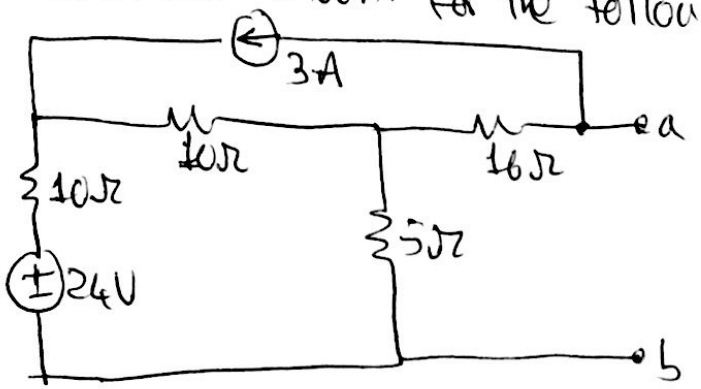
NAS(UEI&EC201)
3rd SEM - Practice Problems
for MODULE 3 - NETWORK THEOREMS

NAME:- PRAHLAD.D.
(Faculty)

Date:- 28-10-2019

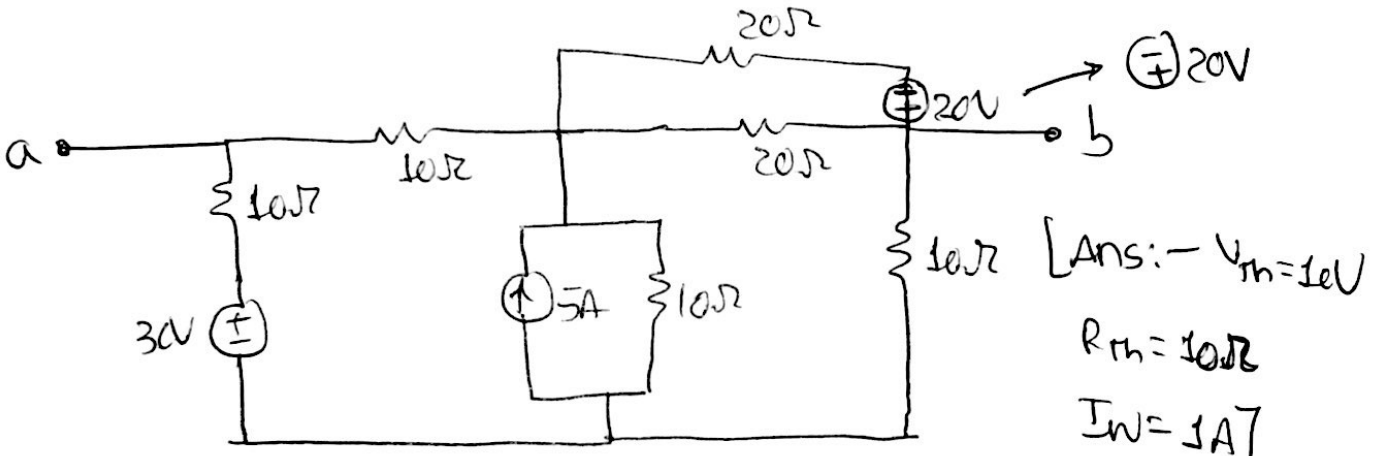
(I) Obtain Thevinin's and Norton's equivalent ~~circuits at terminals a-b of the circuit shown~~. for the following circuits:-

(1)



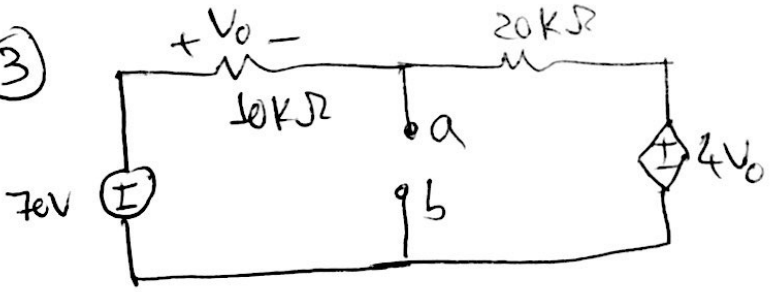

[Ans:- $V_{Th} = -49.2V$
$R_{Th} = 20\Omega$
$I_N = -2.46A$]

