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EXAMINATION SCRIPT

(To be filled up by class teacher)

Question No.	Mark Obtained
1	
2	
3	
4	
5	
Total Marks	

(This part is to be filled up by students)

Name:	MD.Sajed
Student ID:	20211103037
Intake & Section:	46th (01)
Program:	**B.Sc. in CSE**
Course code:	**EEE 101**
Course title:	**Electrical Technology**
Trimester:	**Spring 2021**
Exam type:	**Final Term (Open Book Exam)**
Date:	**August 03, 2021**
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COs	Q. No.	Total Marks	Marks obtained
CO1	1	5	
CO2	3, 4	20	
CO3	2, 5	15	

Signature of Examiner and Date:

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Day

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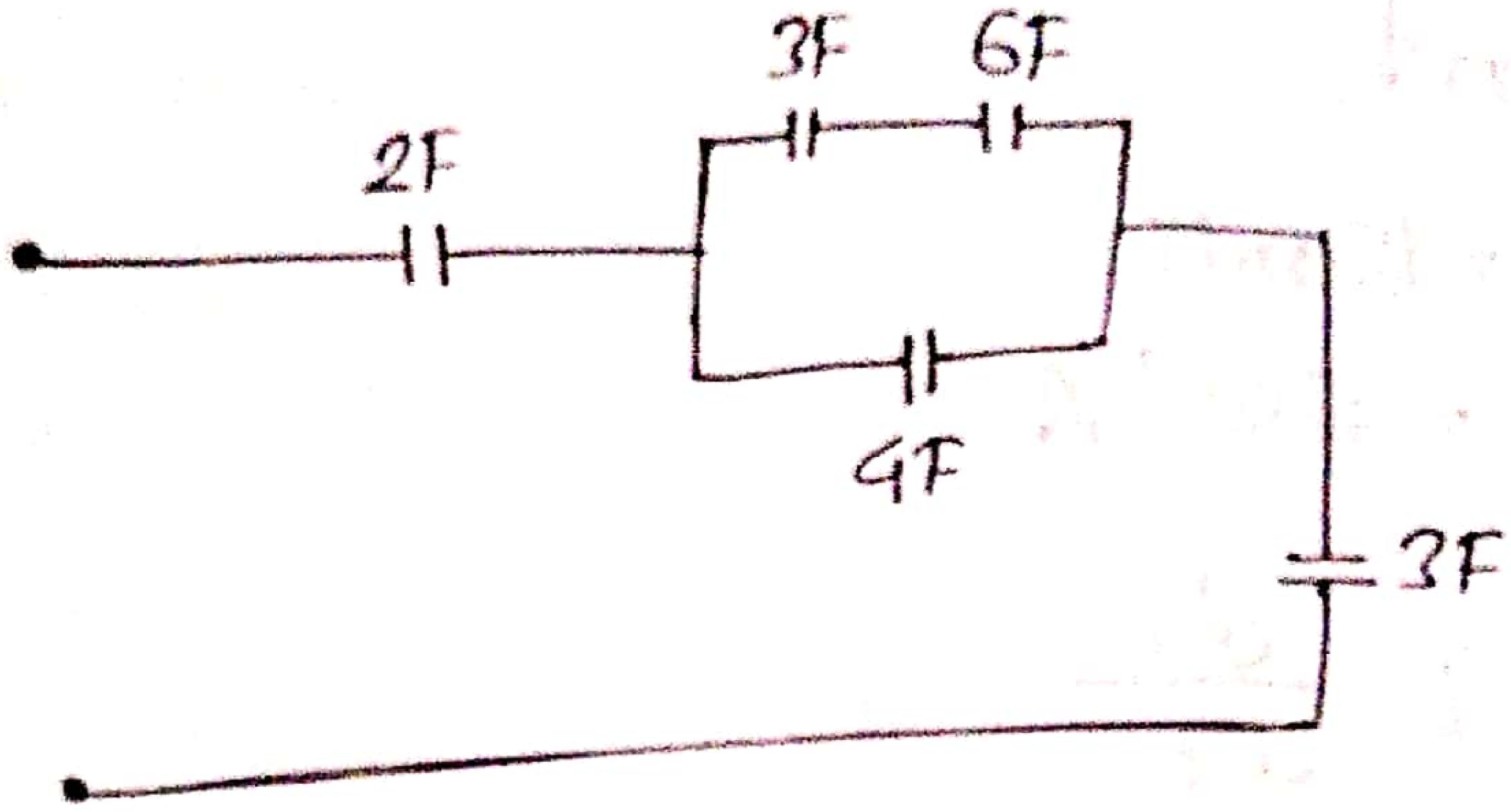
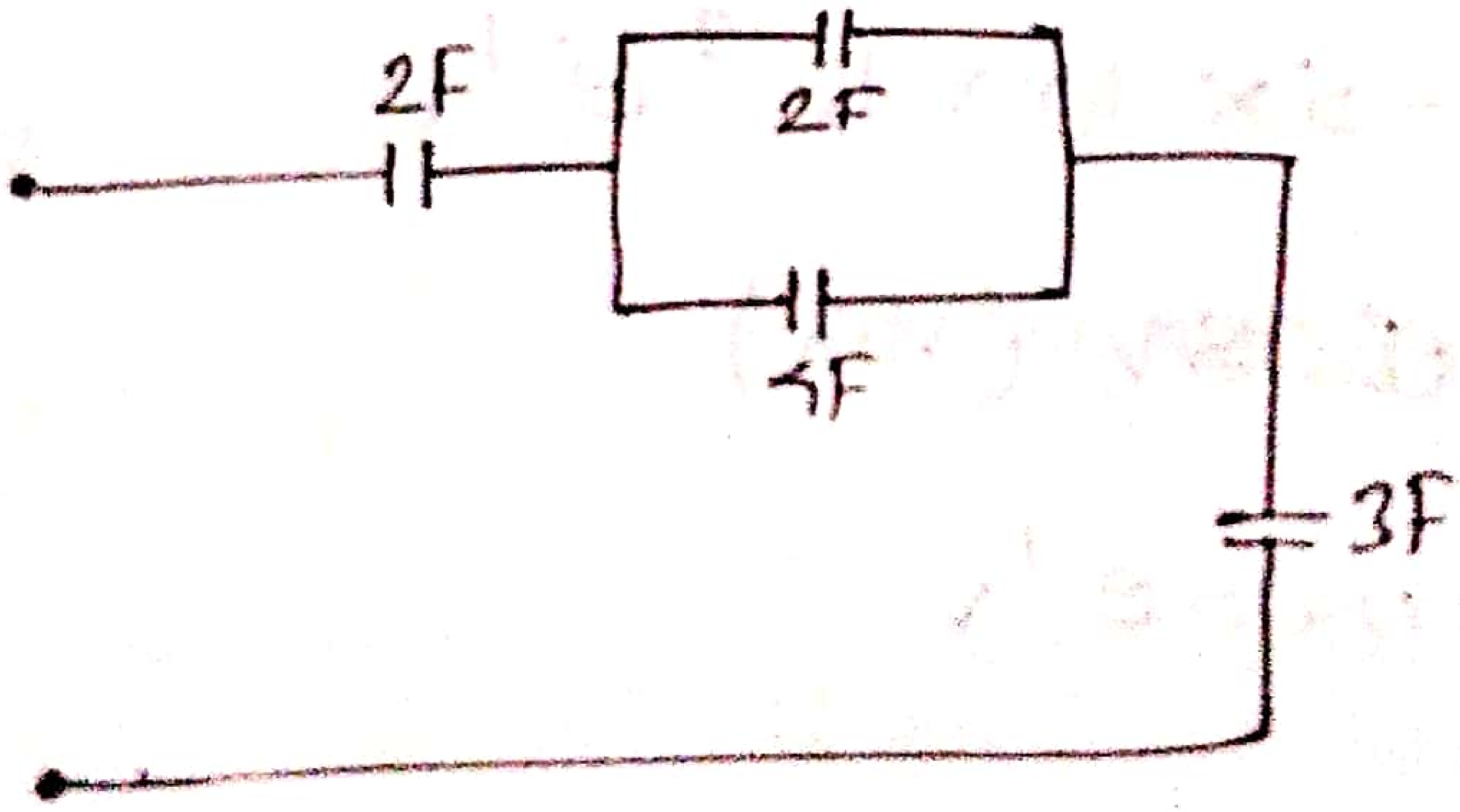
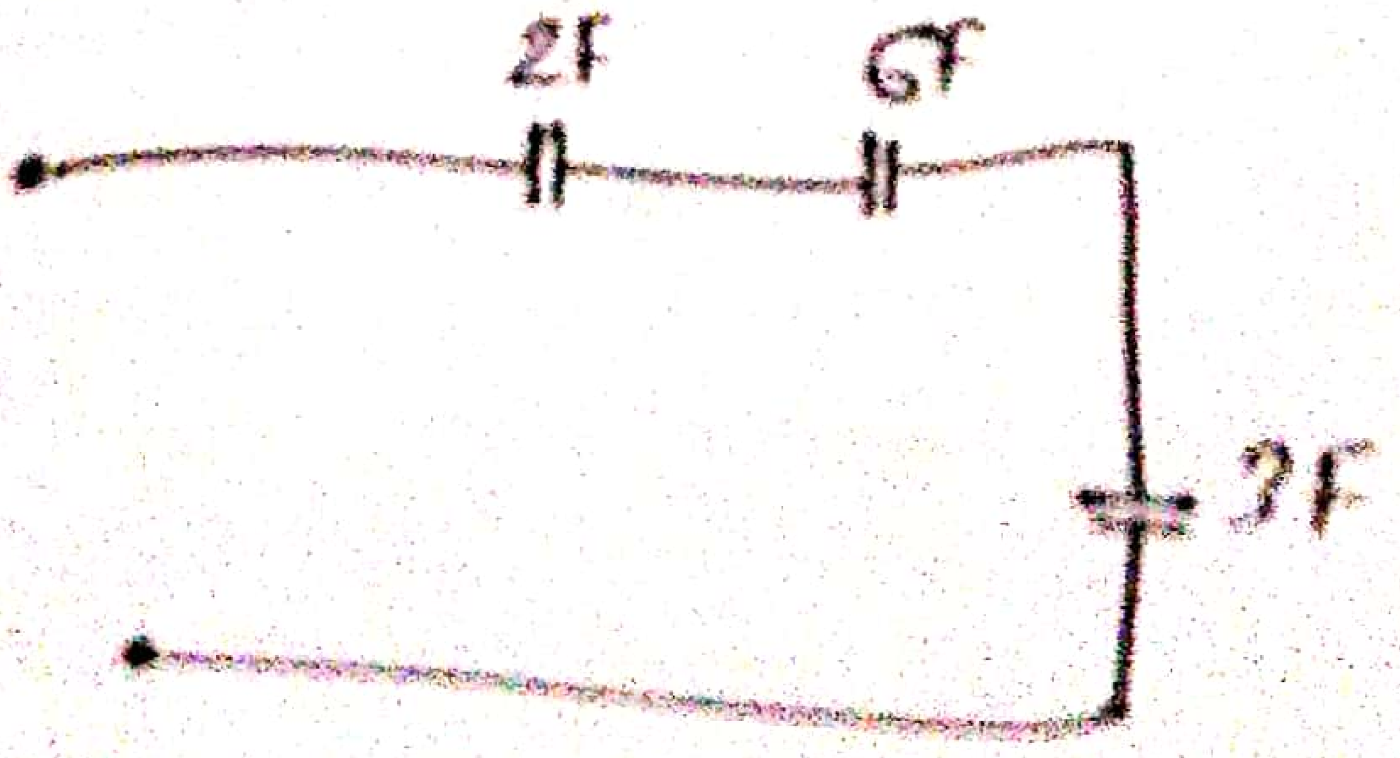
Ans: To the Qs. No. 01 (a)



