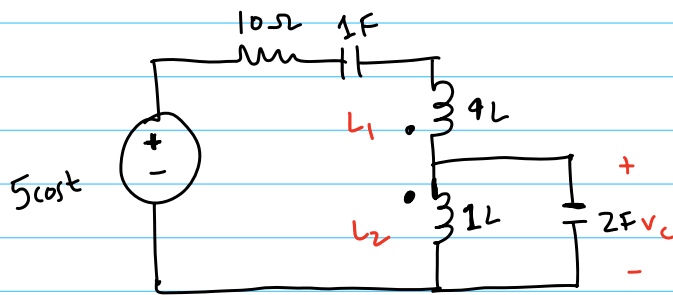


Q1

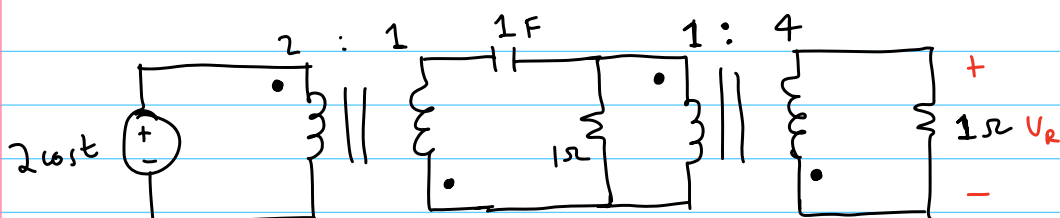


$$k=1, L=1H$$

a) Find V_c ?

b) Find V_c as $L \rightarrow \infty$?

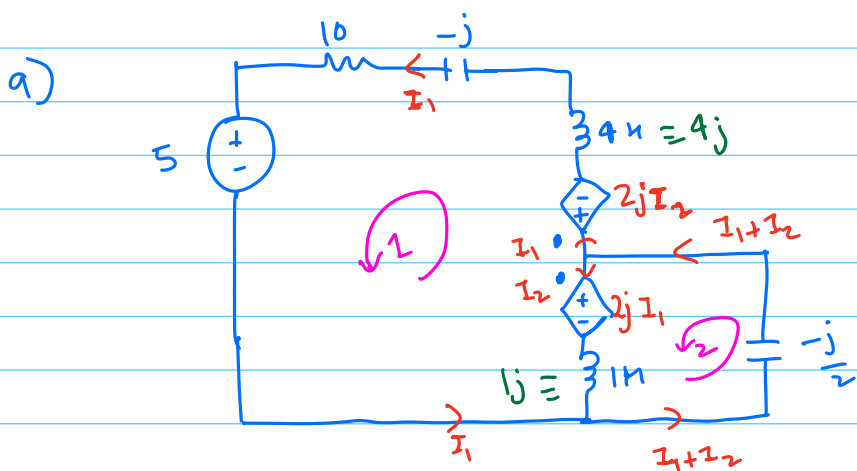
Q2



Find V_r ?

Ans.1

$$M = k \sqrt{L_1 L_2} \Rightarrow 2H$$



KVL in Loop 1

$$-2jI_2 - 4jI_1 + jI_1 - 10I_1 - 5 + jI_2 + 2jI_1 = 0$$

$$I_1(-j-10) + I_2(-j) = 5$$

$$I_1(j+10) + jI_2 \Rightarrow -5 \quad - (1)$$

KVL in loop 2

$$+j \frac{(I_1 + I_2)}{2} - 2jI_1 - jI_2 = 0$$

$$-\frac{3j}{2}I_1 - \frac{jI_2}{2} = 0$$

$$3I_1 + I_2 = 0 \quad - (2)$$

$$I_2 = -3I_1$$

Substitute (2) in (1)

