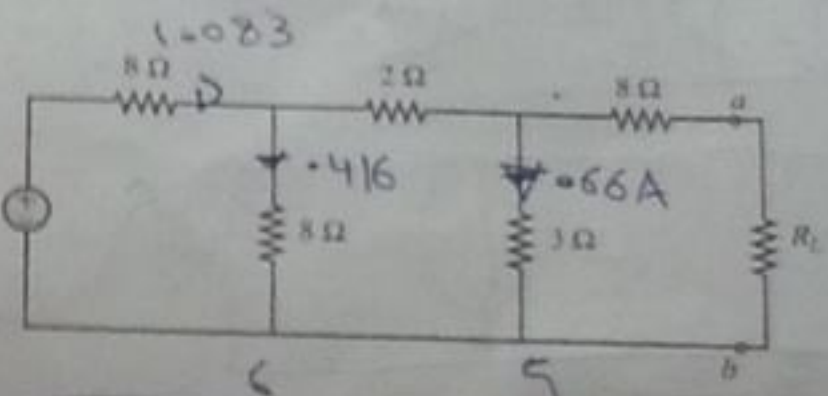
Q1- For the following circuit:

a. Determine Thevenin's equivalent circuit between a and b then draw it.
b. Find I_N
c. Find the value of R_L to get maximum transferred power to the load.
d. Calculate the P_{max}.



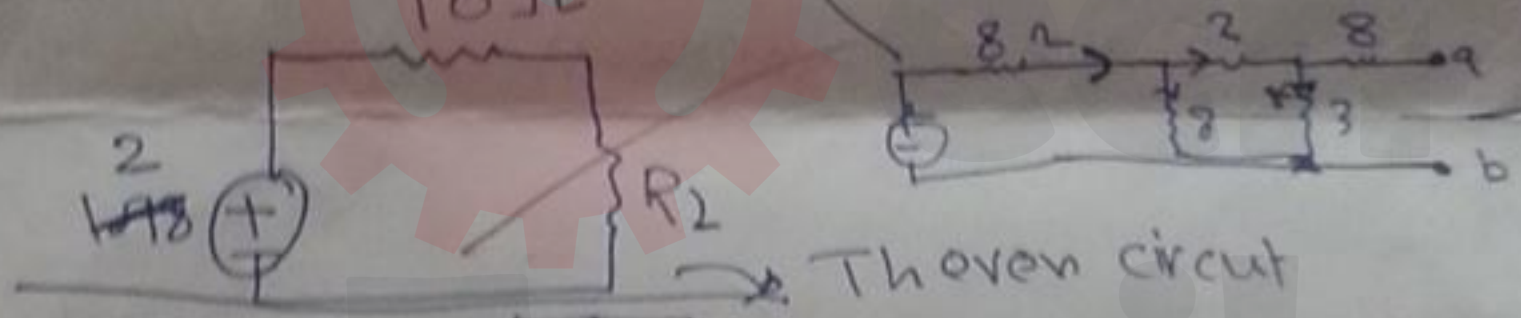
$R_{eq} = 10\ \Omega$

$[[[8 // 8] + 2] // 3] + 8 = 10\ \Omega$

$I_{total} = \frac{12}{R_{eq}} = \frac{12}{\frac{144}{13}} = 1.083\ A$

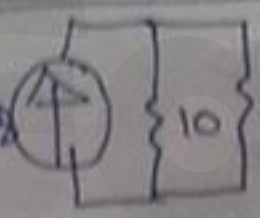
$V_{ab} = V_{3\Omega} = 3 * .66 = 1.98 V$

a)