$\therefore (3^{-1}+6^{-1})^{-1} = 2F$



$(2+4)F = 6F$



$\therefore$ Equivalent capacitor $= (2^{-1}+6^{-1}+3^{-1})^{-1} = 1F$

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Ans to the Qs No: 01 (b)

Given that,

$L = 10 mH$

$I = 5e^{-t} A$

$$\therefore V(t) = L \frac{di}{dt}$$

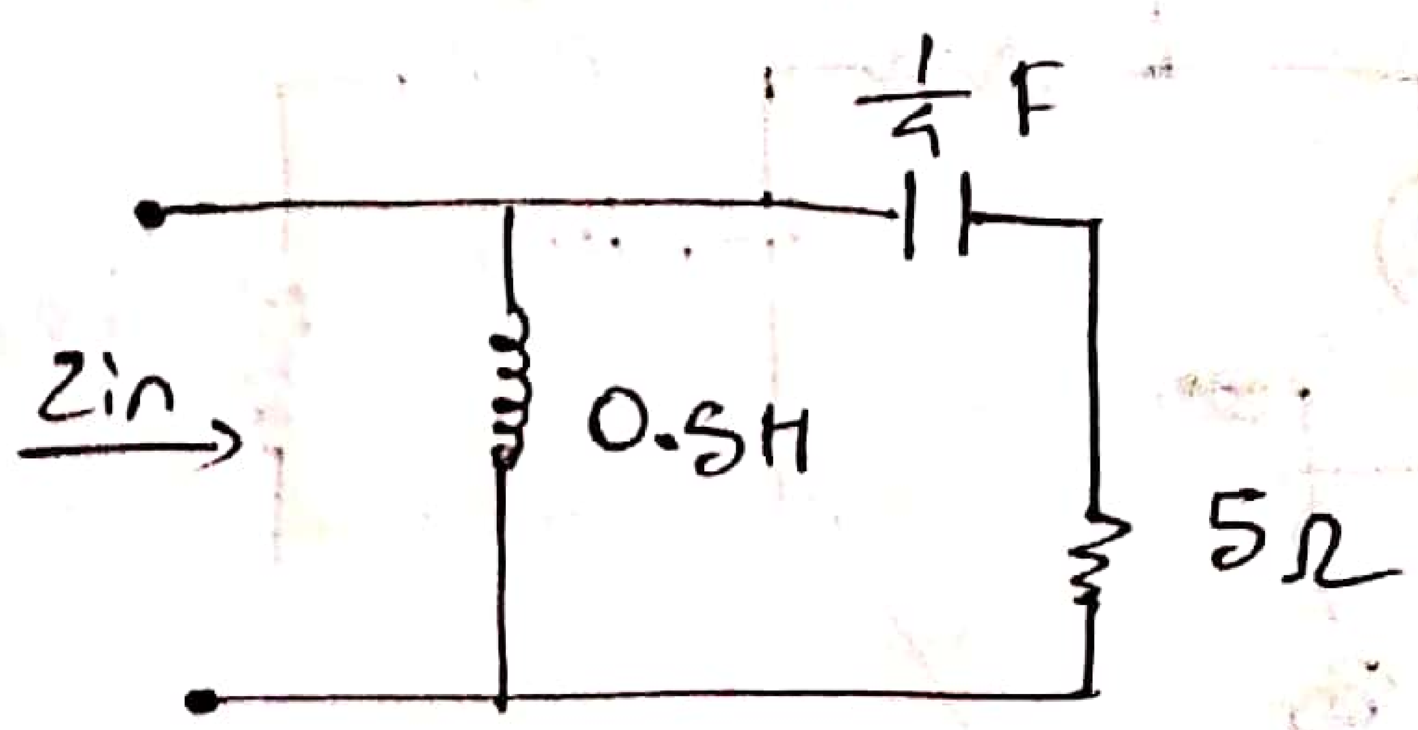
$$= 10 \times 10^{-3} \frac{d}{dt}(5e^{-t})$$

$$= -5 \times 10 \times 10^{-3} e^{-t} V$$

$$\cancel{= 0.05 e^{-t} (4ms)}$$

$$= 0.05 e^{-t} V$$

Ans to the Qs. No 1(c)



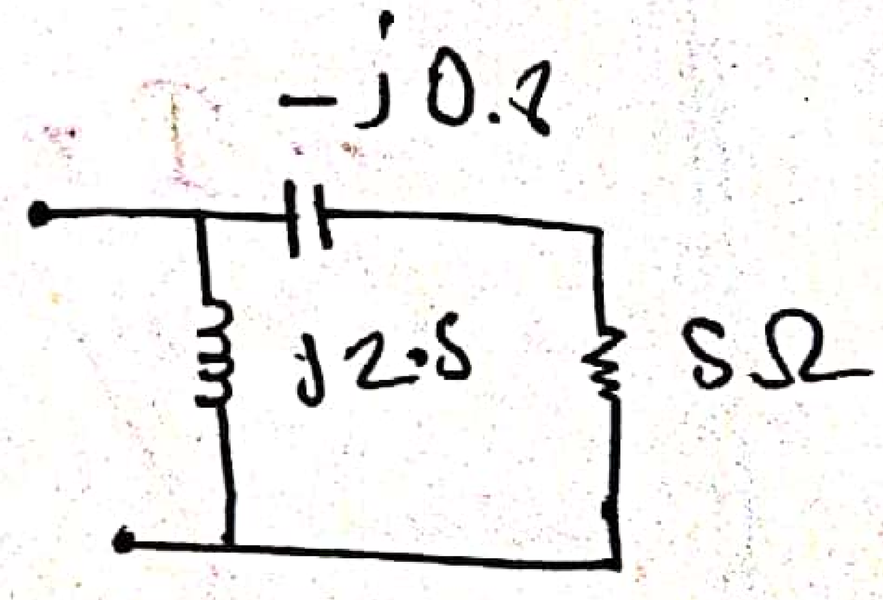
Given that,

$$\omega = 5 \text{ rad/s}$$

Here, $X_L = j\omega L$
$= j \times 5 \times 0.5 = j2.5\,\Omega$

$$X_C = \frac{1}{j\omega C}$$

$$= \frac{1}{j \times 5 \times \frac{1}{4}} = -j0.8\,\Omega$$



$$Z_{in} = \left((j2.5)^{-1} + (-j0.8+5)^{-1}\right)^{-1}$$

$$= (1.12 + j2.12)\,\Omega$$

$$= 2.4 \angle 62.13^{\circ}$$ (Ans)

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Ans to the Qs. No. 01 (d)

Given that,

$V_1 = -10\sin(\omega t - 10^\circ)\,V$

$V_2 = 10\cos(\omega t + 10^\circ)\,V$

We know,

$V(t) = V_m \cos(\omega t + \phi)$

$V_1 = -10\sin(\omega t - 10^\circ)\,V$

$= 10\cos(\omega t - 10^\circ + 90^\circ)\,V$

$= 10\cos(\omega t + 80^\circ)\,V$

$V_2 = 10\cos(\omega t + 10^\circ)\,V$

phase difference $= \theta_1 - \theta_2$

$= (80^\circ - 10^\circ)$

$= 70^\circ$

V_1 Leads V_2 by 70° (Ans)

