

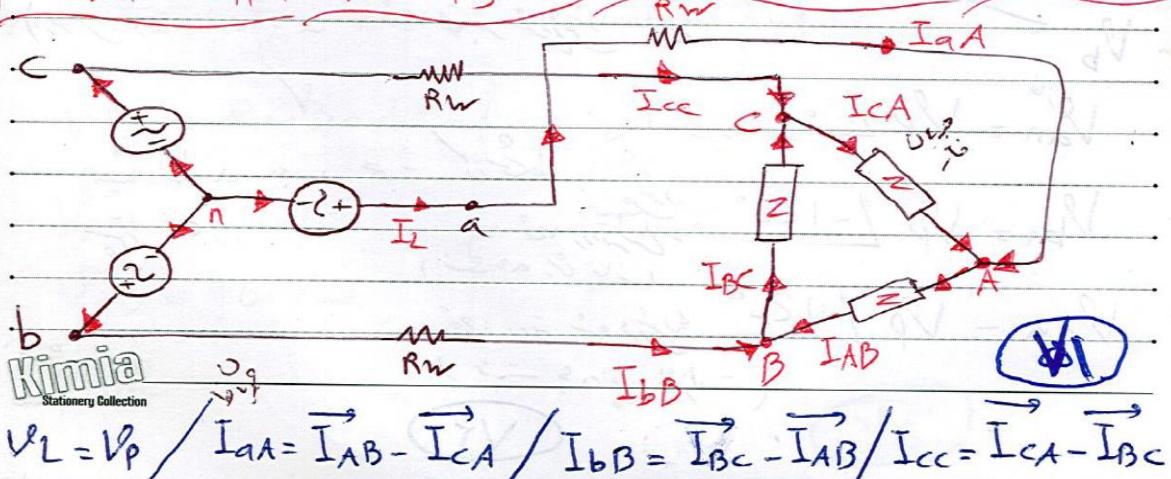
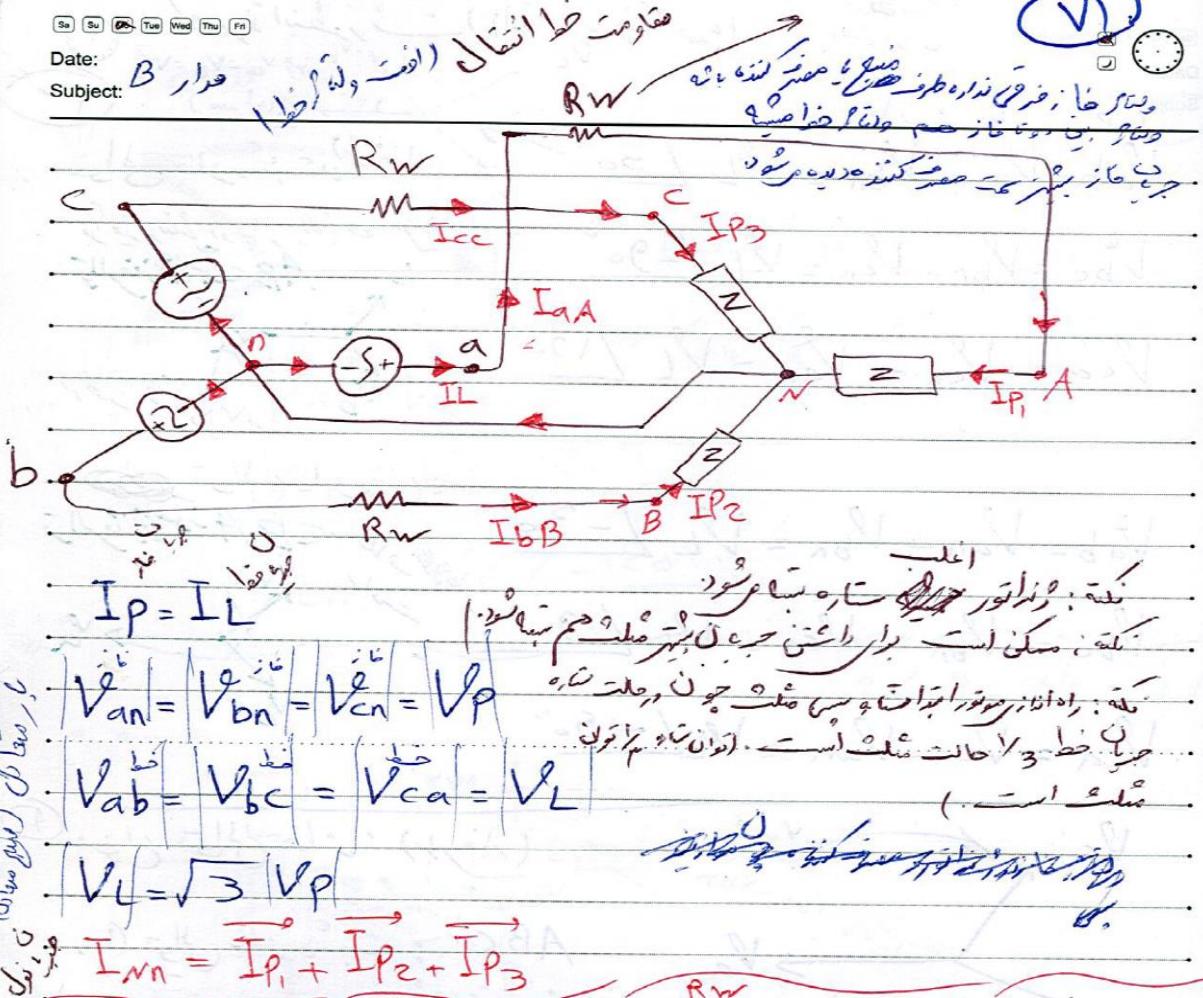
خط مدار (لحن) چون که ایست صفت پسر است.

Sa Su Tue Wed Thu Fr

Date:

Subject:

VI



آخر درسنا بارها مقادير بالـ \angle و ϕ $\varphi_1 = \phi_1 - \phi_2$ و $Z_1 = Z_2 = Z$
 انتظاركم لا انتظركم \rightarrow (الله يرحمك) $V_C = V_A - V_B = V_L$

Date:

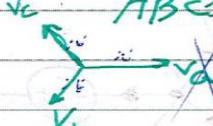
Subject:

كان طار خطا

$$V_{ab} = V_{an} - V_{bn} = V_L / 30^\circ$$

$$V_{bc} = V_{bn} - V_{cn} = V_L / -90^\circ$$

$$V_{ca} = V_{cn} - V_{an} = V_L / 150^\circ$$

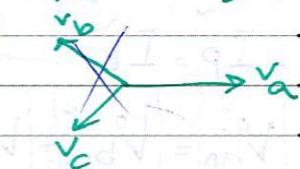


$$V_{ab} = V_{an} - V_{bn} = V_L / -30^\circ$$

$$V_{bc} = V_{bn} - V_{cn} = V_L / 90^\circ$$

$$V_{ca} = V_{cn} - V_{an} = V_L / -150^\circ$$

حوالى فاز متر: CBA



أنواع حوالى فاز: (بار فاز) ①

$$V_{ab} = V_L / 30^\circ$$

(1) حوالى فاز متر: ABC

(بر فاز) $a = 120^\circ$, $b = 0^\circ$, $c = -120^\circ$

$$V_{an} = V_p / 0^\circ$$



$$V_{bn} = V_p / -120^\circ$$

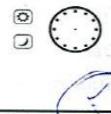
حسب ادراك بعد رجوع a, b, c سهل

$$V_{cn} = V_p / 120^\circ$$

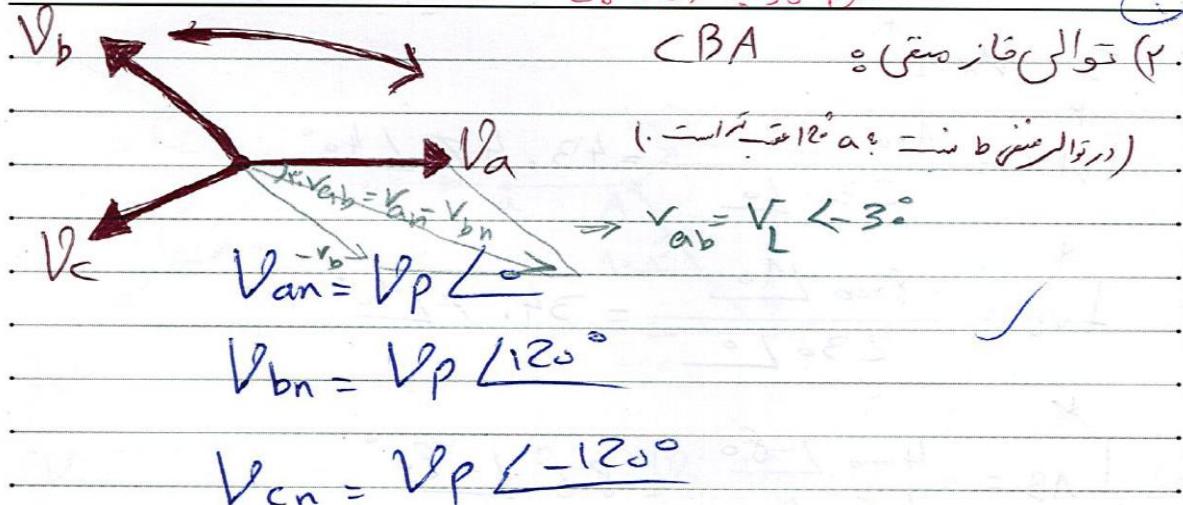
(بر فاز) $a = 0^\circ$, $b = -120^\circ$, $c = 120^\circ$

VI

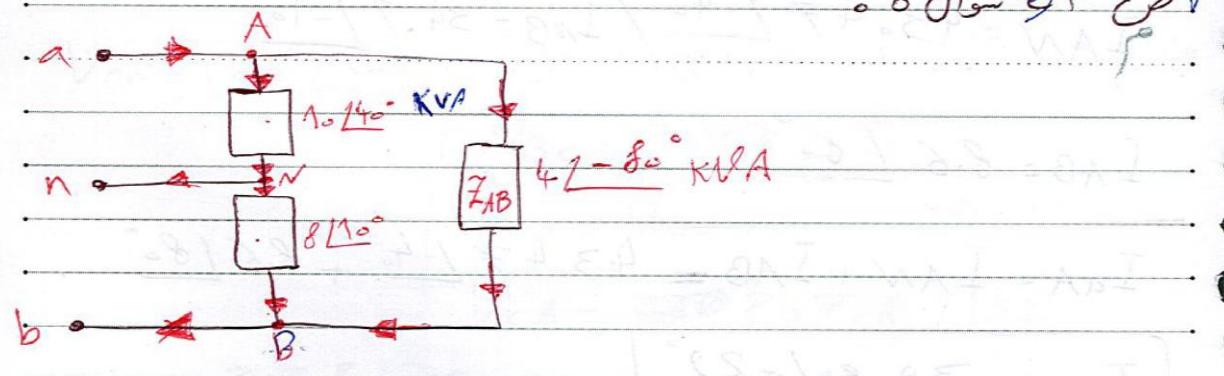
٩:٨ : ٣٤ ص
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٢٨٠ ٢٧٠ ٣٦ : ٣٦ ص



(١)



٦ ج ٣٤ ص



$$V_{AN} = 230 \angle 7^\circ$$

$$V_{NB} = 230 \angle 0^\circ$$

$$V_{AB} = 460 \angle 0^\circ$$

$$S = V \times I^*$$

$$I_{AN}^* = \frac{10000 \angle 40^\circ}{230 \angle 0^\circ} = 43.47 \angle 40^\circ$$

$$I_{NB}^* = \frac{8000 \angle 10^\circ}{230 \angle 0^\circ} = 34.7 \angle 10^\circ$$

$$I_{AB}^* = \frac{4000 \angle -80^\circ}{460 \angle 0^\circ} = 8.6 \angle -80^\circ$$

$$I_{AN} = 43.47 \angle -40^\circ / I_{NB} = 34.7 \angle -10^\circ$$

$$I_{AB} = 8.6 \angle 80^\circ$$

$$I_{AA} = I_{AN} + I_{AB} = 43.47 \angle -40^\circ + 8.6 \angle 80^\circ$$

$$I_{AA} = 39.8 \angle -20^\circ$$

$$I_{BB} = I_{NB} + I_{AB} = 34.7 \angle -10^\circ + 8.6 \angle 80^\circ$$

$$I_{BB} = 35.7 \angle 30^\circ$$

$$I_{NN} = I_{AN} - I_{NB} = 43.47 \angle -40^\circ - 34.7 \angle -10^\circ$$

$$I_{NN} = 21.9 \angle -92.2^\circ$$

✓

ریخت حل \leftarrow ۱) موزو خازها \leftarrow ۲) موزو خطها \leftarrow ۳) جریان فیزیک \leftarrow ۴) جریان خطوط

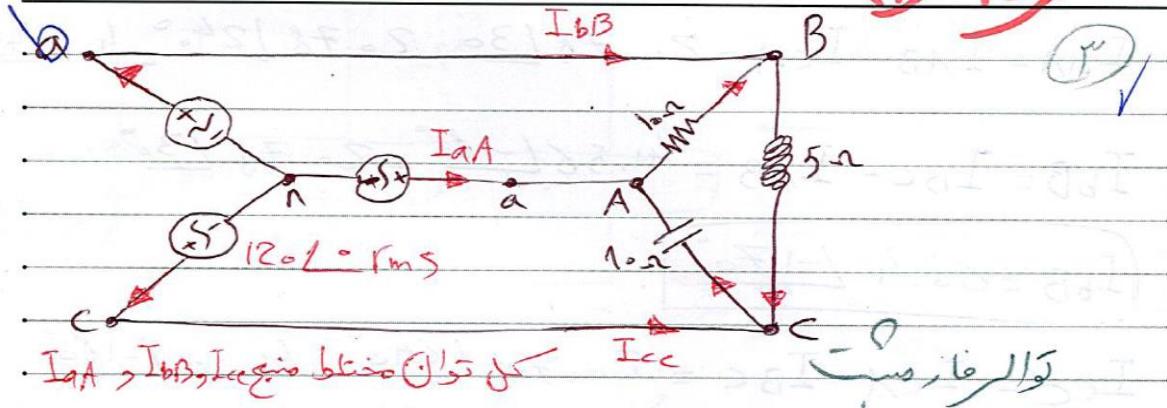
Sa Su Mo Tue Wed Thu Fr

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۲۴۰۵۰



$$V_{An} = 12 \angle 1^\circ \quad \left. \begin{array}{l} V_{AB} = V_A - V_B = 12 \angle 1^\circ - 12 \angle -12^\circ \\ V_{BC} = V_B - V_C = 12 \angle -12^\circ - 12 \angle 12^\circ \end{array} \right\}$$