(2)



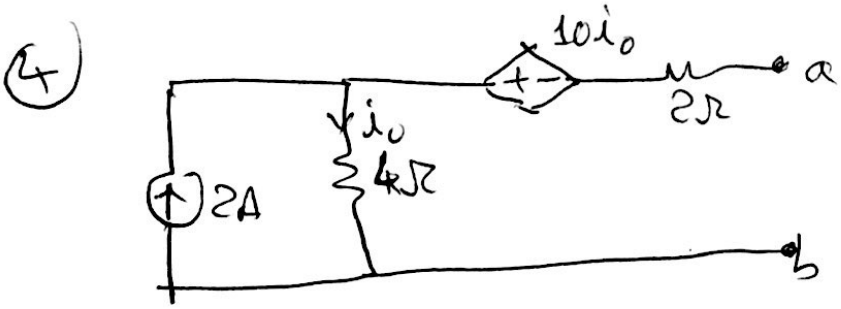

[Ans:- $V_{Th} = 10V$
$R_{Th} = 10\Omega$
$I_N = 1A$]

(3)



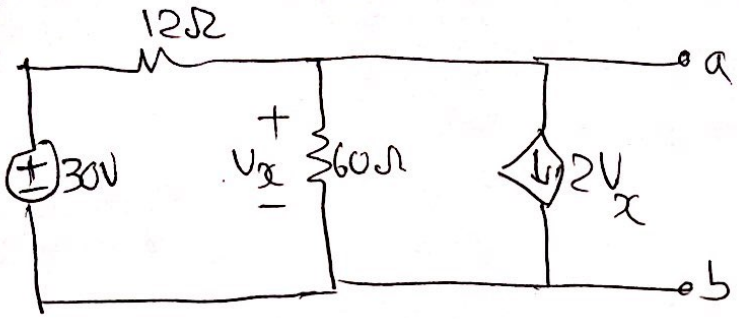

[Ans:- $R_{Th} = 2.857K\Omega$
$V_{Th} = 6CV$ $I_N = 21mA$]

(4)



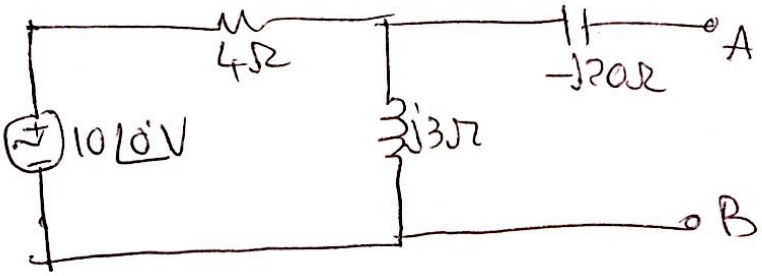

[Ans:- $R_{Th} = -4\Omega$
$V_{Th} = -12V$
$I_N = 3A$]

(5)



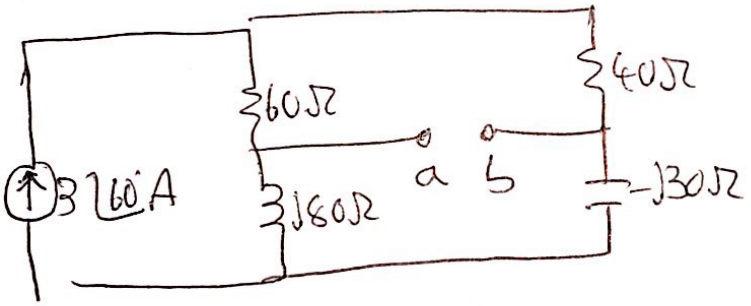

[Ans:- $V_{th} = 1.19V$
$R_{th} = R_N = 0.4762\Omega$
$I_N = 2.5A$]

(6) Calculate the current through a load of $(6+j3)\Omega$ connected b/n A and B, after finding Thevinin's and Norton's eq. Ckt.