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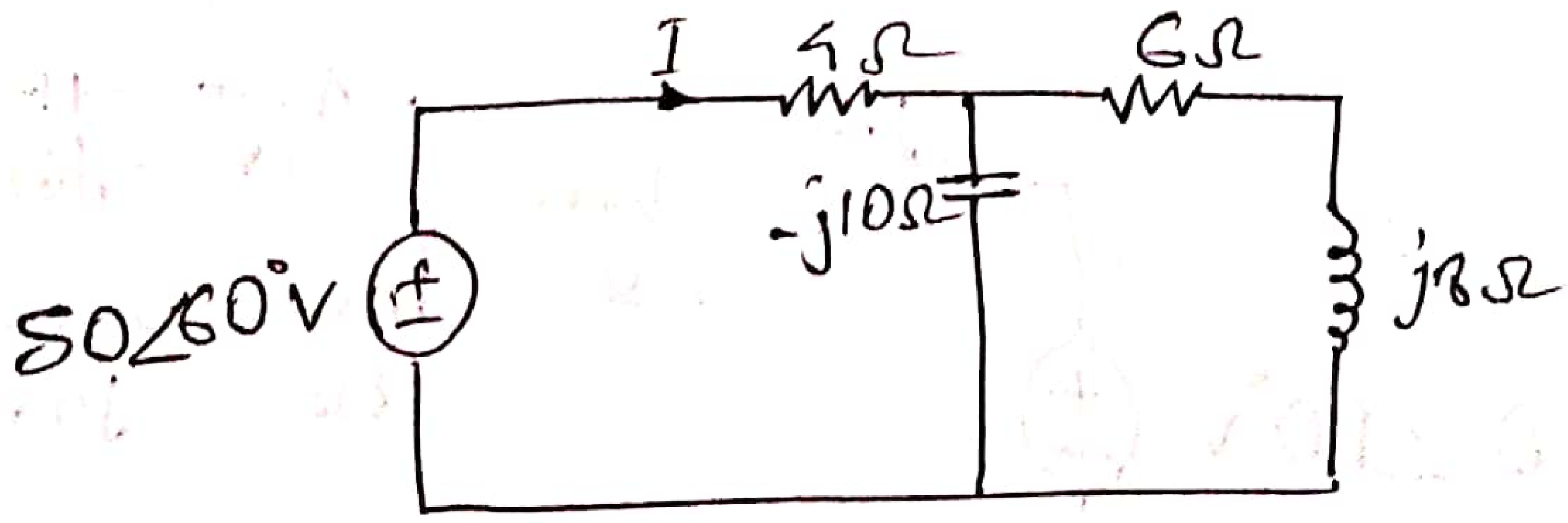
Ans to the Qs No 01 (e)



Here,

$w = 0$ rad/s

$\therefore Z_1 = 4 + ((-j10)^{-1} + (6+j8)^{-1})^{-1}$

$= 19 - j5$

$= 19.65\angle -14.74^\circ$

$\therefore I = \frac{V}{Z} = \frac{50\angle 60^\circ}{19.65\angle -14.74}$

$= 2.54\angle 74.74^\circ$

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Answer the Q.No.2 (a)

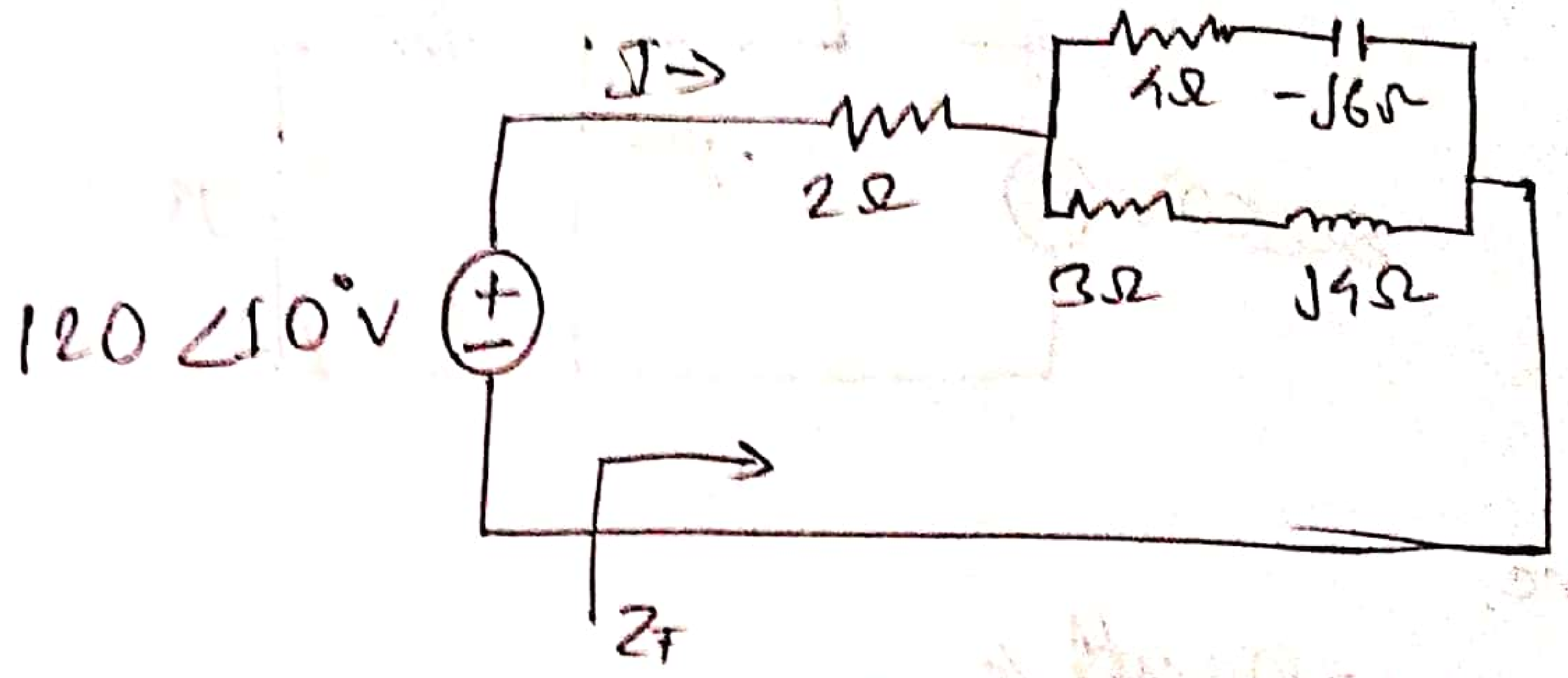

Fig = 1

From the Figure 1 the total impedance is

$$Z_T = 2 + (4 - j6) \parallel (3 + j4)$$

$$= 2 + \frac{(4-j6)(3+j4)}{(4-j6)+(3+j4)}$$

$$= 2 + \frac{(4(3+j4) - j6(3+j4))}{(4-j6)+(3+j4)}$$

$$= 2 + \frac{(12 + j16 - j18 + 24)}{7 - j2}$$

$$= 2 + \left(\frac{36 - j2}{7 - j2}\right)$$

$$= 6.83 + j1.094\,\Omega$$

Sub :