Thoven circut

b) $I_N = .2\ A$



c) $R_L = R_{thevo} = 10\ \Omega$

d) $P_{max} = \frac{V_{th}^2}{4 R_{th}} = .2\ W$

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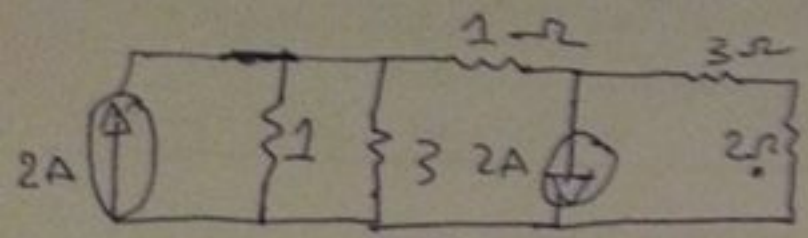
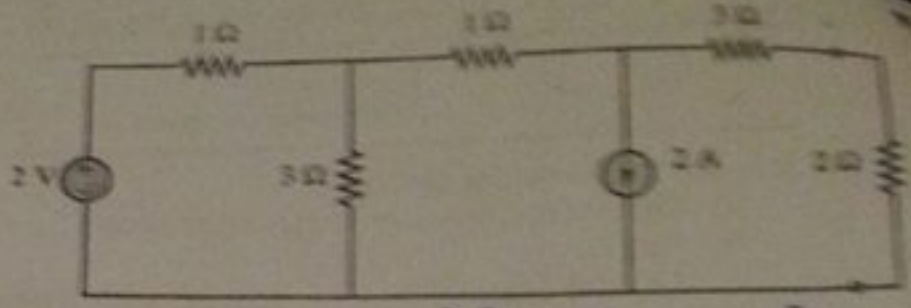
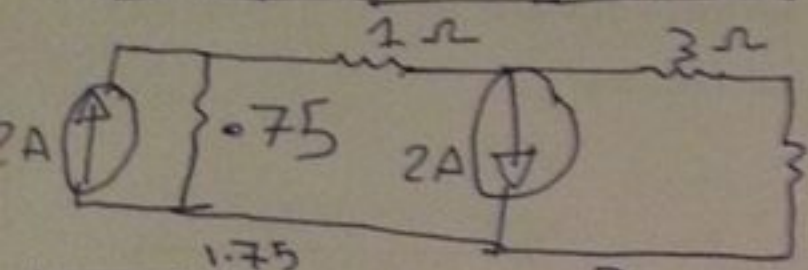
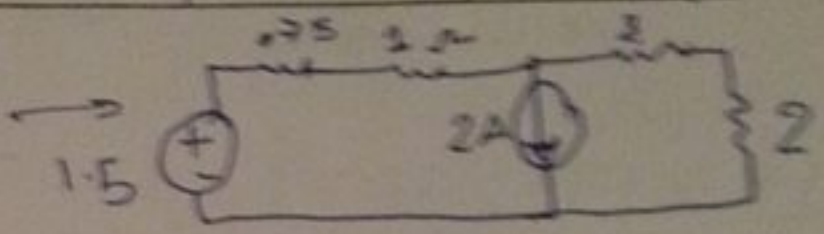
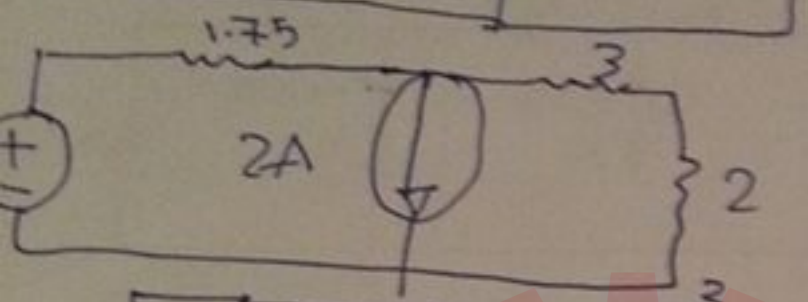
Q2- Use Source Transformation to find the absorbed power in the 2Ω resistor in the following:

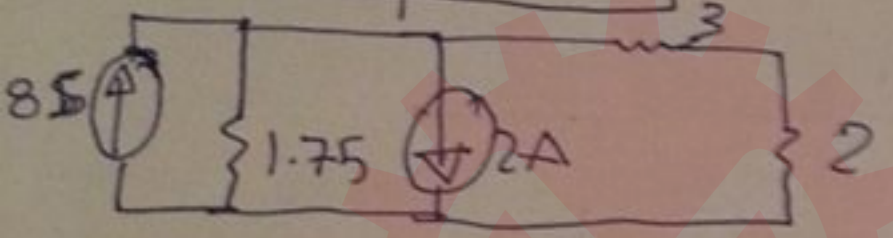


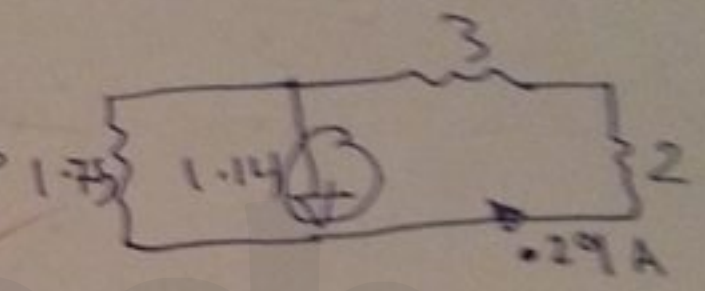




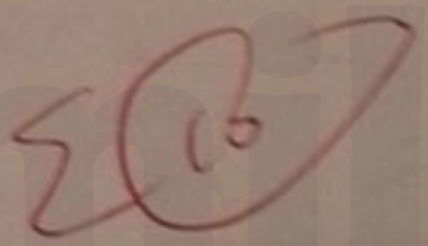




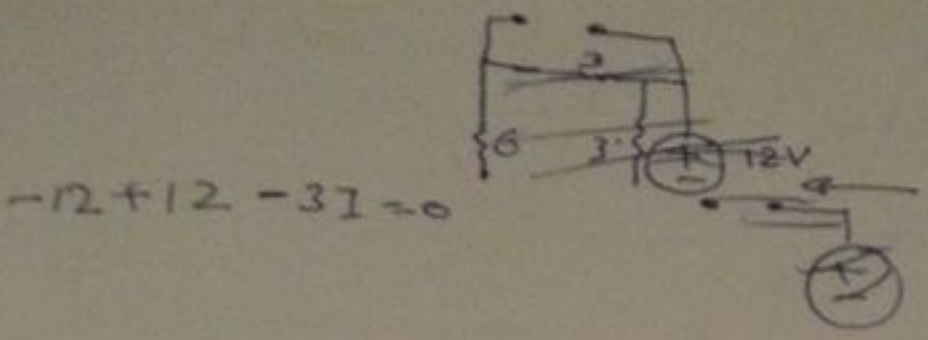




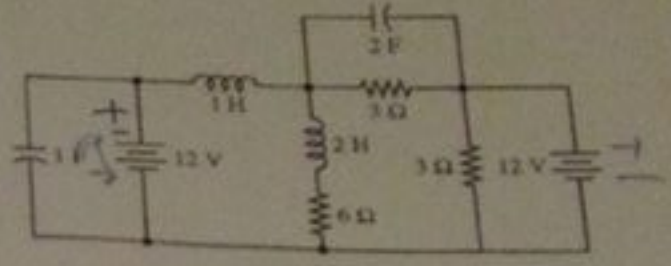
$P_{2\Omega} = (.295)^2 * 2 = .17405$ watt

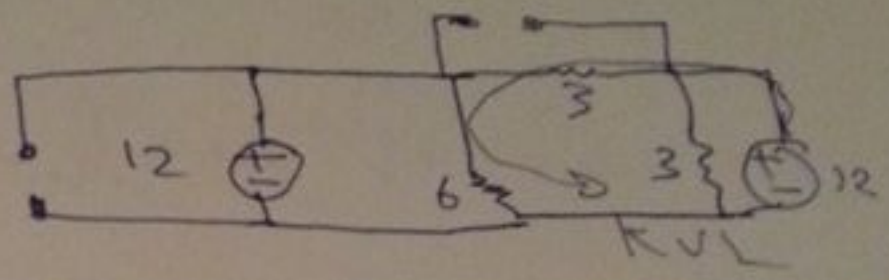


Calculate the energy stored in each inductor and capacitor in the following circuit.