$$V_{Bn} = 12 \angle -12^\circ \quad \left. \begin{array}{l} V_{AB} = 20.78 \angle 3^\circ \\ V_{BC} = 20.78 \angle -9^\circ \end{array} \right\}$$

$$V_{Cn} = 12 \angle 12^\circ \quad \left. \begin{array}{l} V_{BC} = V_B - V_C = 12 \angle 12^\circ - 12 \angle 12^\circ \\ V_{CA} = V_C - V_A = 12 \angle 12^\circ - 12 \angle 1^\circ \end{array} \right\}$$

$$V_{CA} = 20.78 \angle 15^\circ$$

$$I_{AB} = \frac{20.78 \angle 3^\circ}{1\Omega} = 20.78 \angle 3^\circ$$

$$I_{BC} = \frac{20.78 \angle -9^\circ}{5\Omega} = 4.156 \angle -18^\circ$$

$$I_{CA} = \frac{20.78 \angle 15^\circ}{1-j} = 20.78 \angle 24^\circ$$

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V_A

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$$I_{aA} = I_{AB} - I_{cA} = 20.78 \angle 30^\circ - 20.78 \angle 24^\circ = 40.1 \angle 45^\circ$$

$$I_{bB} = I_{BC} - I_{AB} = 41.56 \angle -18^\circ - 20.78 \angle 30^\circ$$

$$I_{bB} = 50.4 \angle -17^\circ$$

$$I_{cc} = I_{cA} - I_{BC} = 20.78 \angle 24^\circ - 41.56 \angle -18^\circ$$

$$I_{cc} = 35.9 \angle -30^\circ$$

$$g_{io} S = V_{an} \cdot I_{aA}^* + V_{bn} \cdot I_{bB}^* + V_{cn} \cdot I_{cc}^*$$

$$g_{io} S = (120 \angle 0^\circ)(40.1 \angle 45^\circ) + (120 \angle -120^\circ)(50.4 \angle 17^\circ)$$

$$+ (120 \angle 120^\circ)(35.9 \angle 30^\circ) = 6105.45 \angle 44.82^\circ$$

V.A

V4

$$V = 8 \angle 32^\circ$$

$$Z_L = 2 + j5$$

$$R = 0.1 - j0.3$$

$$Z_L = \frac{1}{R} = \frac{1}{0.1 - j0.3}$$

$$= 1 + j3 \Omega$$

$$-5 \angle 30^\circ + \frac{V}{2 + j5} + \frac{V}{1 + j3} = 0$$

$$0.185 \angle -68^\circ V + 0.2 \angle -36.8^\circ V = 5 \angle 30^\circ$$

$$\Rightarrow V = \frac{5 \angle 30^\circ}{0.185 \angle -68^\circ + 0.2 \angle -36.8^\circ} = 13.4 \angle 181.7^\circ$$

$$I_2 = \frac{13.4 \angle 181.7^\circ}{1 + j3} = 2.68 \angle 44.8^\circ \Rightarrow V_{3\omega} = 8.04 \angle 143.8^\circ$$

$$\text{real } S = \frac{1}{2} \times V \times I^* = \frac{1}{2} (8.04 \angle 143.8^\circ) (2.68 \angle -44.8^\circ)$$

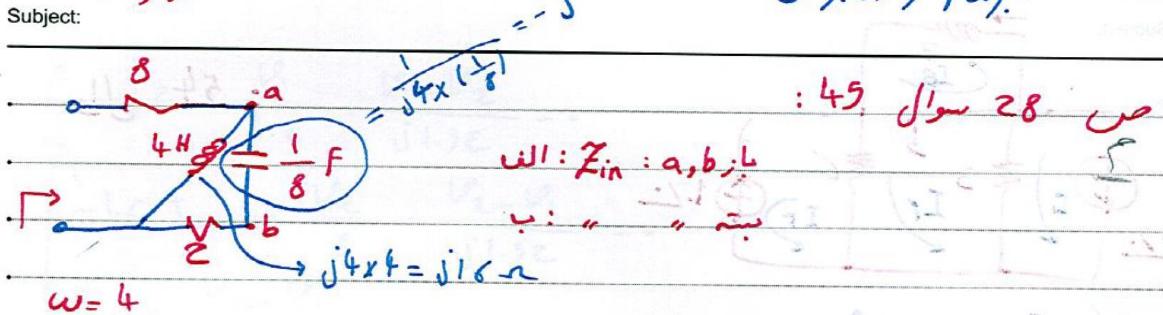
$$= 10.77 \text{ W}$$

$$\text{app } S = \frac{1}{2} \times V \times I^* = \frac{1}{2} (13.4 \angle 181.7^\circ) (5 \angle -3.0^\circ)$$

$$= \underbrace{20.7}_{W} + 26.2j$$

Subject:

ص 28 سوال 45



النيل: $Z_{in} = a, b$

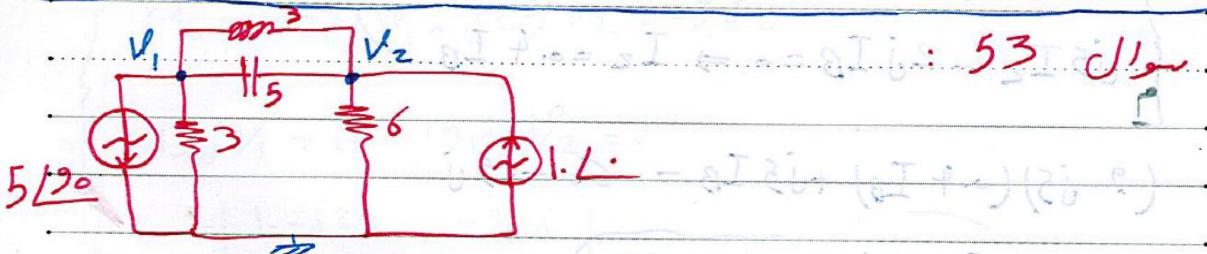
ب: " بسته "

المت:

$$Z_{in} = \frac{(2-j2)(j16)}{2-j2+j16} + 8$$

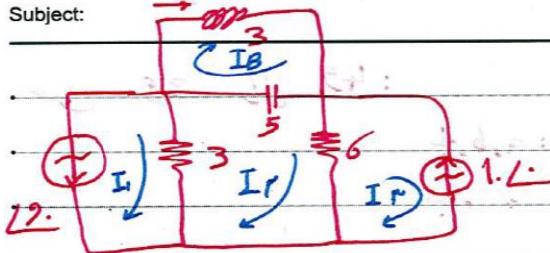
$$Z_{in} = \frac{(2-j2)(j16)}{2-j2+j16} + 8 = \frac{32+32j}{2+14j} + 8 = 10.7 \angle -10^\circ$$

$$Z_{in} = \frac{(2)(j16)}{2+j16} + 8 \Rightarrow Z_{in} = \frac{j32}{2+j16} + 8 = 9.97 \angle 11.4^\circ$$



$$\left\{ \begin{array}{l} 5\angle 90^\circ + \frac{V_1}{3} + \frac{V_1 - V_2}{j5} + \frac{V_1 - V_2}{-j5} = 0 \\ -1.1 \angle 0^\circ + \frac{V_2}{6} + \frac{V_2 - V_1}{3j} + \frac{V_2 - V_1}{-j5} = 0 \end{array} \right.$$

$$\left\{ \begin{array}{l} (5-2j)V_1 + 2jV_2 = -75j \\ 4jV_1 + (5-4j)V_2 = 300 \end{array} \right. \Rightarrow V_2 = \frac{\begin{vmatrix} 5-2j & -75j \\ 4j & 300 \end{vmatrix}}{\begin{vmatrix} 5-2j & 2j \\ 4j & 5-4j \end{vmatrix}} = \frac{-300}{25-20j} = \frac{1200-600j}{25-30j} = 34.3 \angle 23^\circ$$