The total impedence ~~in~~ in the circuit Z_T is $= 6.8~~8~~3 + j1.094\,\Omega$

The current flowing is the circuit is

$$I = \frac{V}{Z_T}$$

$$= \frac{120\angle 10^\circ}{6.83 + j1.094}$$

$$= 17.34 + j0.27$$

$$= 17.34\angle 0.9^\circ A$$

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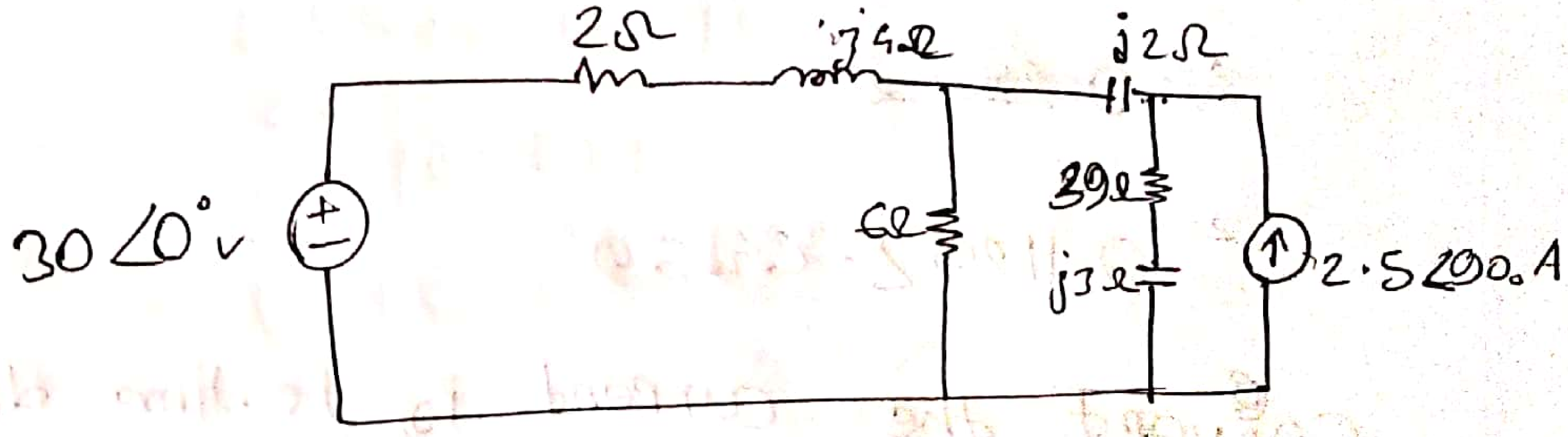
Ans to the Qs No. 2(b)

$$x = (37+2)\,\Omega$$
$$= 39\,\Omega$$

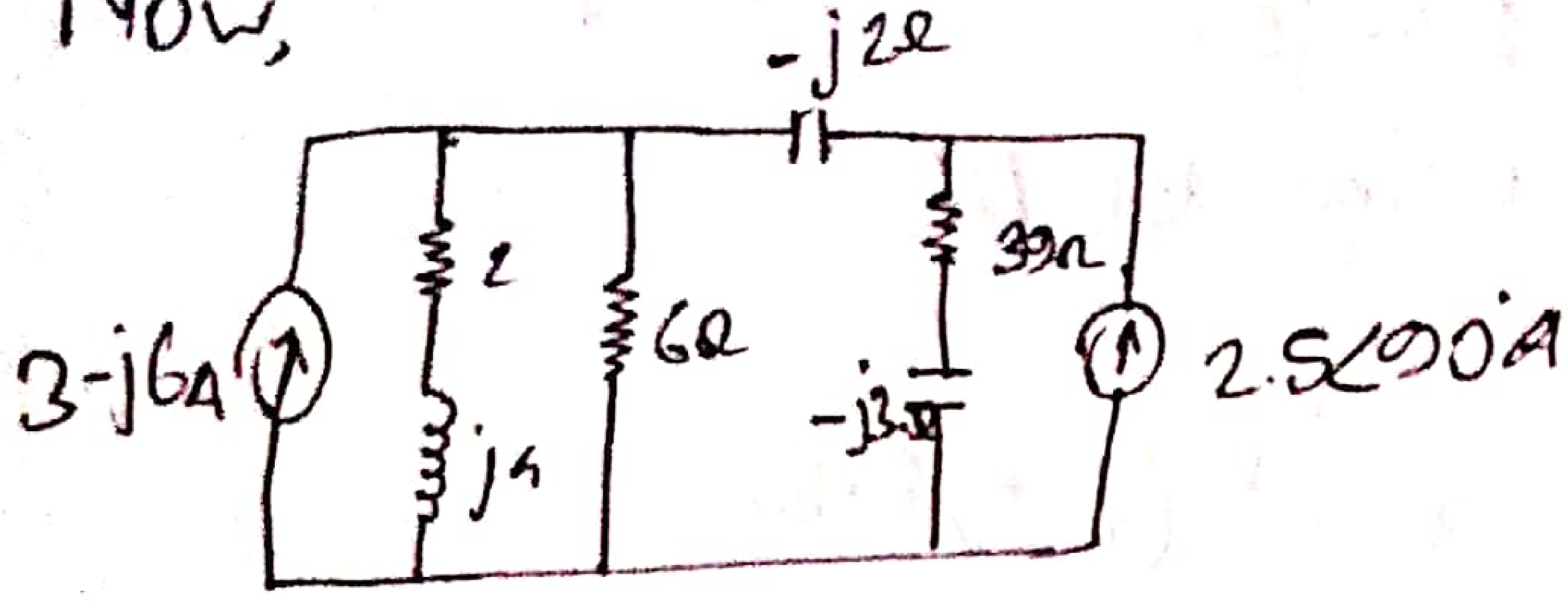


We transform the voltage source to current source

$$I_s = \frac{30\angle 0^\circ}{2+j4}$$
$$= 3 - j6\ A$$

Sub :

