Quiz 5. For the network below, find $\mathbf{Z}_{ab}$ and $\mathbf{I}_o$.

$$\frac{M}{\sqrt{L_1 L_2}} = k.$$

$$2.20 \, \underline{/-94.92°}$$

i_o 4 Ω a 1 Ω $k = 0.5$ 3 Ω

$W = 2.$

12 sin 2t V $+$ 0.5 F

cos

$= 12 \underline{/-90°}$ 2 Ω 1 H 1 H 2 H

$Z_{ab}.$ b

$= 1.51 \, \underline{/8.04°}$
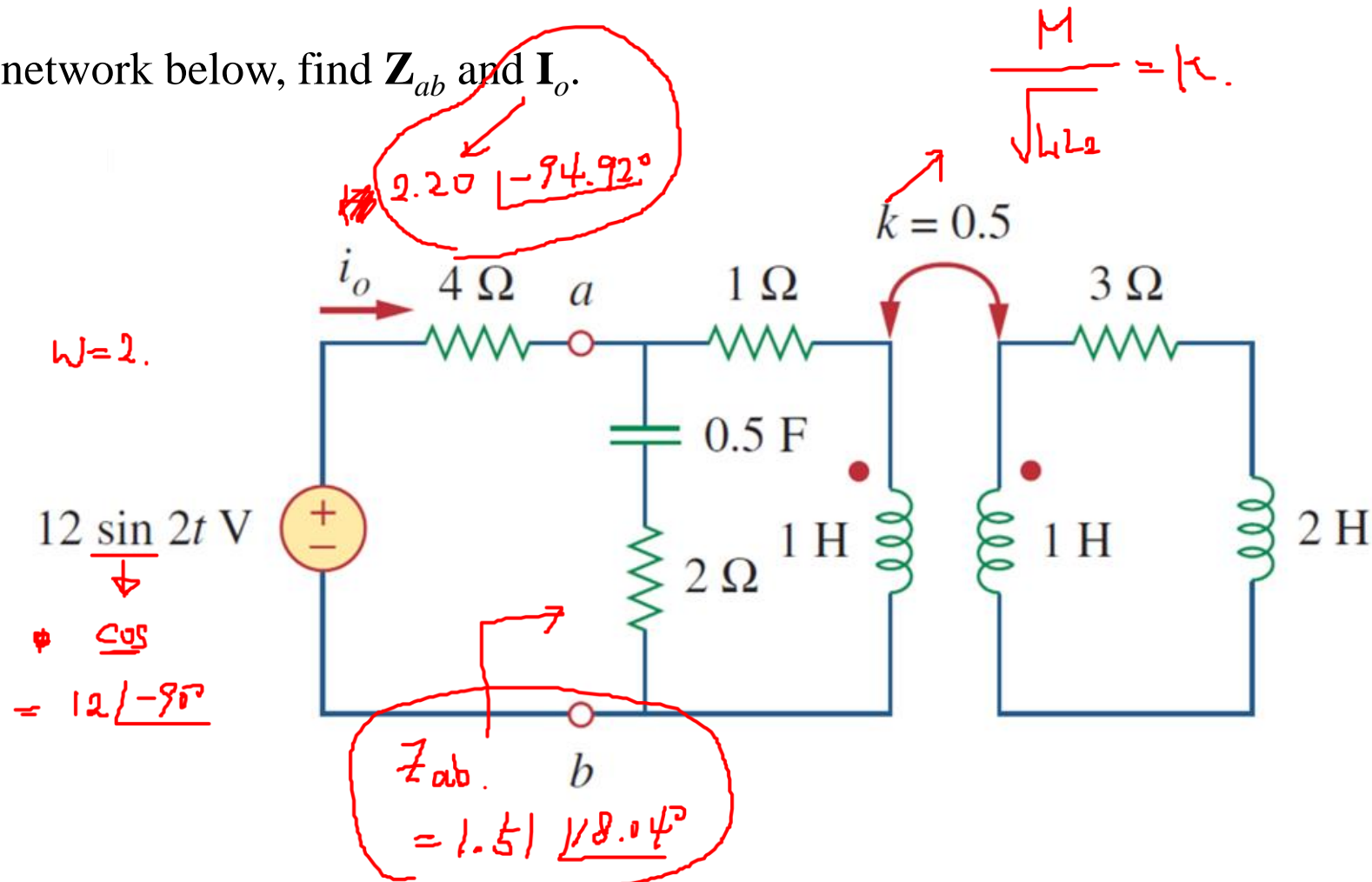
(Optional) Course Evaluation http://coursesel.umji.sjtu.edu.cn/
Please kindly provide your thought/opinion/suggestion in the course evaluation. It could be positive aspects of the course and instructor, some points that could be better in the future course offering, or some points that did not meet your expectations.

The circuit shows a source $12\angle-90°$ with elements labeled 4, 1, 3, $-j1$, $j2$, $j2$, $j4$, etc.
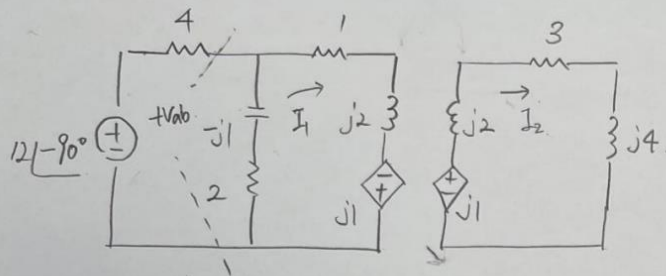
① $\quad -V_{ab} + (1+j2)I_1 - j1\,I_2 = 0$

② $\quad (3+j6)I_2 - j1 I_1 = 0 \qquad I_2 = \dfrac{j1}{3+j6}\cdot I_1$

$$V_{ab} = (1+j2)I_1 - \cancel{j1}\times\cancel{j1}\times\frac{1}{3+j6}I_1 = \left(1+j2 + \frac{1}{3+j6}\right)I_1$$

$$\frac{V_{ab}}{I_1} = 1+j2 + \frac{1}{3+j6} = 2.15\angle 60.26°$$

$$Z_{ab} = (2-j1) \parallel 2.15\angle 60.26° = \frac{2.24\times 2.15\ \angle 33.69°}{2.24\angle -26.57° + 2.15\angle 60.26°}$$

$$= 3.07 + j0.86$$
$$3.19\angle 15.65°$$

$$= 1.51\angle 18.04°$$

$$I_0 = \frac{12\angle -90°}{4 + 1.51\angle 18.04°} = \frac{12\angle -90°}{5.44 + j0.47} = \boxed{2.20\angle -94.82°}$$

or $\quad i_0(t) = 2.20 \sin(2t - 4.82°)$