$$I_1(j+10) - 3jI_1 = -5$$

$$-2jI_1 + 10I_1 = -5$$

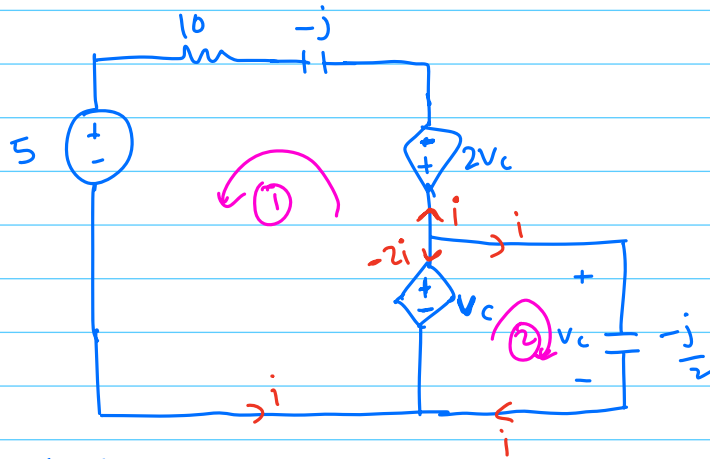
$$I_1(10 - 2j) = -5$$

$$I_1 = \frac{-5}{10-2j} = \frac{5}{2j-10} \Rightarrow \frac{-25}{52} - \frac{5}{52}j$$

$$I_2 = \frac{75}{52} + \frac{15}{52}j$$

$$V_c \Rightarrow j \frac{(I_1 + I_2)}{2} \Rightarrow j \left(\frac{50}{52} + \frac{10j}{52} \right) \Rightarrow -\frac{5}{52} + \frac{25j}{52}$$

$$b) \quad \frac{L_1}{L_2} \Rightarrow \left(\frac{N_1}{N_2} \right)^2 = \frac{4}{1} \Rightarrow \frac{N_1}{N_2} = 2$$



KVL in loop (1)

$$-2V_c + ji - 10i - 5 + V_c = 0$$

$$-V_c + i(j - 10) = 5 \quad \text{--- (1)}$$

KVL in loop (2)

$$V_c + j \frac{i}{2} = 0$$

$$i = -\frac{2V_c}{j} = 2jV_c \quad \text{--- (2)}$$

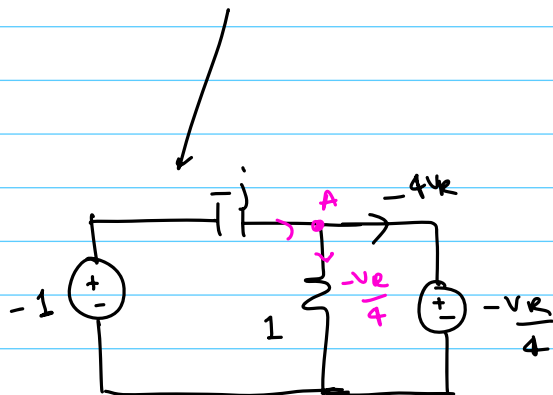
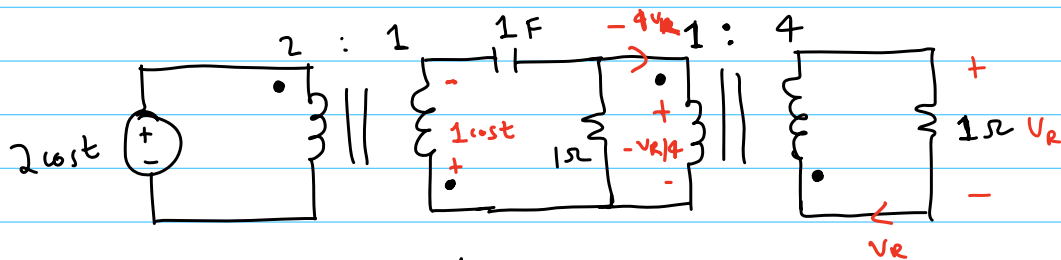
Substitute (2) in (1)

$$-V_c + 2jV_c(j - 10) = 5$$

$$V_c(-1 + -2 - 20j) = 5$$

$$V_c = \frac{5}{-3 - 20j} \Rightarrow \frac{-15}{409} + \frac{100j}{409}$$

Ans. 2



KCL @ Node A

$$\frac{-1 + \frac{V_R}{4}}{-j} = \frac{-V_R}{4} - 4V_R$$

$$j(-1 + \frac{V_R}{4}) = \frac{-V_R}{4} - 4V_R$$

$$-j = V_R \left(-\frac{17}{4} - \frac{j}{4} \right)$$

$$V_R = \frac{j}{\frac{17}{4} + \frac{j}{4}} \Rightarrow \frac{2}{145} + \frac{34}{145}j$$