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سؤال 54

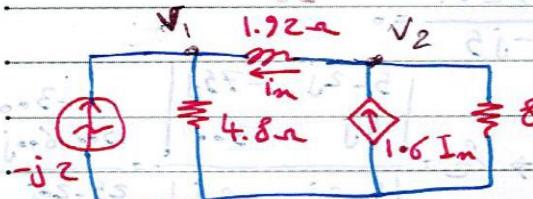
$$\left\{ \begin{array}{l} I_1 = -5 \angle 90^\circ \\ 3(I_2 + 5 \angle 90^\circ) - j5(I_2 - I_B) + 2(I_2 + 1 \cdot L) = 0 \\ I_3 = -1 \cdot L \\ j3I_B - j5(I_B - I_2) = 0 \end{array} \right.$$

$$\left\{ \begin{array}{l} (9 - j5)I_2 + j5I_B = -60 - 15j \\ j5I_2 - 2jI_B = 0 \Rightarrow I_2 = 0.4I_B \end{array} \right.$$

$$(9 - j5)(0.4I_B) + j5I_B = -60 - 15j$$

$$I_B = \frac{-60 - 15j}{3.6 + 3j} = 13 \angle 154^\circ$$

سؤال 32



متوسط توان = ?

واسطه منج

VA

Subject:

$$\left\{ \begin{array}{l} +jZ + \frac{V_1}{4.8} + \frac{V_1 - V_2}{j1.92} = 0 \\ -1.6 I_m + \frac{V_2}{8} + \frac{V_2 - V_1}{j1.92} = 0 \end{array} \right.$$

$$I_m = \frac{V_2 - V_1}{j1.92}$$

$$\left\{ \begin{array}{l} jZ + \frac{V_1}{4.8} + \frac{V_1 - V_2}{j1.92} = 0 \quad \xleftarrow{\times 4.8} \\ -1.6 \frac{V_2 - V_1}{j1.92} + \frac{V_2}{8} + \frac{V_2 - V_1}{j1.92} = 0 \quad \xleftarrow{\times 4.8} \end{array} \right.$$

$$\left\{ \begin{array}{l} (10 - 25j)V_1 + j25V_2 = -96j \\ -15jV_1 + (6 + 15j)V_2 = 0 \end{array} \right.$$

$$V_2 = \frac{\begin{vmatrix} 10 - j25 & -96j \\ -15j & j25 \end{vmatrix}}{\begin{vmatrix} 10 - j25 & j25 \\ -15j & 6 + j15 \end{vmatrix}} = \frac{1440}{60} = 24V$$

$$V_1 = \frac{(6 + j15)(24)}{15j} = 25.8 \angle -21.8^\circ$$

$$I_m = \frac{24 - 25.8 \angle -21.8^\circ}{j1.92} = 5 \angle -0.26^\circ \quad \text{No}$$

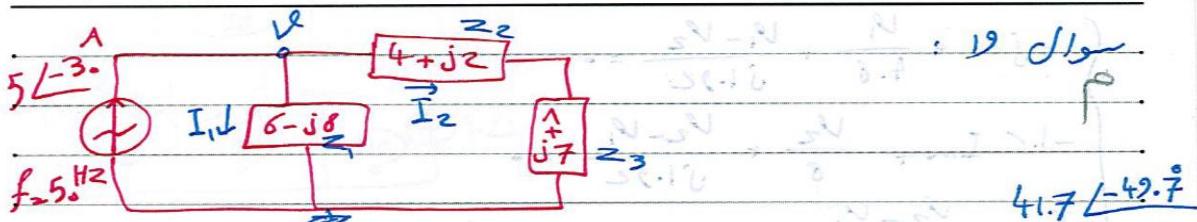
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$$I_m = (1.6)(5 \angle -0.26^\circ) = 8 \angle -0.26^\circ$$
$$S = \frac{1}{2} V_2 \cdot I^* = \frac{1}{2} (24)(8 \angle 0.26^\circ) = 96 + j 0.43$$

مکانی: در محلت بسیار برسی آوردن جریان خطای دو تا جریان فاز رسانی از رام
و براس برست آوردن دستگاه خاکری به رو تا وسیع مینهندن از رام

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$$-5 \angle -3^\circ + \frac{V}{6-j8} + \frac{V}{12+j9} = 0 \Rightarrow V = \frac{5 \angle -3^\circ}{0.1 \angle 53.1^\circ + 0.66 \angle -36.8^\circ}$$

$$I_1 = \frac{41.7 \angle -49.7^\circ}{6-j8} = 4.17 \angle 3.43^\circ$$

$$I_2 = I_3 = \frac{41.7 \angle -49.7^\circ}{12+j9} = 2.78 \angle -86.56^\circ$$

$$V_{Z_2} = (2.78 \angle -86.56^\circ)(4+j2) = 12.43 \angle -60^\circ$$

$$V_{Z_3} = (2.78 \angle -86.56^\circ)(8+j7) = 29.55 \angle -45.3^\circ$$

$$S_1 = \left(\frac{1}{2}\right)(41.7 \angle -49.7^\circ)(4.17 \angle -3.43^\circ) = 52.1 - j69.5$$

$$S_2 = \frac{1}{2}(12.43 \angle -60^\circ)(2.78 \angle 86.56^\circ) = 15.45 + j7.7$$

$$S_3 = \frac{1}{2}(29.55 \angle -45.3^\circ)(2.78 \angle 86.56^\circ) = 30.8 + j27$$

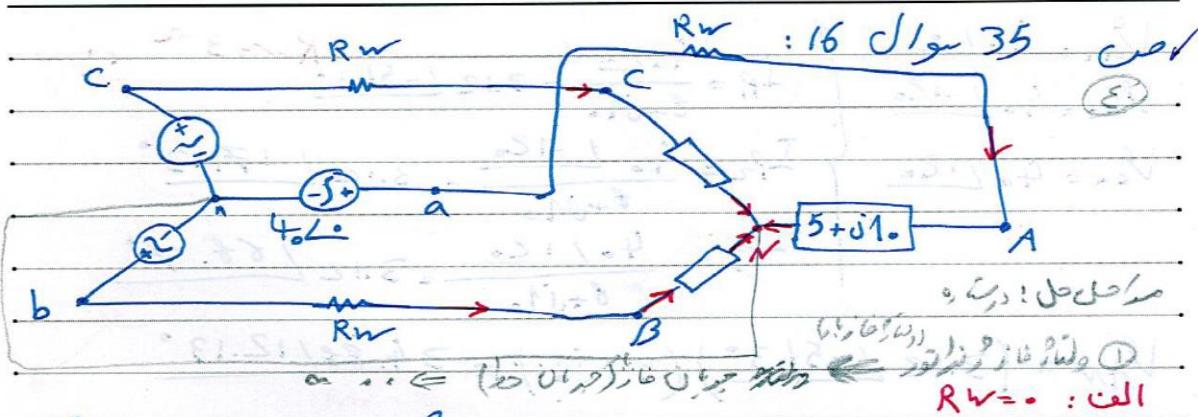
$E + jB + 2S = (25.0 - j15.0) + \frac{1}{3}(52.1 - j69.5) + \frac{1}{3}(15.45 + j7.7) + \frac{1}{3}(30.8 + j27)$

