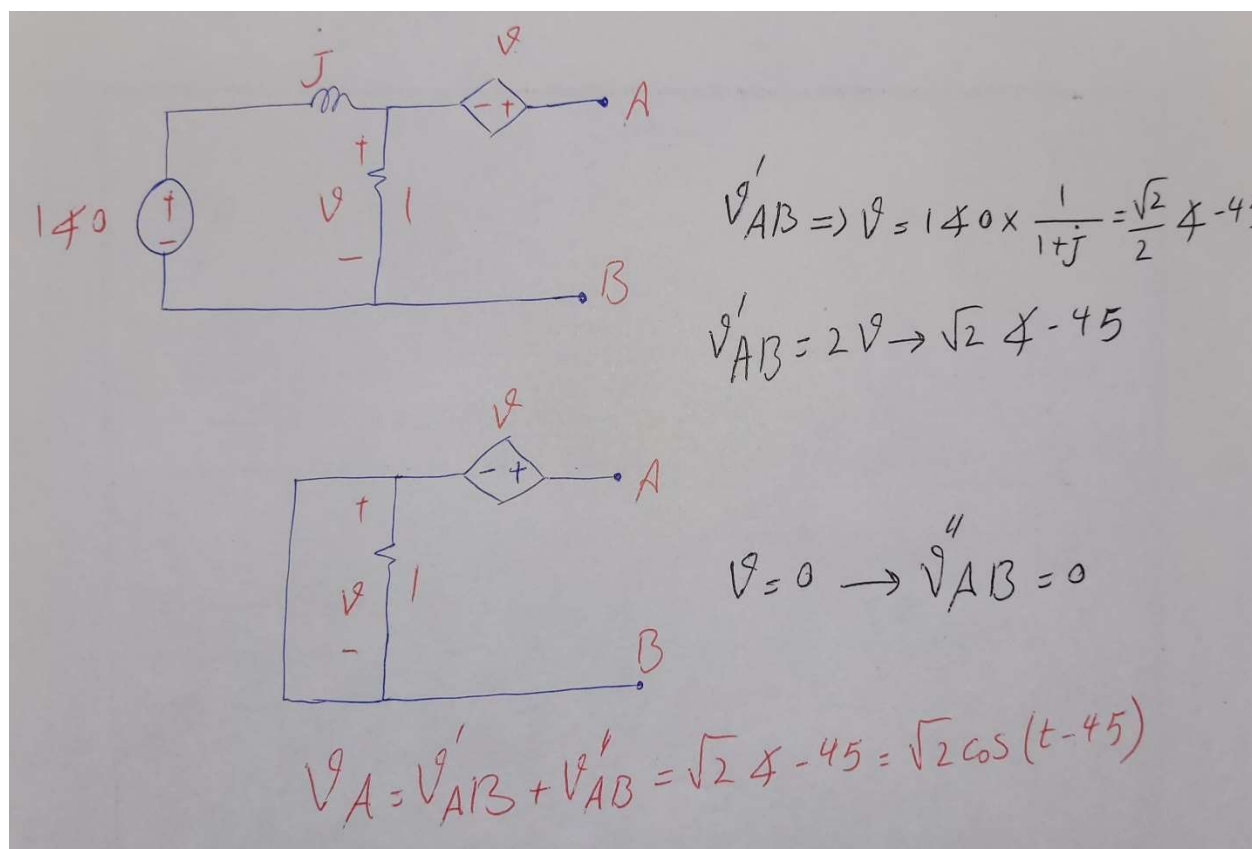


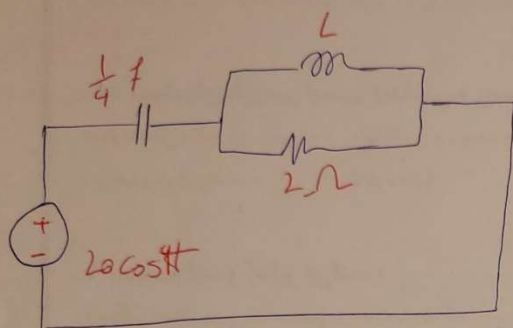
سوال اول :

