LAHORE UNIVERSITY OF MANAGEMENT SCIENCES
Department of Electrical Engineering

EE240 Circuits I
Quiz 02 - Section 1 - Solutions

Name: _____

Campus ID: _____

Total Marks: 10
Time Duration: 15 minutes

Question 1 (6 marks)

The voltage across the $0.5F$ capacitor is given by $v_C(t) = 2\cos(\omega_o t)$.

(a) [1 mark] Evaluate the expression for the current $i_C(t)$ through capacitor.

Solution:

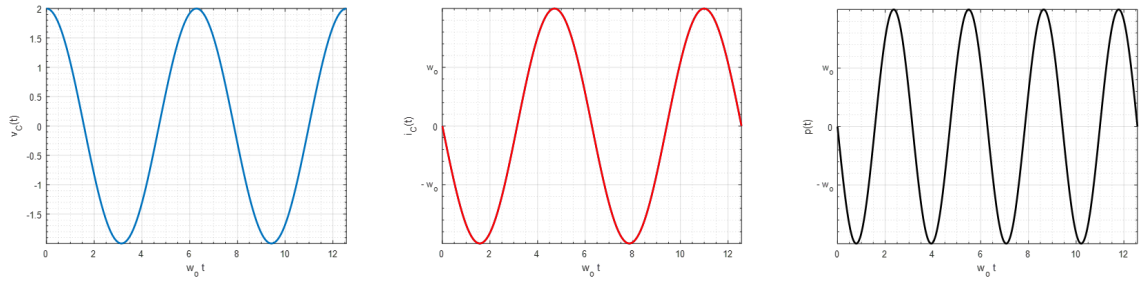
$$i_C(t) = -2\omega_o \sin(\omega_o t)$$

(b) [1 mark] Evaluate the expression of power $p(t)$.

Solution:

$$p(t) = -4\omega_o \cos(\omega_o t)\sin(\omega_o t) = -2\omega_o \sin(2\omega_o t)$$

(c) [2 marks] Plot the current, voltage and power versus time for $0 \leq t \leq 4\pi/\omega_o$. You must appropriately label the plots.



(d) [1 mark] How does the amplitude of the current change with the increase in the frequency ω_o?

Solution: The current decreases with the increase in the frequency ω_o.

(e) [1 mark] How much energy (average power) over one period is stored in the capacitor?

Solution: Zero.

Question 2 (2 marks)

Do you agree with the following statements (support your answer with the justification)?

(a) [1 mark] Ideal current sources can be connected in series.

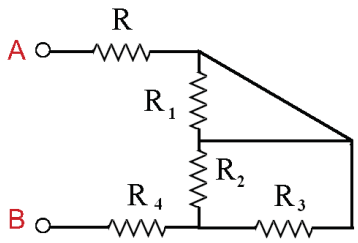
Solution: No! Current sources are not allowed to be connected in series. Current is the movement of charges and the charges do not accumulate. In fact, the series connection of current sources violates Kirchhoff current law.

(b) [1 mark] Ideal voltage source and ideal current source in parallel is equivalent to the current source only.

Solution: No! Ideal voltage source and ideal current source in parallel is equivalent to the voltage source only.

Question 3 (2 marks)

For a circuit shown in Fig. 2, if $R_1 = R_2 = R_3 = R_4 = 10\Omega$ and $R = 20\Omega$, determine the equivalent resistance of the circuit between the terminals A and B.



Solution: The only catch is that R_1 is short-circuited. R, R_4 and $R_2||R_3$ are in series. Equivalent resistance is 35Ω.