[Ans:- $Z_{th} = (1.44 - j16.1)\Omega$
$V_{th} = (3.6 + j4.8)V$]

(7)




[Ans:- $Z_{th} = (20 + j40)\Omega$
$I_N = 3\angle 60°A$]

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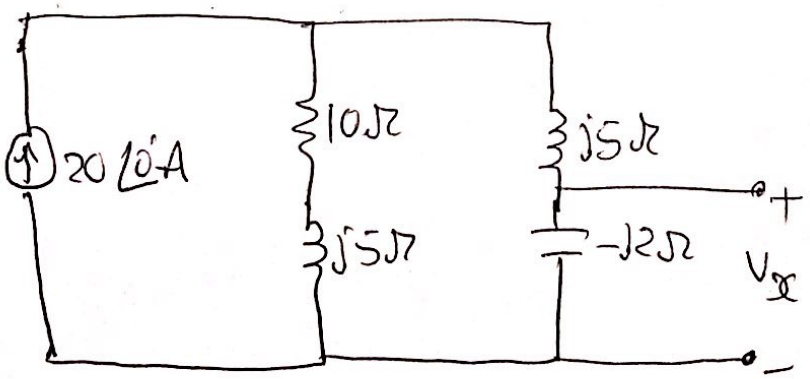
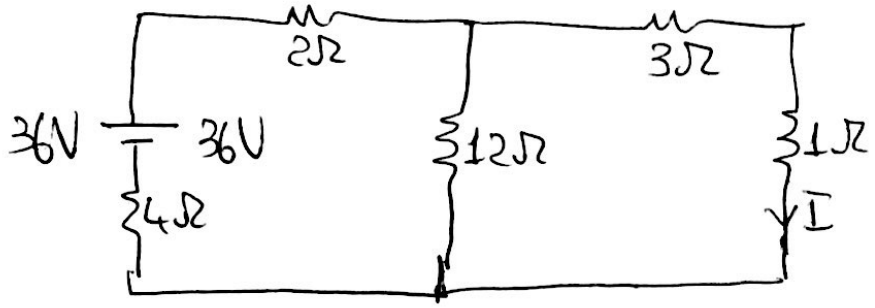
## (II) Reciprocity and Tellegen's theorems and Millman's theorem

(1) Verify Reciprocity Theorem for the following circuit.




[Ans:-
$V_x = 34.92\angle -12.09°$]

(2) Verify Reciprocity Theorem for the circuit shown.