Now,



Now,

$$Z_s = 6 \parallel (2+j4)$$

$$= \frac{6(2+j4)}{8+j4}$$

$$= \frac{12}{5} + \frac{9}{5}i = 2.4 + j1.8$$

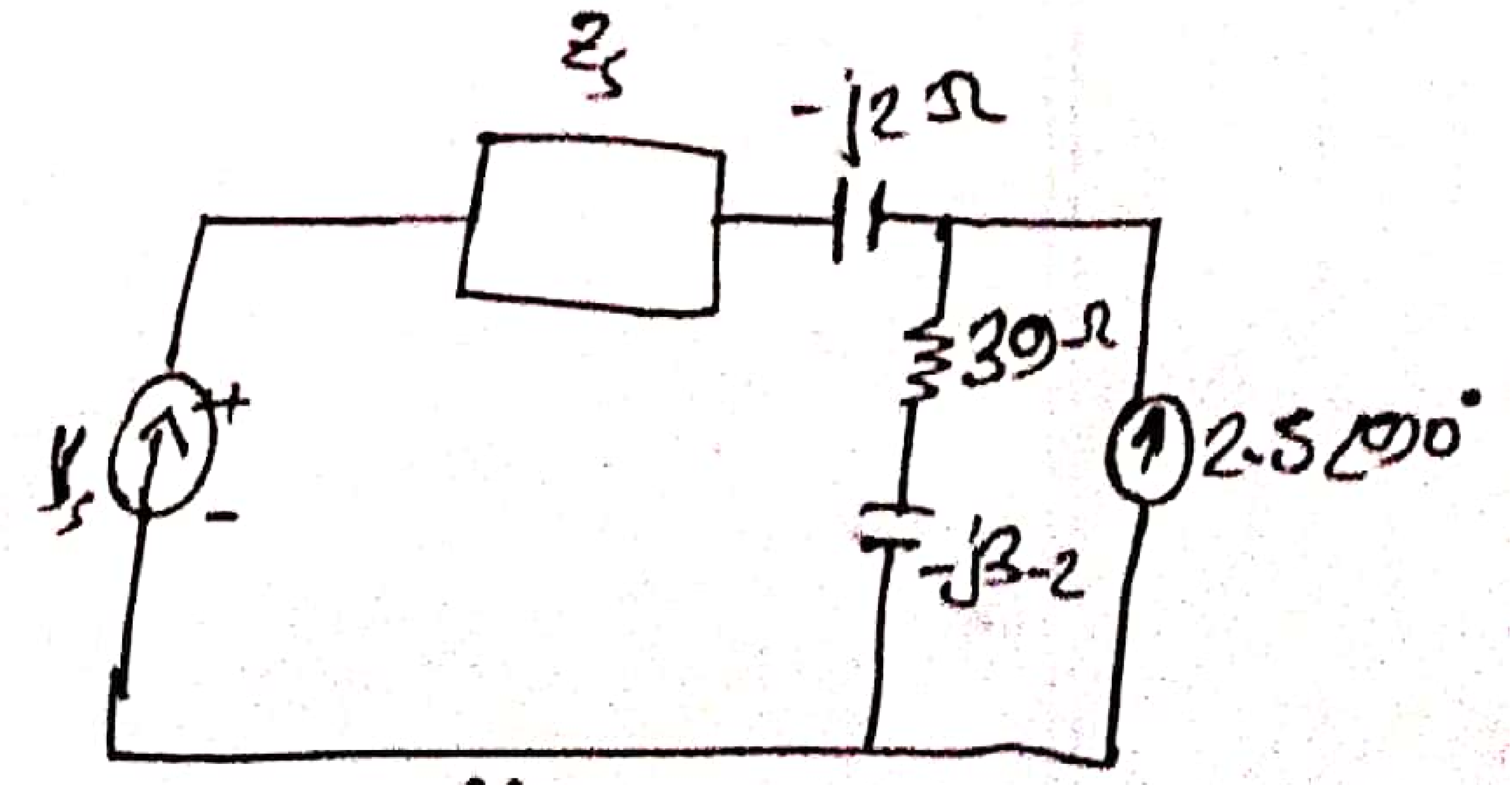
Therefore,

$$V_s = I_s \times Z_s$$

$$= (3-j6) \times (2.4+j1.8)$$

$$= 18 - j9$$

Here, $2.5\angle 90^\circ A = j2.5\ A$



(b)

from fig(b).

$$Z_0 = Z_s - j2$$

$$= 2.4 + j1.8 - j2$$

$$= 2.4 - j0.2$$

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So, $I_o = \frac{V_s}{Z_o} = \frac{18 - j0}{2.4 - j0.2} = 7.76 - j3.103A$

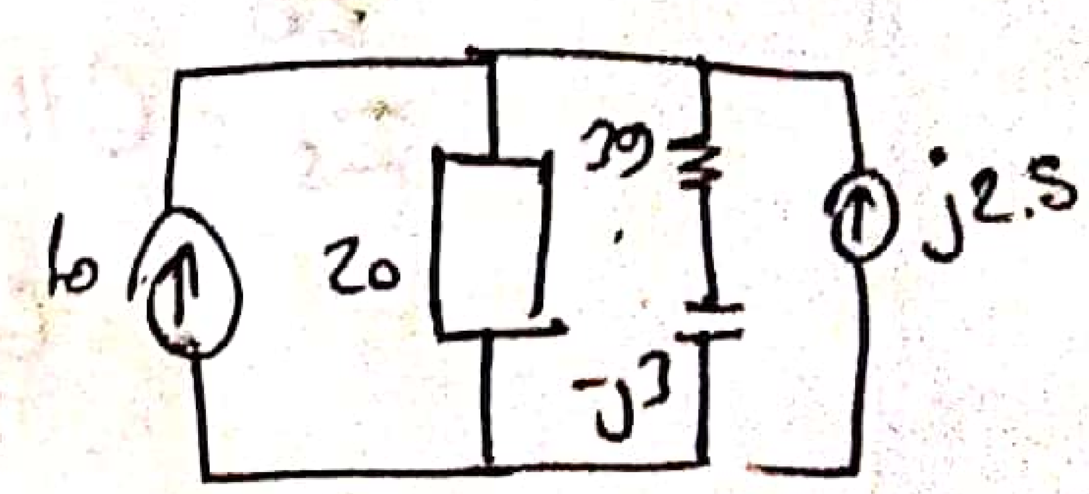
From fig(c) By using CDR,

$$I_x = \left(\frac{Z_o}{Z_o + 39 - j3}\right) \times (I_o + j2.5)$$

$$= \frac{2.4 - j0.2}{2.4 - j0.2 + 39 - j3} \times (7.76 - j3.103 + j2.5)$$

$= \cancel{(0.10625+}$

$= 0.41 \angle -0.023023^\circ A$



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Ans to the Qs. No. 4(a)

The total curent due to acting of both sources is

$i_o = i_{o1} + i_{o2}$

i_{o1} is the reponse due to 8V be source and

i_{o2} is the puen due to $10\cos(4t)$ v

Ac source

the buld i_{o1} set ac source value to zero In a steady state inductor acts like a s-ort circuit.