(11)

ولی درستاره براز برسی وردن جریان خواسته است جریان

فشار را ببری درستاره برسی برسی وردن و لکه فشار آغاز فشار آغاز

Date: Subject: **C** سوال 35 : حصہ ۱۶



$$\begin{aligned} V_{AN} &= 4 \angle 0^\circ \\ V_{BN} &= 4 \angle -120^\circ \\ V_{CN} &= 4 \angle 120^\circ \end{aligned} \quad \left\{ \begin{array}{l} R_w = 0 \\ \rightarrow \end{array} \right. \begin{aligned} V_{AN} &= 4 \angle 0^\circ \\ V_{BN} &= 4 \angle -120^\circ \\ V_{CN} &= 4 \angle 120^\circ \end{aligned}$$

$$I_{AP_1} = I_{P_1} = I_{L_1} = \frac{V_{AN}}{Z} = \frac{4 \angle 0^\circ}{5+j1} = 3.57 \angle -63.4^\circ \quad \text{جریان خط}$$

$$I_{BP_1} = I_{P_1} = \frac{4 \angle -120^\circ}{5+j1} = 3.57 \angle 176.4^\circ$$

$$I_{CP_1} = I_{P_1}^* = \frac{4 \angle 120^\circ}{5+j1} = 3.57 \angle 56.54^\circ \quad \text{نیز مقادیر ممکن}$$

$$S = \frac{1}{2} V_{AN} \cdot I_{P_1}^* + \frac{1}{2} V_{BN} \cdot I_{P_1}^* + \frac{1}{2} V_{CN} \cdot I_{P_1}^* = \frac{1}{2} V_{AN} \cdot I_{P_1}^*$$

$$S = \frac{1}{2} (4 \angle 0^\circ) (3.57 \angle -63.4^\circ) + \frac{1}{2} (4 \angle -120^\circ) (3.57 \angle 176.4^\circ)$$

$$\text{Kimia} + \frac{1}{2} (4 \angle 120^\circ) (3.57 \angle 56.54^\circ) = 214.1 \angle 63.5^\circ$$

جواب مطابق است که میتواند باستخراج مذکور شده من

۸۲

$$\begin{aligned}
 V_{an} &= 4 \angle 12^\circ \\
 V_{bn} &= 4 \angle -12^\circ \\
 V_{cn} &= 4 \angle 12^\circ
 \end{aligned}
 \quad
 \left\{
 \begin{array}{l}
 I_{P_1} = \frac{4 \angle 12^\circ}{8+j10} = 3.12 \angle -51.3^\circ \\
 I_{P_2} = \frac{4 \angle -12^\circ}{8+j10} = 3.12 \angle -171.3^\circ \\
 I_{P_3} = \frac{4 \angle 12^\circ}{8+j10} = 3.12 \angle 68.7^\circ
 \end{array}
 \right. \quad R_w = 3 \Omega$$

$$V_{AN} = (3.12 \angle -51.3^\circ) (5 + j10) = 34.88 \angle 12.13^\circ$$

$$V_{BN} = (3.12 \angle -171.3^\circ) (5 + j10) = 34.88 \angle -107.8^\circ$$

$$V_{CN} = (3.12 \angle 68.7^\circ) (5 + j10) = 34.88 \angle 132.1^\circ$$

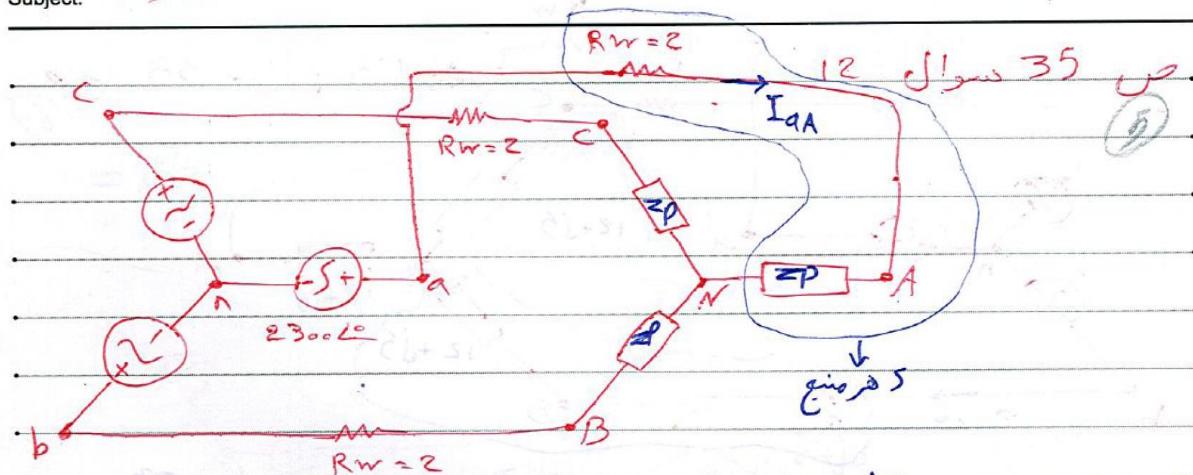
$$S = \frac{1}{2} V_{AN} I_{P_1}^* + \frac{1}{2} V_{BN} I_{P_2}^* + \frac{1}{2} V_{CN} I_{P_3}^*$$

$$S = \frac{1}{2} (34.88 \angle 12.13^\circ) (3.12 \angle 51.3^\circ) + \frac{1}{2} (34.88 \angle -107.8^\circ)$$

$$(3.12 \angle 171.3^\circ) + \frac{1}{2} (34.88 \angle 132.1^\circ) (3.12 \angle -68.7^\circ)$$

$$\underline{S = 72.9 + j146 \text{ V.A}}$$

Subject:



$$\text{معنی } S = 100 + j30 \text{ kVA} \Rightarrow \text{عوامل } S = \frac{100 + j30}{3} = 33333 + j10000 \text{ VA}$$

الآن I_{AA} $\Rightarrow V_{AN}$ Z_P γ

$$\text{معنی } S = V_{An} \cdot I_{AA}^* \Rightarrow I_{AA}^* = \frac{S}{V_{An}} = \frac{25}{23\angle 0^\circ} = 30.26 \angle 17^\circ$$

$$\Rightarrow I_{AA} = 30.26 \angle -17^\circ$$

$$Z_P + R_W = \frac{V_{An}}{I_{AA}}$$

$$V_{AN} = V_{An} - R_W \cdot I_{AA} = 23\angle 0^\circ - 1(30.26 \angle -17^\circ) = 2242 \angle 0^\circ$$

$$Z_P = \frac{V_{AN}}{I_{AA}} = \frac{2242 \angle 0^\circ}{30.26 \angle -17^\circ} = 74 \angle 17.45^\circ$$

$$\text{رانمان } \gamma = \frac{P_{A \text{ حضر}}}{P_{A \text{ فراغ}}} \times 100 = \frac{32360}{33333} \times 100 = 97\%$$

