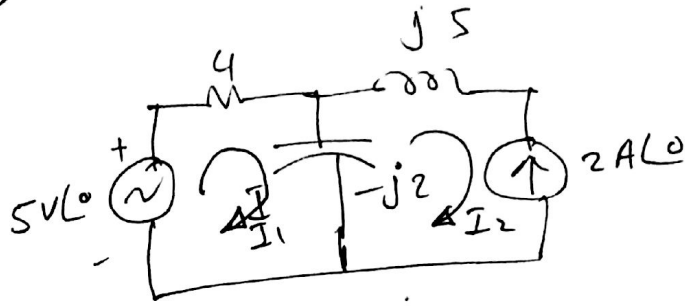




(2)

## 2- Mesh Poop



loop 1

$$5 \angle 0 = (4 - j2)I_1 - (-j2I_2)$$

$$\text{or } 5 \angle 0 = (4 - j2)I_1 + 2jI_2 \rightarrow (1)$$

loop 2

$$I_2 = -2 \angle 0$$

منس محتاج معادله

substitute in (1) or  $5 = (4 - j2)I_1 + 2j \times (-2)$

$$5 = [4 - 2j]I_1 - 4j \rightarrow (5 + 4j) = (4 - 2j)I_1$$

$$\therefore I_1 = \frac{5 + 4j}{4 - 2j} = \frac{\sqrt{25+16} \angle \tan^{-1} \frac{4}{5}}{\sqrt{16+4} \angle \tan^{-1} \frac{-2}{4}} = \frac{6.4 \angle 38.66}{4.47 \angle -26.56}$$

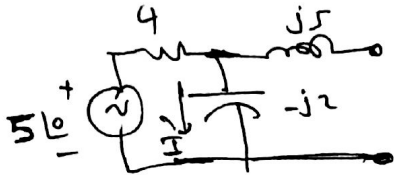
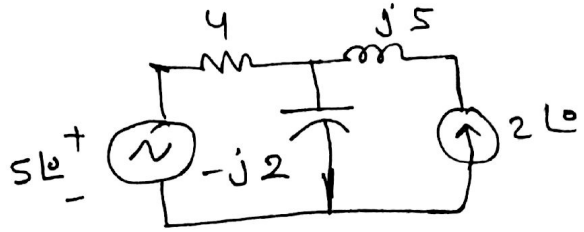
$$I_1 = 1.43 \angle 65.22$$

$$\begin{aligned} \text{Reqd } I &= I_1 - I_2 = 1.43 \angle 65.22 - (-2) \\ &= (1.43 \cos 65.22) + j(1.43 \sin 65.22) + 2 \\ I &= 2.6 + 1.3j = 2.9 \angle 26.56^\circ \end{aligned}$$

### ③ Superposition

[3]

① 1<sup>st</sup> step open circuit current source



ثم نطبق اى نظرية قدرية لحساب التيار I ونصوب I'

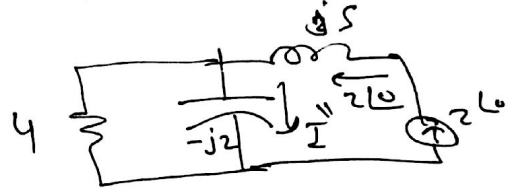
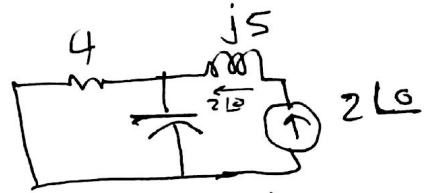
∴ open circuit ∠ 2∠0°

الدائرة تكافئ دائرة مقصورة  
تقريباً

$$\therefore I' = \frac{5\angle 0^\circ}{4 - 2j} = \frac{5\angle 0^\circ}{4.47 \angle -26.57^\circ} = 1.118 \angle 26.57^\circ$$

② 2<sup>nd</sup> step S.C voltage source

using current divider to calc. I''



$$I'' = \frac{I_{\text{total}} \times 4}{4 - 2j} = \frac{2 \times 4\angle 0^\circ}{4 - 2j}$$

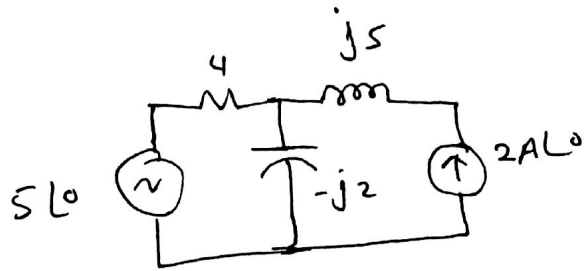
$$= \frac{8\angle 0^\circ}{4.47 \angle -26.57^\circ} = 1.789 \angle 26.57^\circ$$

$$\therefore I = I' + I'' = 1.118 \angle 26.57^\circ + 1.789 \angle 26.57^\circ$$

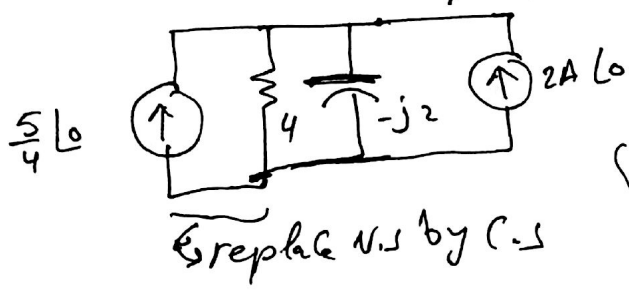
$$= 2.9 \angle 26.56^\circ$$

(4)