چون منابع هم از نوع DC است و هم AC پس از جمع آثار حل می کنیم. (میدانیم که در حالت DC سلف اتصال کوتاه است و خازن مدار باز)



سوال دوم:

می دانیم که برای هم فاز شدن ولتاژ و جریان باید بخش موهومی مدار برابر صفر شود:



$$Z_{in} = \frac{1}{j\omega C} + (j\omega L \parallel R) =$$

$$-j + (4j \parallel 2) = \frac{8jL}{2 + 4jL} - j$$

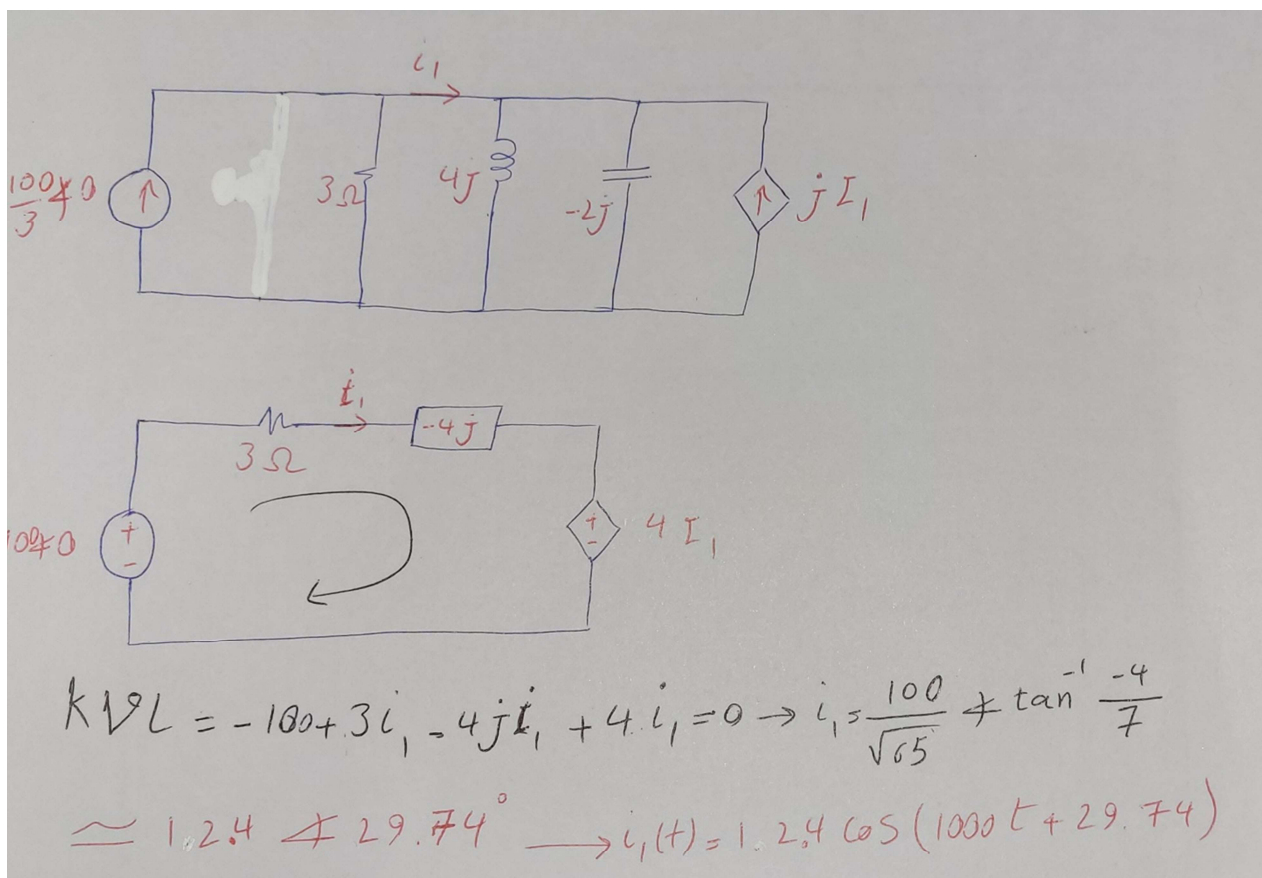
$$\frac{8L^2}{1 + 4L^2} + j \left(-1 + \frac{4L}{1 + 4L^2} \right) \quad \text{A} \quad A = 0 \rightarrow L = \frac{1}{2} H$$