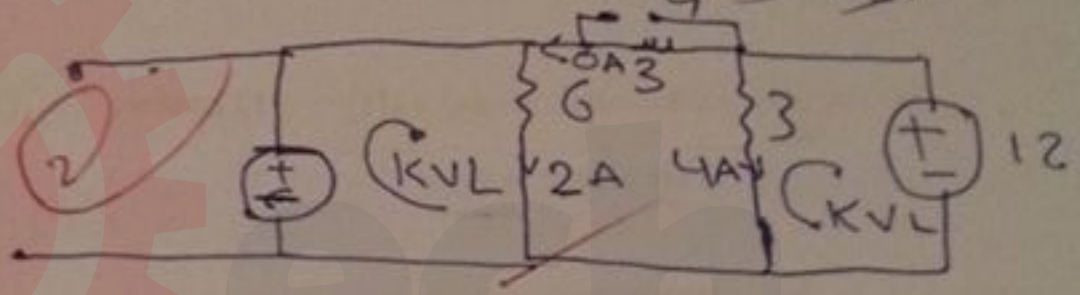
$-12+12-3I=0$





$+12-3I_1-6I_1=0$

$I_1=\frac{12}{9}=1.33A$



$12-6I_2=0$ $\quad I_2=2$

$12-3I_1=0$ $\quad I_1=4A$

$E_{1F}=\frac{1}{2}CV^2=\frac{1}{2}1*6*12^2=72J$ 1.5

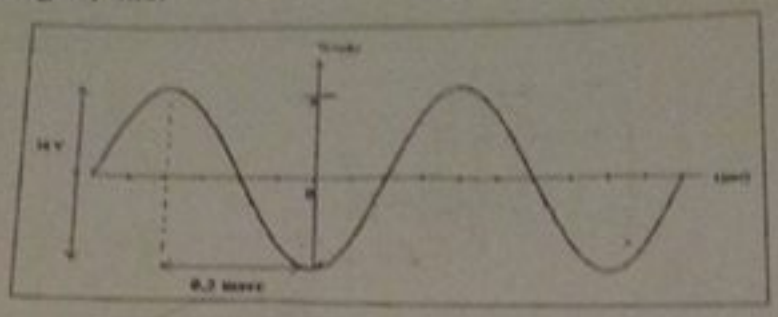
$E_{2f}=$ zero 1.5

$E_{2H}=\frac{1}{2}Li^2=\frac{1}{2}*2*2^2=4J$ 1.5

$E_{1H}=\frac{1}{2}Li^2=\frac{1}{2}*1*(2+4)^2=18J$

Σ 7.5

Q4- For the following signal, find:



a. V_m = 8 V

b. V_{rms} = 5.65 V

c. V_{ave} = zero

d. $\omega = 2\pi f = 2\pi * \frac{1}{0.4 * 10^{-3}} = 5\pi * 10^3 = 15.7 * 10^3$ rad/s

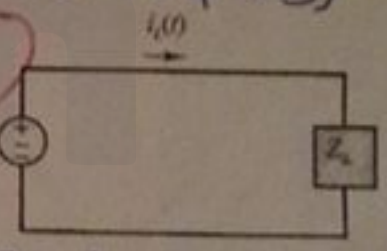
e. $\theta = \frac{T_0}{T} * 360 = \frac{.2}{.4} * 360 = 180$

Q5- For the circuit shown, where: $v_s(t) = 311\cos(wt)$V, $i_L(t) = 2.83\sin(wt + 55°)$A. **Determine** the:

$2.83\cos(wt + 35)$

a- rms phasor voltage $= \frac{311}{\sqrt{2}} = 219.91$ V

b- rms phasor current $\frac{2.83}{\sqrt{2}} = 2.00 \angle$ A



c- Phasor load impedance $Z = \frac{311\angle 0}{2.83\angle -35} = 109.89\angle 35$

d- Load power factor $= .8191$

e- Power factor it's leading or lagging. Lagging

f- Load is Resistive, Capacitive or Inductive. Resistive and Inductive

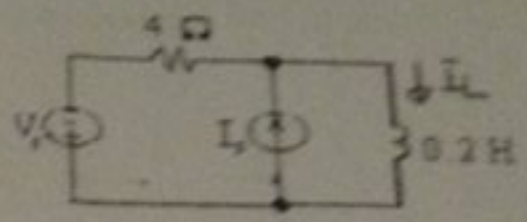
$311\angle 0 * 2.83\angle 35 = 440\angle 35$

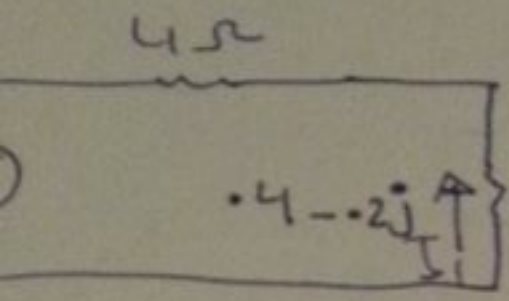
5/13

Q6- If $V_s(t)=2\cos(10t)$ and $I_s(t)=6\sin(40t+30)$ in the following circuit, find the current in the inductor

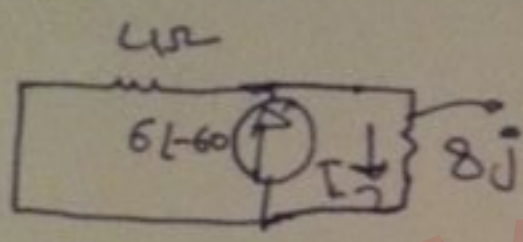
$6\cos(40t-60)$

Superpostion





$.447\angle -26$

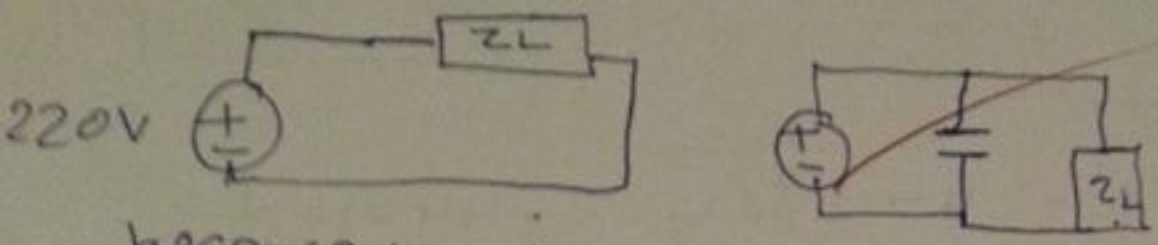


$-1.478 - 2.239j \quad 2.682\angle -123$

$$I_L = I_1 - I_2 = .447\cos(10t - 26) - 2.68\cos(4t - 123)$$

Amper

Q7- An industrial consumer is operating a 100 KW induction motor at a lagging pf of 0.85. The source voltage is 220V rms. In order to obtain lower electrical rates, the customer wants to raise the pf to 0.97 lagging. Specify an arrangement by which this may be done. $\omega = 314$ rad/s



because Lagging than the curcit RL) and we want to decres Q (reactive power) so we put capasitor

$|S|_{old} = \frac{100}{.85} = 117.64$ VA $\quad \theta = \cos^{-1} p.f$

$\theta = 31$

$Q_{old} = |S| \sin\theta \quad Q_{old} = 61.97$ VAR

$|S|_{new} = \frac{100}{.97} = 103.09$ VA $\quad \theta = \cos^{-1} .97$

$\theta = 14$

$Q_{new} = 25.06$ VAR

$Q_c = 25.06 - 61.97$

$Q_c = -36.9$ VAR

$Q_c = \frac{V^2}{X} \longrightarrow X = \frac{220^2}{36.9}$

$X = \frac{1}{\omega C}$ $\quad X = 1311.65$

$C = \frac{1}{\omega X} = 2.42 * 10^{-6}$ f

$= 2.42$ Mf

Σ 11.5