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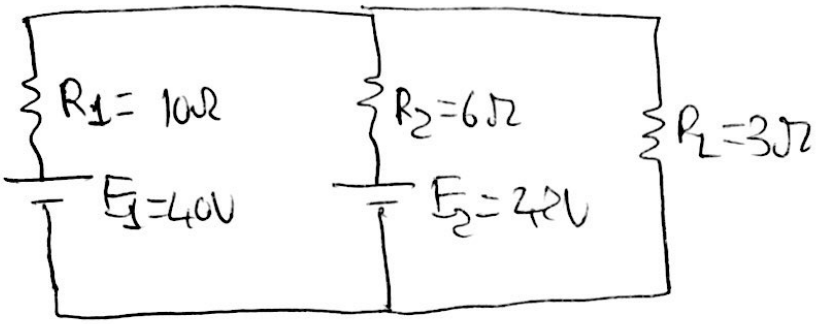
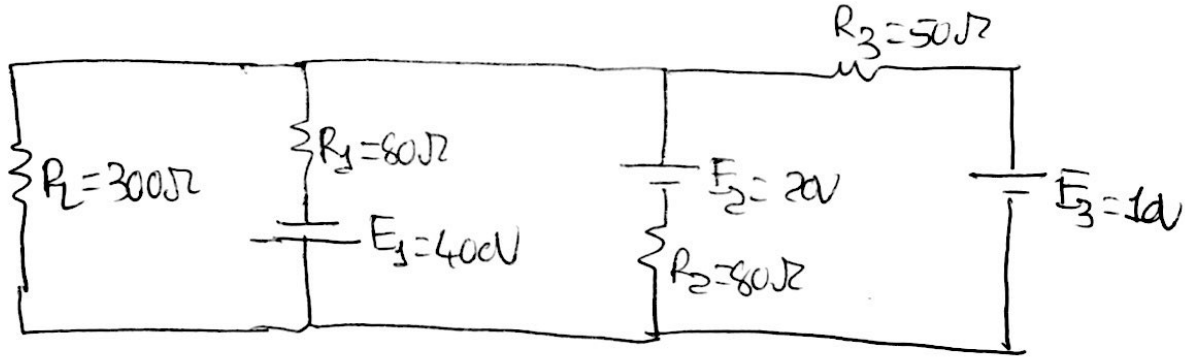
(3) (a) Using millman's theorem find the current and voltage across $R_L$.



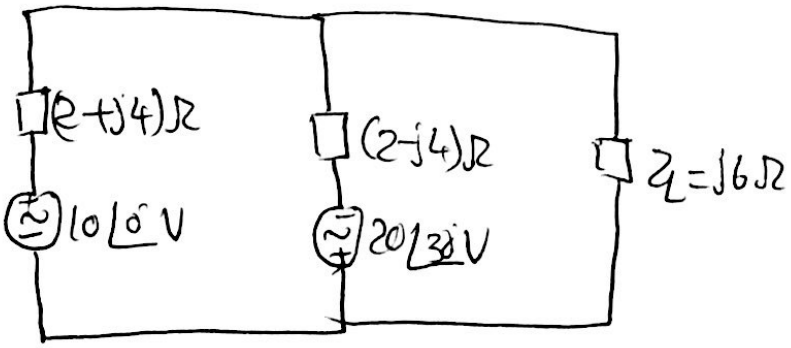

[Ans:-
$I_L = 6.111A$
$V_L = 18.33V$]

(b) 5]



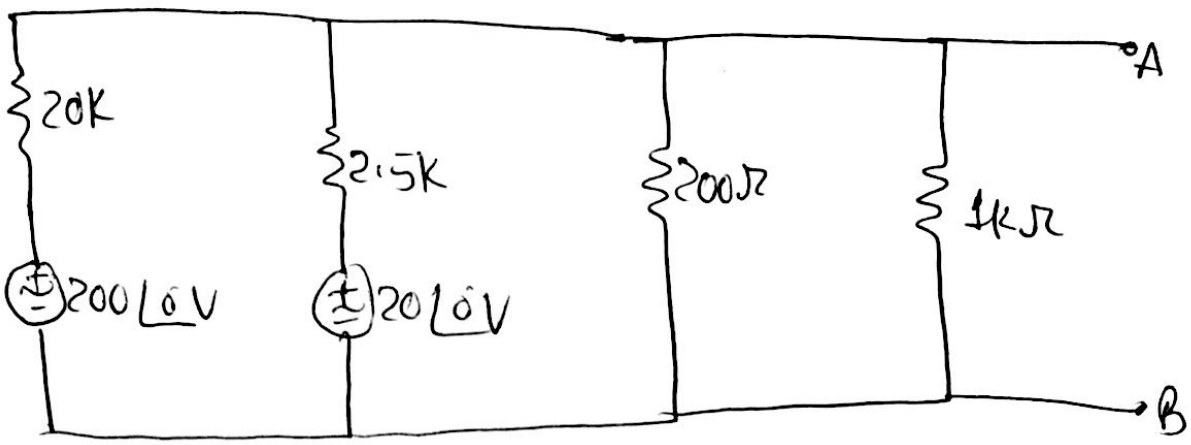

[Ans:- $I_L = -0.3137A$
$V_L = -94.136V$]

c] Using millman's theorem calculate the voltage (V) across a load of $Z_L = j6\Omega$, and current through it.