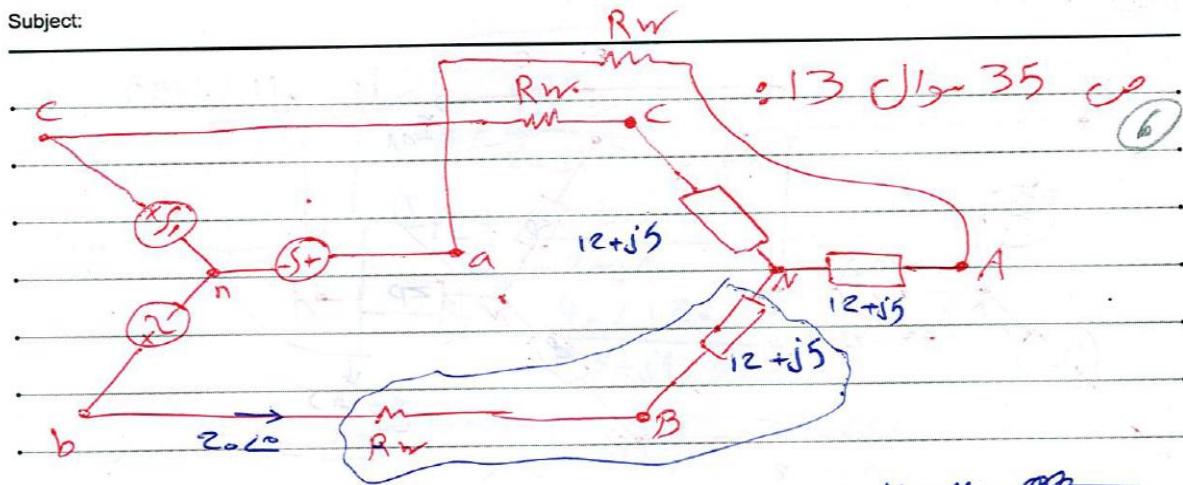
$$\text{معنی } S = \frac{1}{2} V_{AN} \cdot I_{AA}^* = \frac{1}{2} (2242 \angle 0^\circ)(30.26 \angle 17^\circ) \\ = 32360 + j10000$$

$$\text{معنی } S = \frac{1}{2} V_{An} \cdot I_{AA}^* = 33333 + j10000$$

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Subject:



$$C_0 \sin \phi = 0.935$$

(الف) $R_w \rightarrow V_{bn}$ 2) V_{AB}

→ $\sin \phi$

$$R_w 12 \angle 5$$

$$\tan \phi = \frac{XL}{R}$$

$$\phi = \cos^{-1}(0.935) = 20.77^\circ \Rightarrow \tan \phi = \frac{XL}{R} = 0.38 = \frac{5}{12+R_w}$$

$$\Rightarrow R_w = 1.15 \Omega$$

$$V_{bn} = I_{bn} (R_w + Z_p) = 2 \angle 0^\circ (1.15 + 12 + j5) = 281 \angle 20.8^\circ$$

$$v_{an} = 281,36 \angle 140.8^\circ$$

$$V_{BN} = I_{BN} \cdot Z_p = (2 \angle 0^\circ)(12 + j5) = 250 \angle 22.6^\circ$$

~~$$V_{AN} = V_{BN} + V_{BN} = 250 \angle 142.6^\circ$$~~

~~$$V_{BN} = 250 \angle 22.6^\circ$$~~

~~$$V_{CN} = 250 \angle 262.6^\circ$$~~

~~$$I_{AN} = \frac{V_{an}}{R_w + Z_p} = \frac{281,36 \angle 140.8^\circ}{1.15 + 12 + j5} = 19.51 \angle 120.4^\circ$$~~

~~$$V_{AN} = I_{AN} Z_p = 253,63 \angle 143^\circ$$~~

~~$$(AD)$$~~

$$\begin{cases} V_{AB} = V_{AN} - V_{BN} \\ = 250 \angle 142.6^\circ - 250 \angle 22.6^\circ \\ = 450 \angle 172.6^\circ \end{cases}$$

$$V_{BC} = V_{BN} - V_{CN} = 450 \angle 52.6^\circ$$

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~~$$V_{CA} = V_{CN} - V_{AN} = 450 \angle 292.6^\circ$$~~

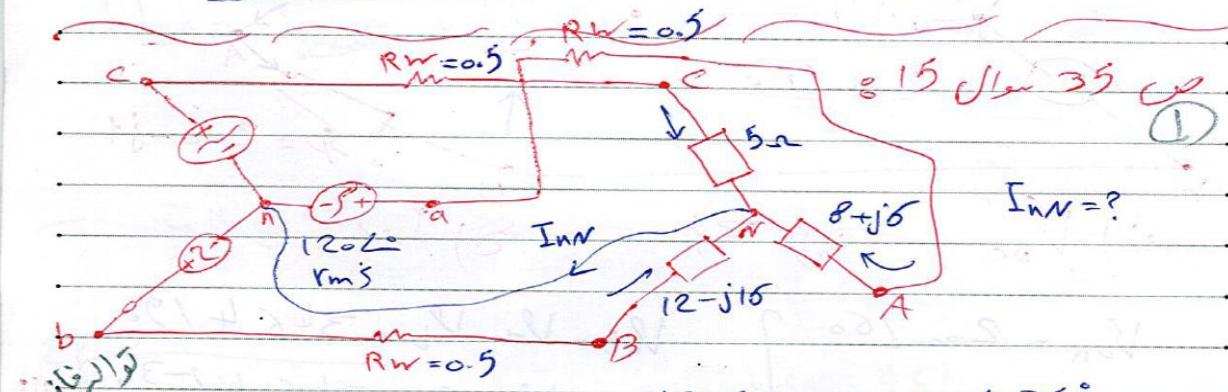
رحلتی، پیدا کرن و لئو فائزیا مسیر دارد

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Subject: B, 1st



$$\text{جهل} S = \frac{1}{2} (V_{bn}) (I_{bB}^*) = \frac{3}{2} (281 \angle 20.8^\circ) (20 \angle 0^\circ)$$

$$= 8430 \angle 20.8^\circ \text{ V.A}$$



$$V_{an} = 120 \angle 0^\circ$$

$$V_{bn} = 120 \angle -120^\circ \Rightarrow I_{bA} = \frac{120 \angle -120^\circ}{8.5 + j15} = 11.53 \angle -35^\circ$$

$$V_{cn} = 120 \angle 120^\circ \quad I_{bB} = \frac{120 \angle 120^\circ}{12.5 - j15} = 5.9 \angle -68^\circ$$