My id = 37+1 = 38Ω

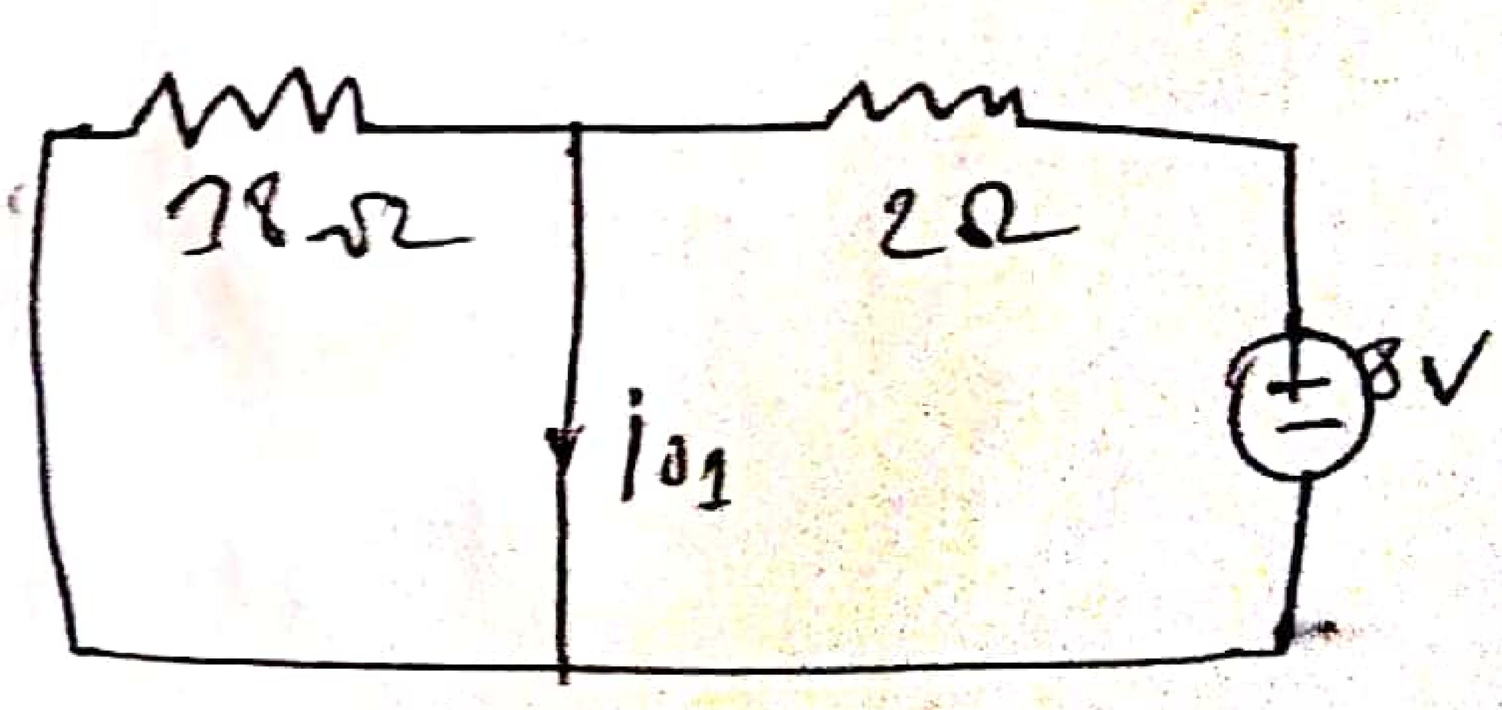

Fig1

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Since 4Ω resistor is conec in parellel with short circuit.

cure ent i_{o1}

$$i_{o1} = \frac{8}{2}$$

$$= 4A$$

Therforn the current i_{o1} due to ~~8~~8v DC source in 4A

to find i_{o2}. set dc volue A 0 zero ~~and~~ and trausforn the circuit int frequency domin.