[Ans:-
$V_L = 3.35\angle 177°$ Volts
$I_L = 0.56\angle 87°$ A]

4] Using millman's theorem find the voltage across 1kΩ resistor




[Ans:- 2.79V]

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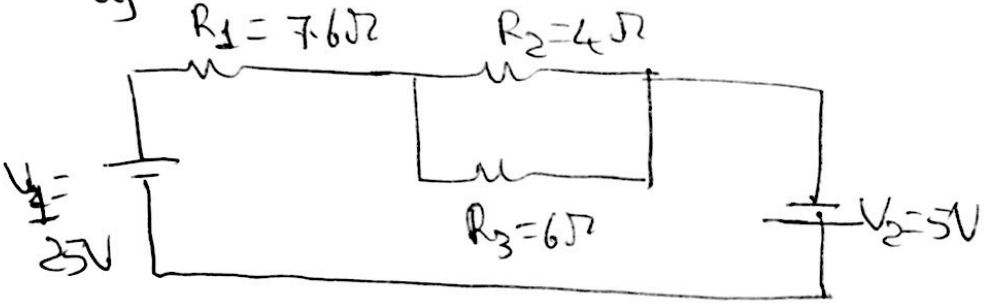
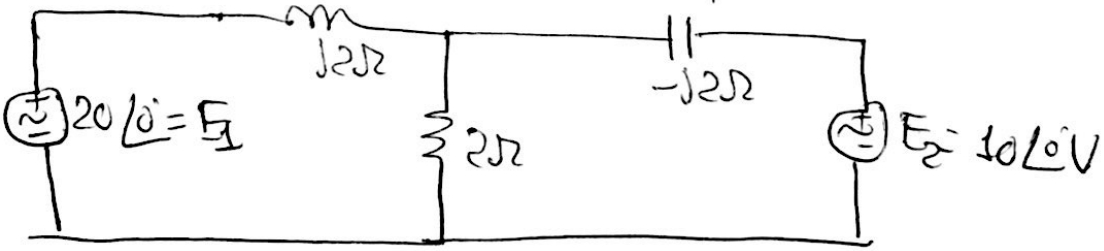
(4) a] Verify Tellegen's theorem for the circuit shown.