$$I_g = \frac{V_g}{Z_{in}} \quad \text{و} \quad Z_{in} = \frac{8L^2}{1 + 4L^2} \xrightarrow{L = \frac{1}{2}} Z_{in} = \frac{2}{1 + 1} = 1$$

$$I_g = 20 \cos 4t$$

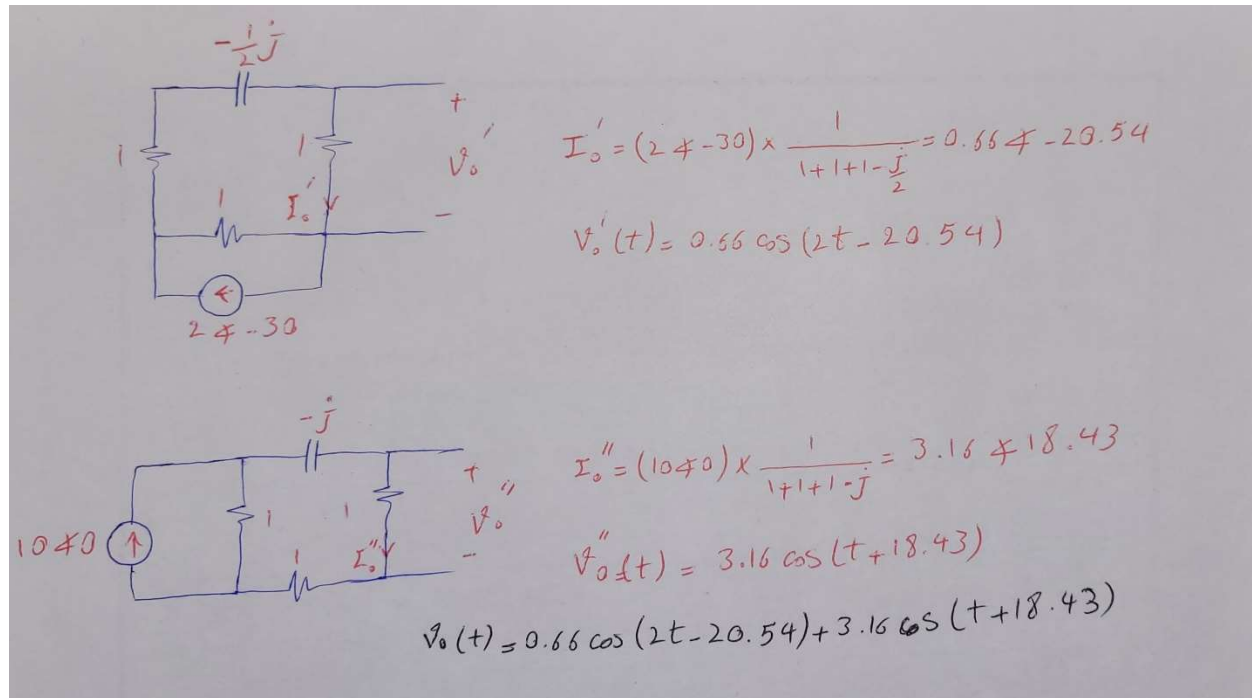
سوال سوم:

با استفاده از تبدیل منابع و ساده سازی داریم:



سوال چهارم:

چون فرکانس منابع متفاوت است پس از جمع آثار استفاده میکنیم:



$$I_o' = (2 \angle -30) \times \frac{1}{1+1+1-\frac{j}{2}} = 0.66 \angle -20.54$$

$$V_o'(t) = 0.66 \cos(2t - 20.54)$$

$$I_o'' = (10 \angle 0) \times \frac{1}{1+1+1-j} = 3.16 \angle 18.43$$

$$V_o''(t) = 3.16 \cos(t + 18.43)$$

$$V_o(t) = 0.66 \cos(2t - 20.54) + 3.16 \cos(t + 18.43)$$

سوال پنجم:

The image shows three circuit diagrams and their corresponding calculations for finding the current I .

Diagram 1: A simple loop with a voltage source (represented by a circle with an upward arrow) and a resistor labeled 9 . The current is labeled I_1 .

Equation 1: $I_1 = 2 A$

Diagram 2: A loop with a voltage source $-16j$, a resistor $4j$, and a voltage source $30 \angle 0^\circ$ (represented by a circle with $+$ and $-$ signs). The current is labeled I_2 .

Equation 2:
$$I_2 = \frac{-30 \angle 0^\circ}{-16j + 4j + 9} = \frac{-30}{9 - 12j} = -2 \angle 53^\circ$$

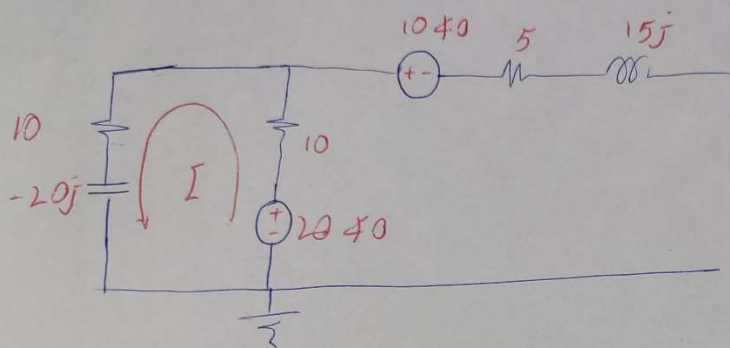
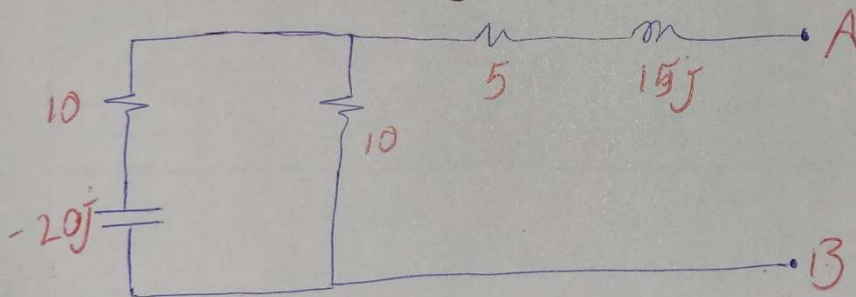
Diagram 3: A loop with a voltage source $-8j$, a resistor $8j$, and a voltage source $4 \angle 0^\circ$ (represented by a circle with an upward arrow). The current is labeled I_3 .

Equation 3:
$$I_3 = -4 \angle 0^\circ \times \frac{9}{9 - 8j + 8j} = -4$$

Final Equation:
$$I = 2 - 2 \cos(2t + 53^\circ) - 4 \cos(4t)$$

سوال ششم:

$$Z_{th} = [10 \parallel (10 - 20j)] + 5 + 15j = 12.5 + 12.5j$$



$$KVL = -20 + 10I + 10I - 20jI = 0 \rightarrow I = \frac{20}{10 + 10 - 20j} = \frac{1}{1 - j} = \frac{1}{2} + \frac{1}{2}j$$

$$V_{th} = -20 + 10\left(\frac{1}{2} + \frac{1}{2}j\right) + 10 = V_a \rightarrow V_a = -5 + 5j \rightarrow V_{th} = -5 + 5j$$