4) Source transformation

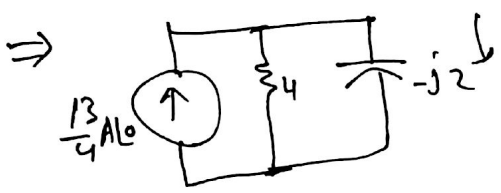


1<sup>st</sup> equivalent circuit



coil removed (has no effect with independent source)  
 series element independent voltage source  
 element independent voltage source  
 independent voltage source

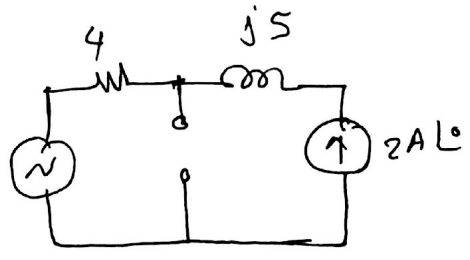
Graph N.S by C.S



$$I = \frac{\frac{13}{4} L_0 \times 4}{4 - j2} = \frac{13 L_0}{4.47 \angle -26.56^\circ} = 2.9 \angle 26.56^\circ$$

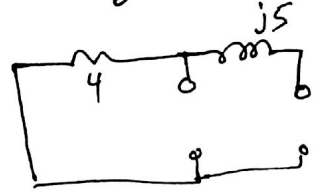
5) Thevenin's || open circuit the capacitor

(2) calc.  $V_{th}$ ,  $Z_{th}$  across cap (المقاومة)



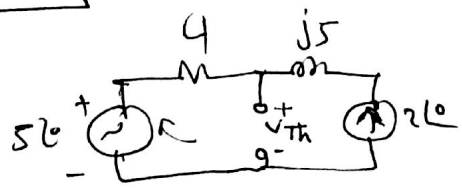
(a) to calc  $Z_{th}$  (o.c current source, s.c voltage source)

j5 cancelled open - C.C



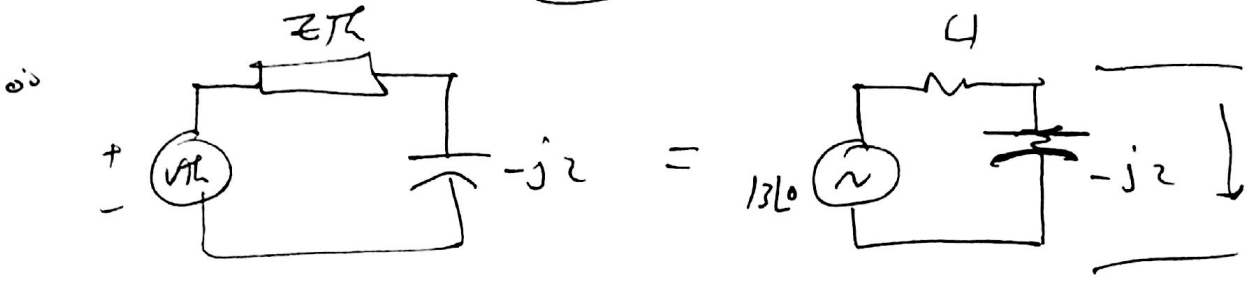
$Z_{th} = 4 \Omega$  only

(b) calc.  $V_{th}$  using KVL



loop 1  $5 - V_{th} = 4I$   
 loop 2  $V_{th} = 2A \times 2$   $I = -2L_0$   
 $\therefore 5 - V_{th} = 4 \times -2$   
 $V_{th} = 13 L_0$

(5)



$$I = \frac{13 \angle 0}{4 - j2} = 2.9 \angle 26.56$$

لا يمكن استخدام A-Y، بل يجب أن نأخذها من حيث هي صورة فلكل وقتية  
المكافئ المراد حساب التيارية

✗ فصل  $E_{Th}$  للرجوع ✗  
المحاكاة لقائمة DC & AC

Good Luck!

Quiz

$$2 \angle 30 + j2 \sin 30$$

لا حظ لو قابليت معادلتك (Meshloop) في

$$2 \angle 30 = (2 + j)I_1 + (3 - 2j)I_2$$

$$4 \angle 60 + j4 \sin 60$$

$$4 \angle 60 = (5 - 2j)I_1 + (4)I_2$$

كلها انا !! الى قسم الهندسة الكهربائية، صورة الجواب

$$\Delta = \begin{vmatrix} 2+j & 3-2j \\ 5-2j & 4 \end{vmatrix} = \text{نقلا} \quad \Delta_1 = \begin{vmatrix} 2 \angle 30 + j2 \sin 30 & 3-2j \\ 4 \angle 60 + j4 \sin 60 & 4 \end{vmatrix} = \text{نقلا}$$

$$\Delta_2 = \begin{vmatrix} 2+j & 2 \angle 30 + j2 \sin 30 \\ 5-2j & 4 \angle 60 + j4 \sin 60 \end{vmatrix} = \text{نقلا}$$

$$\therefore I_1 = \frac{\Delta_1}{\Delta} \quad I_2 = \frac{\Delta_2}{\Delta}$$