$w = 4\ rad/s$

The posor $10\angle 0^\circ v$

Inductor

$x_L = jwL$

$= j(4)(1)$

$= j4\Omega$

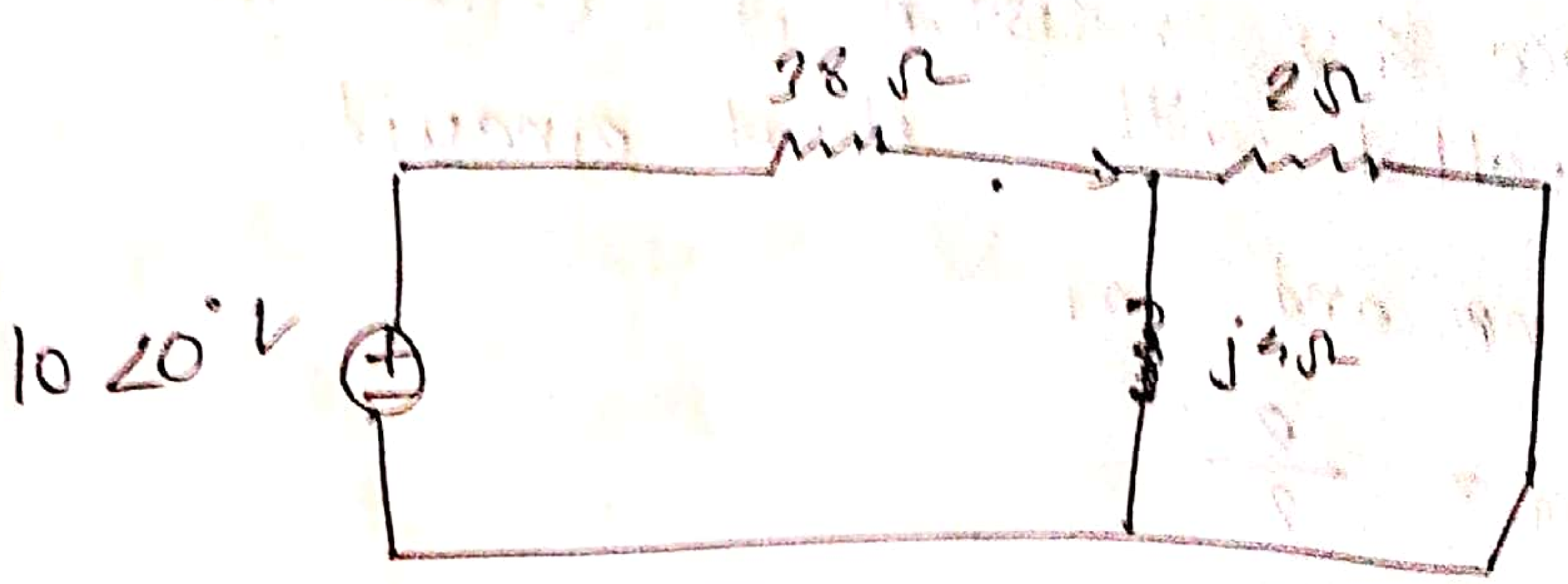

Fig - 2

$$Z_T = 38 + (2 \parallel j4)$$

$$= 38 + \left(\frac{2 \times j4}{2 + j4}\right)$$

$$= 38 + \left(\frac{8}{5} + \frac{4}{5} i\right)$$

$$= 39.6 + 0.8i$$

$$I_T = \frac{10\angle 0^\circ}{Z_T}$$

$$= \frac{10\angle 0}{39.6 + 0.8i}$$

$$= \frac{405}{1961} - \frac{10}{1961} i$$

- Calculate the value of current I_{0L} using current division principle

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$$i_{o_2} = \left(\frac{2}{2+8j4}\right) I_T$$

$$= \left(\frac{2}{2+j4}\right)\left(\frac{405}{1961} - \frac{10}{1961} i\right)$$

$$= \frac{05}{1961} - \frac{2000}{1961} i$$

$$= 0.1129 \angle -64.59^\circ$$

Convend the current i_{o_2} to time domain

$$i_2 = 0.1129 \cos(4t - 64.59) A$$

total current

$$i_o = i_{o1} + i_{o2}$$

$$~~= 4 + 0.1129 \cos(4t + 64.59) A~~$$

$$~~(4t - 0.1129 + 64.59) A~~$$

~~the value of current I_o is [4t cos (4t - 64.59) A~~

$$4 + 0.1120 \cos(4t - 64.59^\circ) A$$

The valu of currnm

I_o is $[4 + 0.1129 \cos(4t - 64.59^\circ) A]$

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Ans to the Qs No. 5

(i) Given that,

$$V_1 = x = 037$$

$$N_1 = 600$$

$$N_2 = 20$$

$\therefore$ Primary load full current

$$I_1 = \frac{25 \times 10^3}{037}$$

$$= 675.675 \text{ Amp}$$

(ii) We know that

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

Hence,

$$I_2 = \frac{N_1}{N_2} \times I_1$$

$$\Rightarrow I_2 = \frac{600}{20} \times 675.67$$

$$= 20270.1 \text{ A}$$

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(iii) Given that,

$$F_1 = 037\,v$$

$$N_s = 20$$

$$N_p = 600$$

Here sendery emf $\dfrac{E_1}{E_2} = \dfrac{N_p}{N_s}$

$$\Rightarrow E_2 = \frac{E_1 \times N_s}{N_p}$$

$$\Rightarrow E_2 = \frac{037 \times 20}{600}$$

$$\Rightarrow E_2 = 1.233\,v$$ (Ans)

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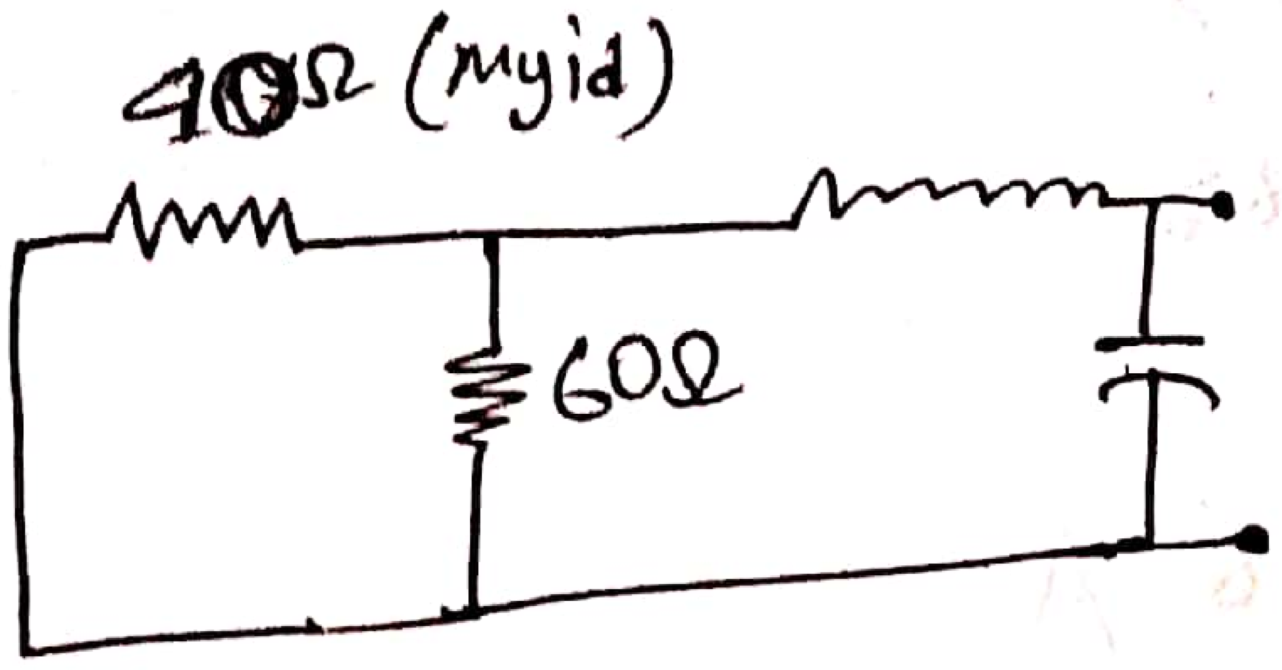
Ans. 4(b)



$Z_N = Z_{th} = -5j \parallel [(40 \parallel 60) + 10j)]$

$= -5j \parallel [13.24 + 10j]$

$= 4.88 \angle -77.85$

Find voltage across 60Ω on a mmr

$V_{60\Omega} = (120\angle 45^\circ) \left[\frac{60 \parallel (j10 - j5)}{40 + (60 \parallel (j10 - j5))} \right]$

$= (120\angle 45^\circ) \times (0.12\angle 78.23^\circ)$

$V_{60\Omega} =$ ~~[illegible]~~ $72/5 \angle 123.23$

Now volt aan divmy

$V_{ab} = (72/5 \angle 123.23) \left(\frac{-j5}{j10 - j5} \right)$

$= 72/5 \angle -56.77$

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$$I_N = \frac{V_{th}}{Z_{th}}$$

$$= \frac{78.13 \angle -56.77}{4.88 \angle -77.85}$$

$$= 2.95 \angle 21.08^\circ \; A$$

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