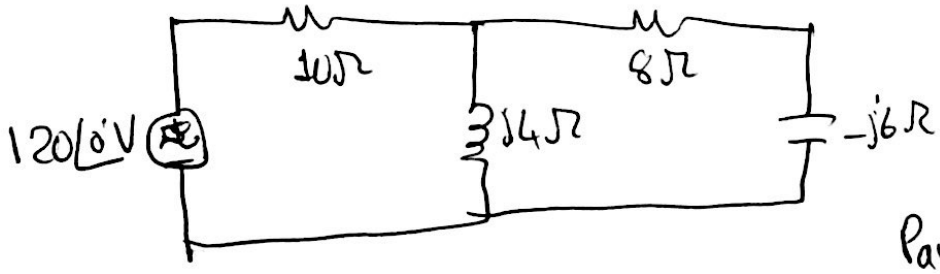



b] Verify Tellegen's theorem for n/w



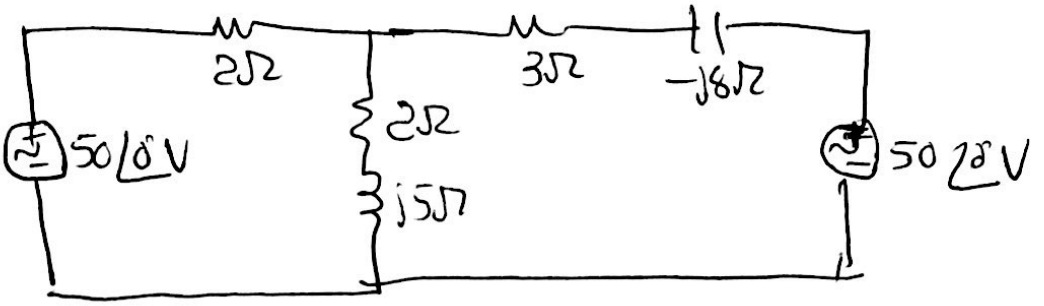

(5) Find the average power delivered to $Z_L = (8 - j11)\Omega$ by a current $I = 5\angle 20°$ A. [Ans:- $P_{av} = 100W$]

(6) For the circuit shown find Z, pf, $I_{rms}$, and $P_{av}$.



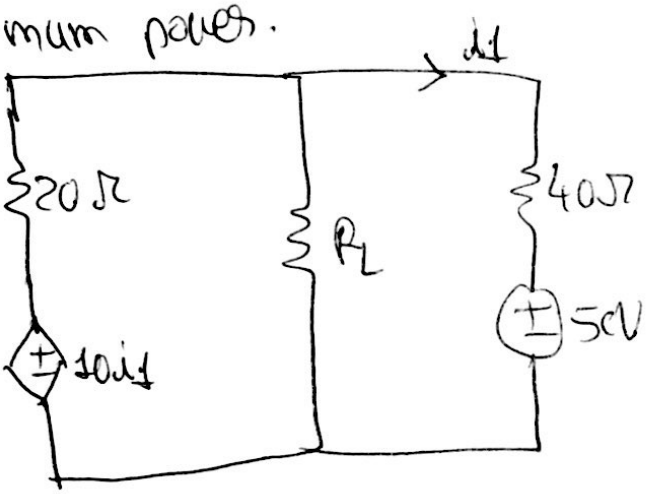

[Ans:- $Z = 12.7\angle 20.61°\Omega$
$I_{rms} = 9.448\angle -20.61°$ A
$P_{av} = 1.06129$ KW]

(7) Verify Tellegen's theorem for the ckt.




## Superposition Theorem and Maximum Power Transfer Theorem

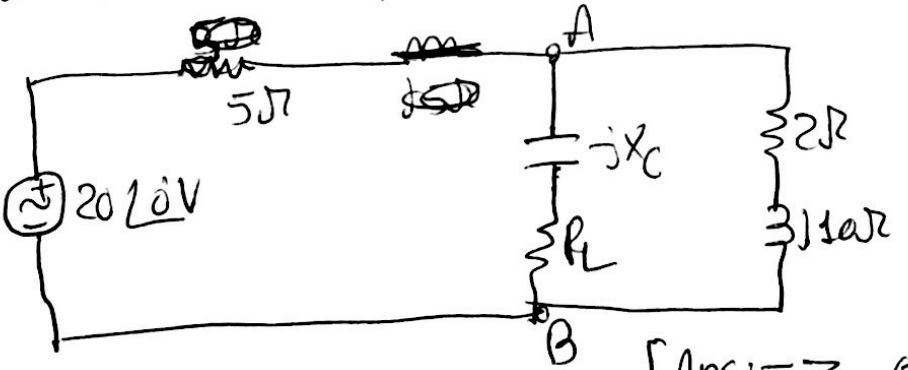
(1) Determine $R_L$ for maximum power transfer, and find maximum power.




[Ans:- $R_L = 16\Omega$

$P_{Lmax} = 1.5625W$

(2) For the circuit shown find the value of $R_L$ and capacitive reactance $X_C$ that would result in maximum power transfer. Find the value of maximum power.