$$I_{cc} = \frac{120 \angle 120^\circ}{5.5} = 21.8 \angle 120^\circ$$

$$I_{NN} = I_{aA} + I_{bB} + I_{cc}$$

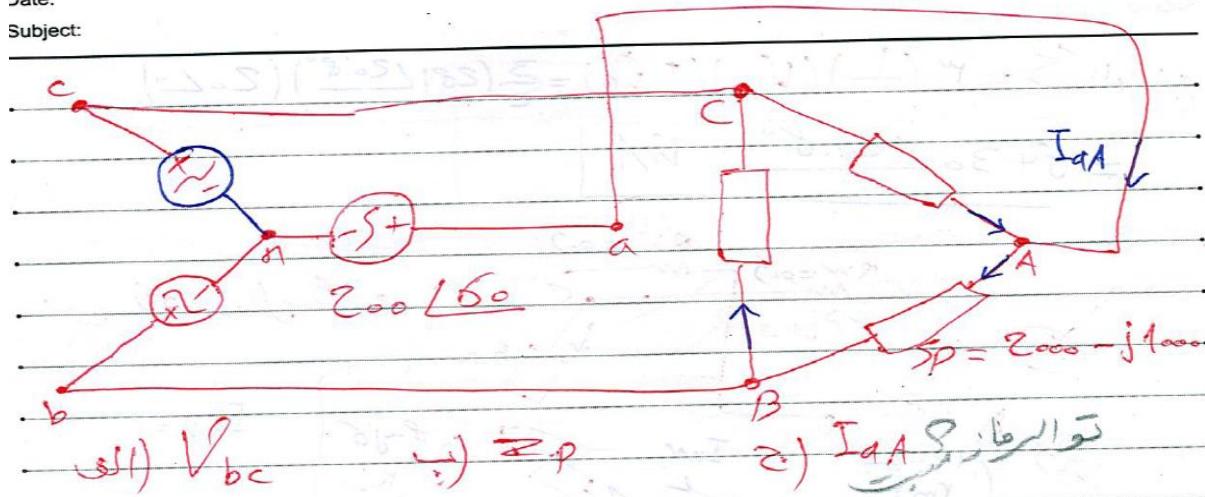
$$I_{NN} = 11.53 \angle -35^\circ + 5.9 \angle -68^\circ + 21.8 \angle 120^\circ = 6.83 \angle 83.6^\circ$$

٢٥ مارس



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$$\left. \begin{array}{l} V_{an} = 200 \angle 16^\circ \\ V_{bn} = 200 \angle -60^\circ \\ V_{cn} = 200 \angle 180^\circ \end{array} \right\} \quad \left. \begin{array}{l} V_{ab} = V_a - V_b = 346.4 \angle 9^\circ \\ V_{bc} = V_b - V_c = 346.4 \angle -3^\circ \\ V_{ca} = V_c - V_a = 346.4 \angle 121^\circ \end{array} \right\} \text{معنی}$$

$$R_w = 0 \Rightarrow \left\{ \begin{array}{l} V_{AB} = V_{ab} \\ V_{BC} = V_{bc} \\ V_{CA} = V_{ca} \end{array} \right. \quad S = \frac{1}{2} V_{AB} \cdot I_{AB}^* \Rightarrow I_{AB} = \frac{25}{V_{AB}} \\ = \frac{4000 - j2000}{346.4 \angle 9^\circ} = 12.9 \angle -116^\circ \\ \Rightarrow I_{AB} = 12.9 \angle 116^\circ$$

$$S = \frac{1}{2} V_{CA} \cdot I_{CA}^* \Rightarrow I_{CA}^* = \frac{25}{V_{CA}} = \frac{4000 - j2000}{346.4 \angle 121^\circ} \\ = 12.9 \angle 123^\circ \Rightarrow I_{CA} = 12.9 \angle -123^\circ$$

AV



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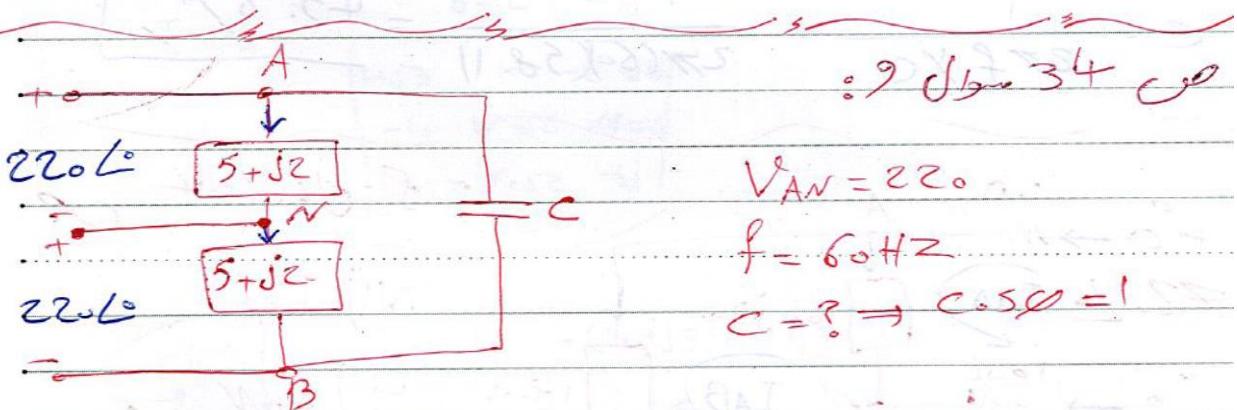
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$$Z_p = \frac{V_{AB}}{I_{AB}} = \frac{340 \cdot 412^\circ}{12.9 \angle 116^\circ} = 26.8 \angle -26^\circ$$

$$I_{AA} = \cancel{I_{AA}} \quad \overrightarrow{I_{AB}} - \overrightarrow{I_{CA}} = 12.9 \angle 116^\circ \quad \cancel{\bullet}$$

$$= 12.9 \angle -123^\circ$$

$$= 22.4 \angle 186^\circ$$



$$I_{AN} = \frac{220 \angle 0^\circ}{5 + j2} = 40.8 \angle -21.8^\circ$$

$$I_{NB} = \frac{220 \angle 0^\circ}{5 + j2} = 40.8 \angle -21.8^\circ$$

$$S_{AN} = \frac{1}{2} V_{AN} \cdot I_{AN}^* = \frac{1}{2} (220 \angle 0^\circ) (40.8 \angle 21.8^\circ)$$

$$= \frac{4167 + j1665}{P} Q$$

$$S_{NB} = \frac{1}{2} (V_{NB}) (I_{NB}^*) = \frac{1}{2} (220 \angle 0^\circ) (40.8 \angle 21.8^\circ)$$

