while $LI^2/2$ varies.

3.1 With $\tau = RC$, $V_C = -4 + 12e^{-t/\tau}$ volts. Zero crossing satisfies $e^{-t/\tau} = 1/3$, so $t = \tau \ln 3$. $I(0) = (V_s - V_C(0))/R = -12\text{ V}/R$. Finite current cannot change capacitor charge instantaneously, so voltage begins at 8 V. Award solution, endpoint check, crossing, signed current and continuity.