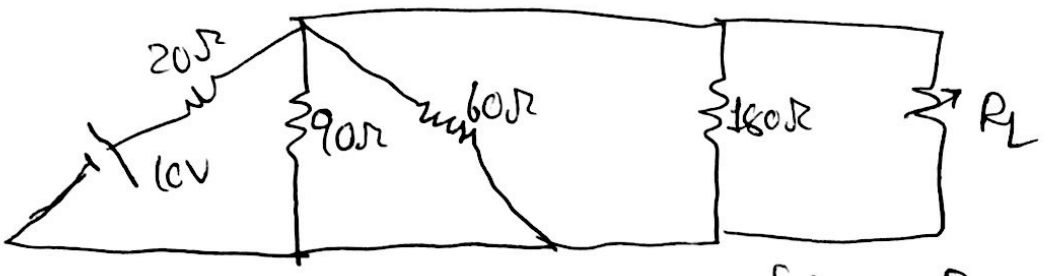



[Ans:- $Z_{Th} = (3.7 + j1.6)\Omega$

$V_{Th} = 41.8\angle 68.7°V$

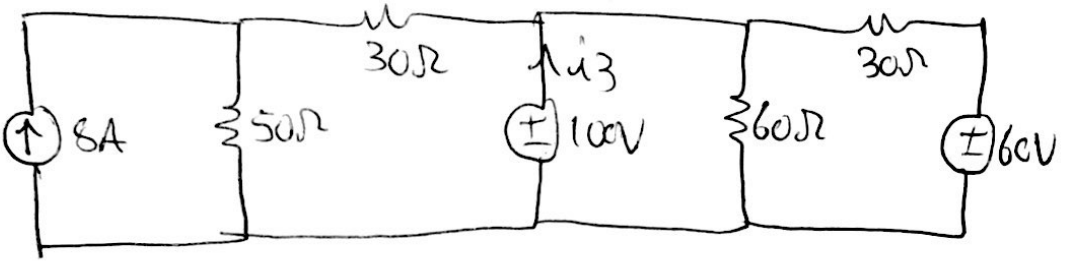
$Z_L = (3.7 - j1.6)\Omega$ $X_C = 1.6\Omega$]

(3) Find $R_L$ for max. power transfer, and find $P_{max}$



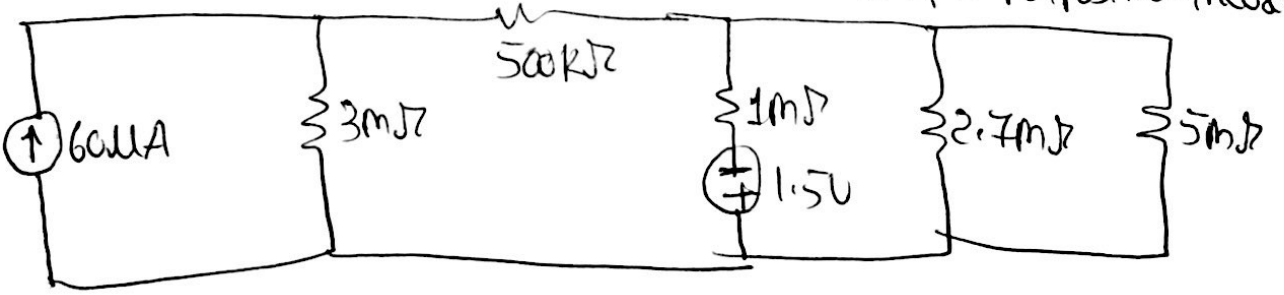

[Ans:- $R_L = 11.39\,\Omega$
$P_{Lmax} = 0.712\,W$]

(4) For circuit shown find the current $i_3$ using superposition theorem.