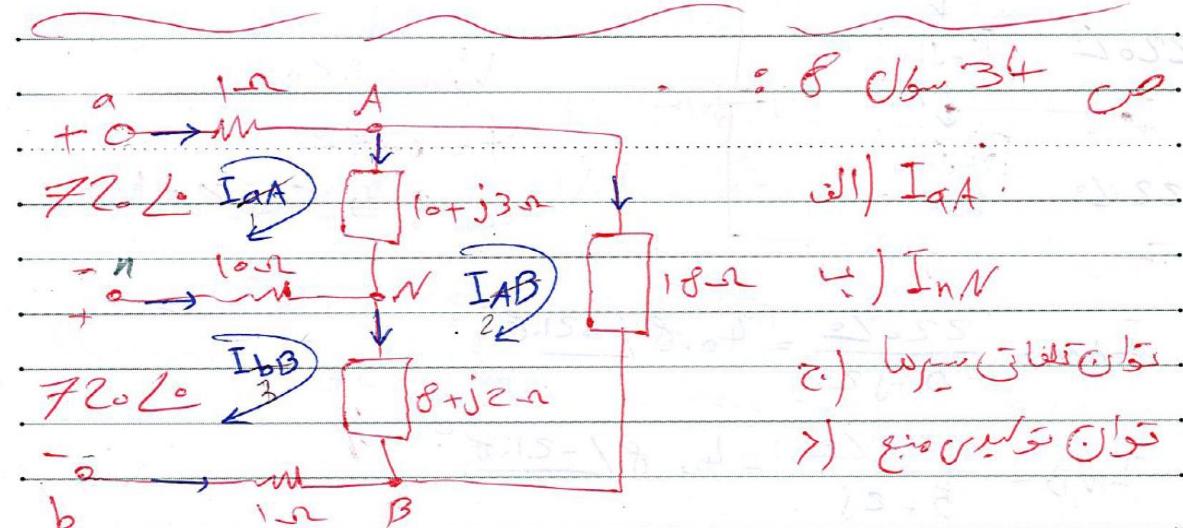
$$= \frac{4167 + j1665}{P} Q$$

$$Q_{AN} + Q_{NB} = Q_{AB}$$

$$Q_{AB} = 3332 \text{ V.A.R}$$

$$\text{Losses} P_r = \frac{V^2}{n_c} \Rightarrow n_c = \frac{V^2}{P_r} = \frac{(440)^2}{3332} = 58.1 \Omega$$

$$C = \frac{1}{2\pi f X_C} = \frac{1}{2\pi(60)(58.1)} = 45.6 \mu F$$



$$\left. \begin{aligned} -72\angle 10^\circ + I_{aA} + (10+j3)(I_{aA} - I_{AB}) + 10(I_{aA} - I_{bB}) &= 0 \\ -72\angle 10^\circ + 10(I_{bB} - I_{aA}) + (8+j2)(I_{bB} - I_{AB}) - I_{bB} &= 0 \\ 18 I_{AB} + (8+j2)(I_{bB} - I_{AB}) + (10+j3)(I_{aA} - I_{AB}) &= 0 \end{aligned} \right.$$

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$I_{AB} = 8.6 \text{ A}$

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$$\begin{cases} (1+j3)I_{aA} + 1 \cdot I_{bB} - (1+j3)I_{AB} = 7\angle 0 \\ -1 \cdot I_{aA} + (17+j2)I_{bB} - (8+j2)I_{AB} = 7\angle 0 \\ (10+j3)I_{aA} + (8+j2)I_{bB} - j5I_{AB} = 0 \end{cases}$$

$$I_{aA} = \frac{\begin{vmatrix} 7\angle 0 & 1 & -(1+j3) \\ 7\angle 0 & 17+j2 & -(8+j2) \\ 0 & 8+j2 & -j5 \end{vmatrix}}{\begin{vmatrix} 1+j3 & 1 & -(1+j3) \\ -1 & 17+j2 & -(8+j2) \\ 10+j3 & 8+j2 & -j5 \end{vmatrix}}$$

$$\begin{vmatrix} 1+j3 & 1 & -(1+j3) & 1+j3 & 1 \\ -1 & 17+j2 & -(8+j2) & -1 & 17+j2 \\ 10+j3 & 8+j2 & -j5 & 10+j3 & 8+j2 \end{vmatrix} = n$$

بعد إزالة I_{AB}, I_{bB}, I_{aA} نحصل على

$$I_{NB} = I_{bB} - I_{aA}$$

$$I_{NB} = I_{aA} - I_{AB}$$

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$$I_{NB} = -I_{AB} - I_{bB} = -j5I_3 - j2I_2$$

(4)

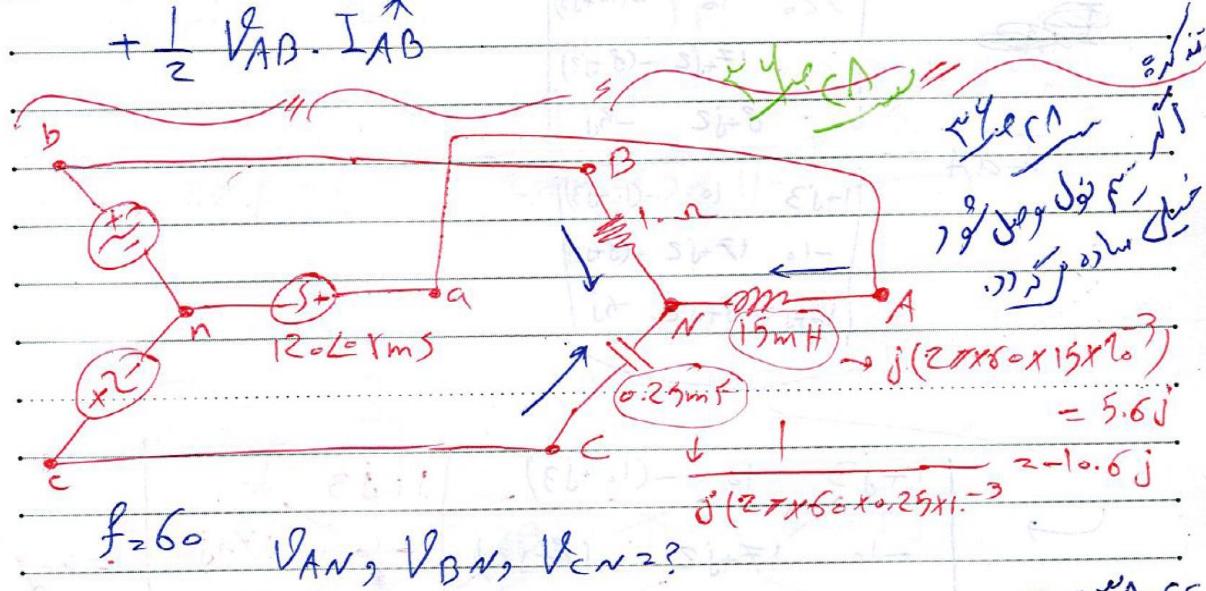
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$$\text{ذو اتفاقی سیم} = (1-a)(I_{aA})^2 + (1-a)(I_{aN})^2 + (1-a)(I_{bB})^2$$

ذو اتفاقی سیم اور میانی توان می باشد

$$S = \frac{6}{\pi} \text{ ذو اتفاقی سیم} + \frac{1}{2} V_{AN} \cdot I_{AN} + \frac{1}{2} V_{NB} \cdot I_{NB}$$

$$+ \frac{1}{2} V_{AB} \cdot I_{AB}$$



$$V_{an} = V_{An} = \frac{V_A}{120 \angle 0^\circ}$$

$$V_N = 120 \angle -10.6^\circ$$

$$V_{bn} = V_{Bn} = \frac{V_B}{120 \angle -120^\circ}$$

$$V_{AN} = V_A - V_N = 140.8 \angle 10^\circ$$

$$V_{cn} = V_{Cn} = \frac{V_C}{120 \angle 120^\circ}$$

$$V_{BN} = V_B - V_N = 140.8 \angle -120^\circ$$

$$V_{CN} = V_C - V_N = 120 \angle 10^\circ$$

$$KCL \Rightarrow \frac{V_A - V_N}{5.6j} + \frac{V_B - V_N}{10} + \frac{V_C - V_N}{-10.6j} = 0$$

$$\Rightarrow \frac{120 \angle 0^\circ - V_N}{5.6j} + \frac{120 \angle -120^\circ - V_N}{10} + \frac{120 \angle 120^\circ - V_N}{-10.6j} = 0$$