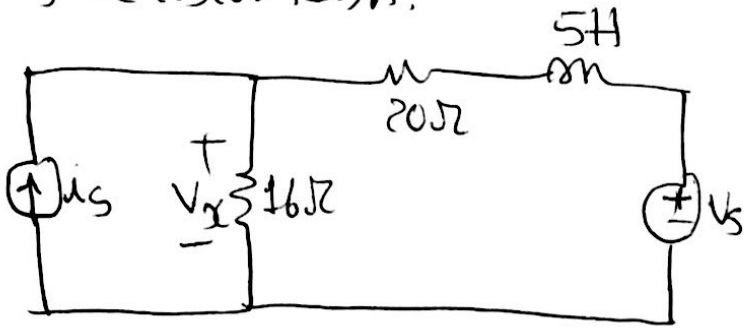

[Ans:- $i_{31}(8A) = -5A$; $i_{32}(100V) = 6.25A$
$i_{33}(60V) = -2A$; $i_3(total) = -0.75A$]

(5) Find power dissipated by 500kΩ resis. using superposition theorem.




[Ans:- $I_1(60\mu A) = 43.51\,\mu A$; $I_2(1.5V) = 0.2308\,\mu A$
$P_{500k} = 956.6\,\mu W$]

(6) Find $V_x$ using superposition, if $V_s = 50\sin 2t$ and $i_s = 12\cos(6t+10°)$ A.




[Ans:- Find the impedance value of L corresponding to $\omega = 2$ for $V_s$.

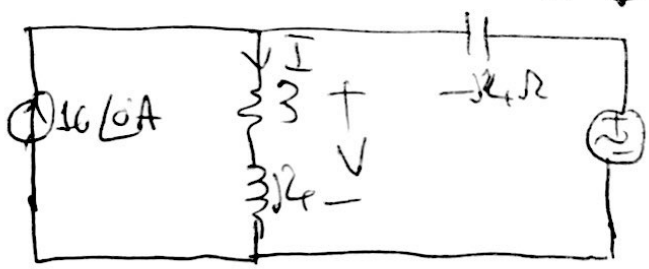
$\therefore V_x(V_s) = 21.41 \sin(2t - 15.52°)$ V

next Find impedance value of L corresponding to $\omega = 6$ for $i_s$

$V_x(i_s)$ [$V_x$ due to $i_s$] $= 14.7\cos(6t + 26.5°)$ V.

$\therefore$ [$V_x = V_x$ (due to $i_s$) + $V_x$ (due to $V_s$)] ]

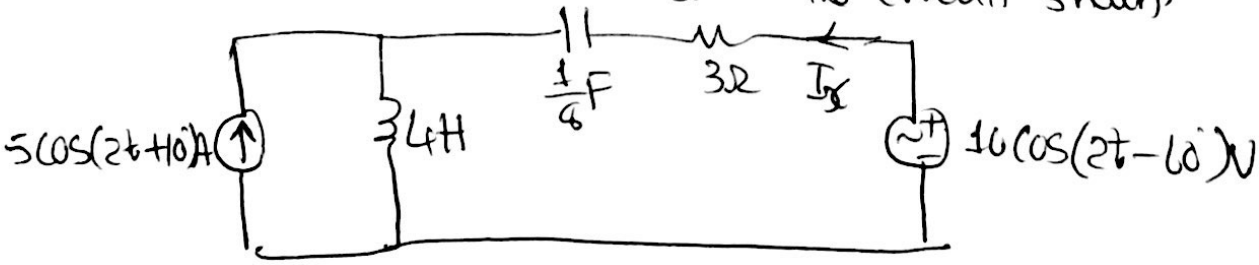
(7) For the circuit shown find V using superposition theorem.




[Ans:-
V' (due to $10\angle 0°$ A)
$= (53.3 - j40)$ V

$V''(50\angle 90°\text{V}) = (-66.7 + j50)$ V  $V = V' + V''$ ]

(8) Using superposition find $I_x$ in the circuit shown.




[Ans:- $I_x$ (due to $10\angle -60°$ V $= \frac{10\angle -60°}{3+j4}$

$I_x$ [due to $5\angle 10°$ A $= \frac{-j40\angle 10°}{3+j4}$ total $I_x = 9.902\angle -129.17°$

$I_x = 9.902\cos(2t - 129.17°)$ A] (7)